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## Can eating worms banish asthma? Scientists discover common diseases are linked to being too clean...

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Could the cure to a wide range of modern epidemics such as diabetes, Crohn's disease, asthma and heart attacks, lie in swallowing parasitic worms and letting them live in our stomachs?

Rob Dunn, an eminent professor of biology, believes our healthy future lies in what he calls 're-wilding our bodies'. In a new book, he urges us all to adopt a radical approach to the 'hygiene hypothesis'.

This is the idea that our lives have become too clean for our own good, and that this is making our immune systems so disorientated that they over-react massively to harmless everyday substances, such as house dust. Professor Dunn says this is causing a rise in serious allergic responses, such as asthma, as well as autoimmune diseases, including Crohn's disease and rheumatoid arthritis.



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**Unappetising idea: Scientists believe having real worms in our guts could help our immune systems**

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Evidence is growing to support the hygiene hypothesis. For example, earlier this year, in a study of 1,400 children, researchers at Yale University in the U.S. said that infants who receive antibiotics have a 70 per cent higher risk of suffering from asthma in childhood.

This asthma risk may be caused by the fact that the antibiotics have wiped out swathes of bacteria — good and bad — in the babies' bodies. This deprives their immature immune systems of a healthy benchmark of normality on which to base their development.

In the years before antibiotics and scrupulous hygiene, our immune systems were used to bacteria and learnt to ignore this as non-hazardous. But when they are deprived of this early lesson thanks to growing up in a highly hygienic environment, the immune system can over-react to minor provocations, such as harmlessly low levels of bacteria.

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Professor Dunn, of North Carolina State University, believes we should convince our bodies they are still in the natural state of our ancestors: roaming bug-infested forests and living in unsanitary hovels. We can do this, he says, by having worms living in our guts.

While it sounds wacky and, frankly, disgusting, research scientists across the world are taking this idea very seriously.

'We have gone from lives immersed in nature to lives in which nature has disappeared,' he says. 'But our bodies continue to expect to meet our old companions, the parasite species with which they tangled for generation upon generation.'

Western people became routinely free of parasites only in the early 20th century.

Professor Dunn adds: 'Some of the ways we have distanced ourselves from other species are good. I do not miss smallpox. But in recent years a new suite of diseases has plagued us.'

There is, indeed, a paradox about western healthcare. While old epidemics, such as cholera, have disappeared from advanced nations thanks to antibacterial

wipes and medicines, a set of new ailments — including inflammatory bowel disease, rheumatoid arthritis, diabetes and multiple sclerosis — has become more common. Many of these seem linked to our immune systems.

In the Thirties, Crohn's — a chronic form of inflammatory bowel disease that can inflict constant misery and pain on people's lives — was so rare that it was mostly undetected.

Then, between the Fifties and the mid-Eighties, its incidence rate began to grow. The number of Scottish children affected has risen by 50 per cent since 1995, says Jack Satsangi, professor of gastroenterology at the University of Edinburgh.

Up to 90,000 Britons now suffer from Crohn's and this number is rising. Some of this may be due to better recognition, but that does not wholly explain the rapid rise in this often-debilitating condition.

Professor Dunn's argument is inspired by Joel Weinstock, a medical researcher at Tufts University in the U.S. who noticed the countries where Crohn's was becoming common were also the places where intestinal worms were known to have become rare.

He wondered if the absence of intestinal parasites was causing Crohn's disease — if our bodies missed their worms' parasitic presence so badly they were increasingly attacking themselves.

Such a possibility contradicted the accepted belief that medicine is meant, in part, to remove species from our bodies to make us healthy.

But tests by Weinstock showed that when you put parasitic worms into the digestive systems of mice, you could stop them from getting a mouse version of irritable bowel disease. He tried something similar with 29 humans with Crohn's in 1999. Each was given a glass of whipworm eggs to swallow. Whipworms are found in pigs' guts.

**'Tests have shown when you put parasitic worms into the digestive systems of mice, you could stop them from getting irritable bowel disease'**

Weinstock hoped that although this strain of worm would not be able to breed inside humans, it could prompt the human body to respond to their parasitic presence.

Twenty-four weeks later, all but one patient was doing better and 21 were in remission. Since then, other studies have found that when treated with worms, people with inflammatory bowel disease can improve and diabetic mice may return to normal blood-glucose levels.

In some animal tests, the progression of heart disease has been slowed and the symptoms of multiple sclerosis have improved. All these conditions may be caused by inflammation in the body, which has resulted from an over-reactive immune system.

But why would intestinal worms have this effect? One theory is that, over millennia of evolution, our immune systems got used to worms. So if you take them away, the immune system runs wild, as it has nothing to work against.

Another theory is that parasitic worms in our guts can produce compounds that suppress the immune system. It may be that our bodies evolved to depend on at least low levels of worm-produced compounds to keep them running within normal bounds.

'Perhaps our bodies make more of an immune response than is necessary, as they assume that some of their response will be dulled by the worms,' suggests Professor Dunn.

'Instead, this over-response is precipitating a wide range of modern lifestyle diseases. We must bring back some of the worms.'

He thinks that could apply to all of us, even those who are healthy. But if it were all so easy, why are we not all swallowing glasses of worm eggs at breakfast?

The fact is that while clinical tests on deliberate worm infection have shown benefits, those results have been patchy — some studies work well, but others with the same test conditions do not show such good results.

**400,000**

**The rise in the number of adults with asthma between 2001 and 2004**

Furthermore, experiments have revealed bad side-effects from worms, such as developmental problems in children and heart troubles in adults.

Rick Maizels, professor of zoology at Edinburgh University, is sceptical about using live worms.

'In people exposed to parasites, you see a spectrum of outcomes and they are not all good,' he says. 'In fact, most people have some ill effects.'

Furthermore, many people would simply be too repelled by the idea of swallowing worms ever to try it. Professor Maizels is pursuing a nicer way of bringing us the benefits of parasitic worms.

He is trying to take a known natural remedy (often a medicinal plant), isolating its active ingredient and working out how to manufacture it as a clinically-reliable compound. This is how we got aspirin from willow.

'We are trying to isolate from worm parasites the substance they have that changes the human immune system to make it is less likely to over-react to allergens,' he says.

'We are working on a parasite called *heligmosomoides polygyrus* — a form of worm commonly found in mice. Mice that are without it have many more allergies.'

Professor Maizels' team has also found the mechanisms in the human immune system that react to such parasites. This is the other crucial half of the equation — the lock that fits the worms' chemical key.

'Now, when we find the substance in worms that makes the human immune system less prone to over-reacting, we'll be able to make it into a drug therapy,' he says.

Sadly, for sufferers of diseases caused by over-reactive immune systems, any effective drug remains about ten years away.

Until then, most of us would probably not want to eat worms instead.

***The Wild Life Of Our Bodies: Predators, Parasites And Partners That Shape Who We Are Today, by Rob Dunn, Harper, £16.99. To order at £14.99 (p&p free) call 0843 382 0000.***