

Did you know that there are more worms than people on planet earth??

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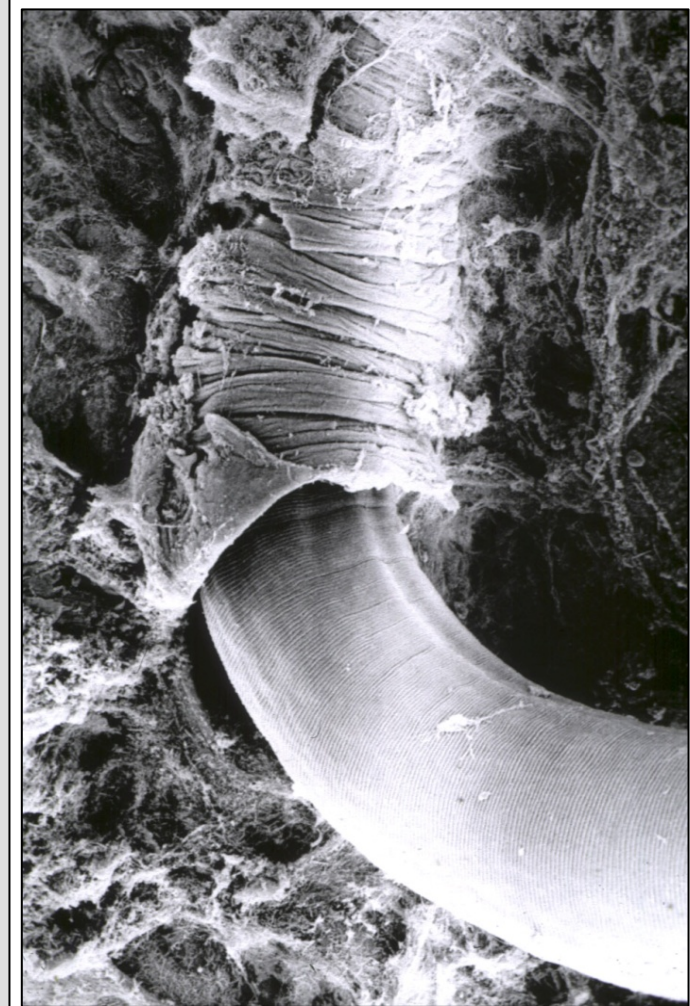
The University  
of Manchester



*With thanks to:*  
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The Worm Wagon

Wriggling...  
Writhing...  
Wow!

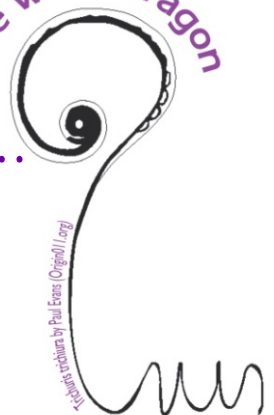


Image by Paul Ford (Original) Logy

Our research has  
shown that...

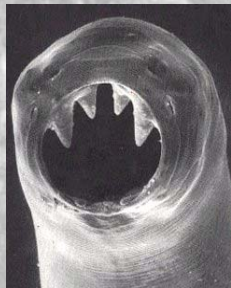
There are many  
different types  
of worm infection

Whipworm (*Trichiuris trichiura*) is transmitted through the faecal-oral route. Eggs can survive in a warm damp environment until they end up in your mouth! They are often found with roundworm (*Ascaris lumbricoides*) infection.

*Trichiuris trichiura*



*Ascaris lumbricoides*



Hookworm (e.g. *Ancylostoma duodenale*) is transmitted by the worm burrowing into skin (usually the feet). These are very small (1cm) but migrate from skin to the lungs. When you cough, they are swallowed and travel to the gut where they mate. They cause severe illness because they suck blood so cause anaemia.

Tapeworms (e.g. *Taenia saginata*) are some of the longest worms that live in your gut. You become infected by eating undercooked meat (including fish). You will often only be infected by one worm, but it can grow to at least 9m long!



# Worms!

**1 billion people** world wide are affected by gut helminth (worm) infections.

**W**orm infections cause severe health problems, particularly in children. The World Health Organisation now agrees that these infections trap countries in poverty because of their indirect effect on economic growth.

**A**long with your gastrointestinal tract, worms can live in many different places in your body including the brain, liver, lungs and lymphatic system.

**I**nterestingly different people respond differently to infection, even if they are infected by the same parasite. **Non-wormy** people can get rid

of their worm infection, but some **wormy** people go on to have long lasting chronic infections, making them very ill.

## Here in Manchester

we study the immune system to try and understand the reason behind these different responses to infection.

Manchester Immunology Group

### • Our immune response to the rescue

Our work has made lots of discoveries about how our immune system works during infection. We now know which kind of immune response promotes resistance to infection. We also know that you need a very quick response by immune cells called dendritic cells to make sure that the immune response gets moving!

• **Mucus fights back!** When worms infect the gut, the body makes more mucus which helps to expel the worm.

• **Whipworm spends it's whole life wriggling** to stay where it is in the gut. It continually burrows into the gut lining against the natural renewal process, a bit like running down an up escalator. Our bodies can increase the speed of the 'escalator' and **beat the worm at its own game!** Eventually the worm can't keep up and gets pushed out into the faeces.

• **Whipworms are perfectly adapted** to live in the gut environment. When worm eggs are eaten, the eggs travel down the gut to the large intestine. The large intestine is full of bacteria and as soon as the eggs sense the bacteria they starts to hatch.

• A wormy response to infection has a lot of similarities to severe Crohn's disease. This may help us understand **why treatment of Crohns' patients with worm eggs** actually makes them feel better!