New model for the development of hookworm vaccines – bacteria eating worms

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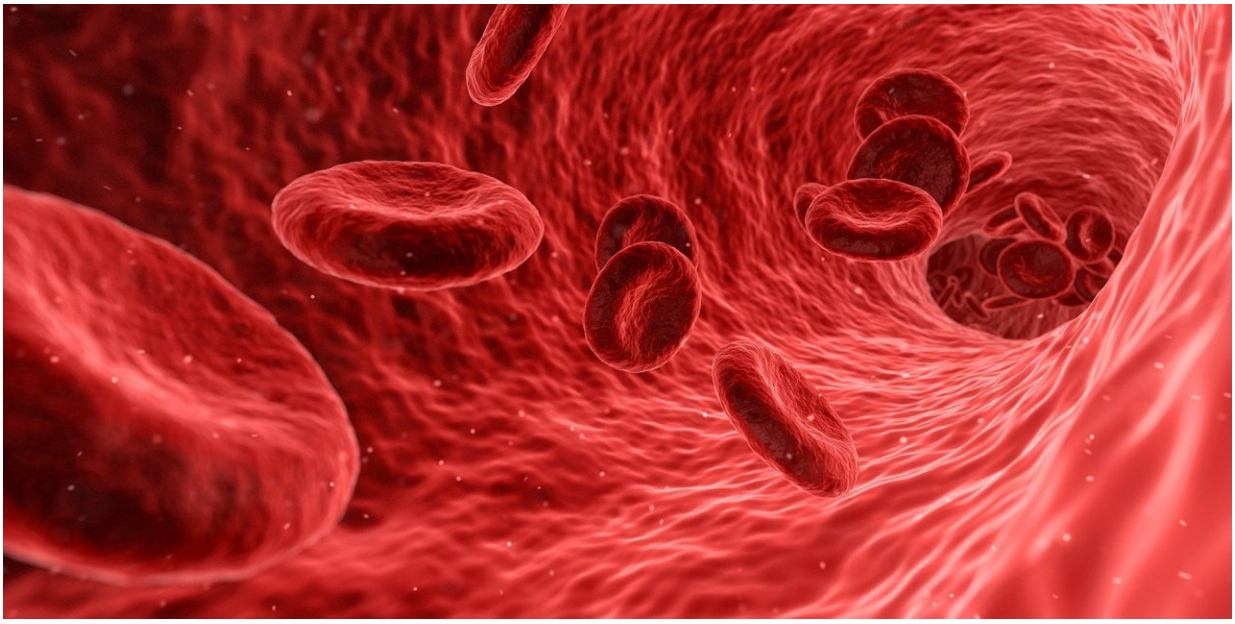

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Having identified the complex physicochemical fingerprint of the parasitic hookworm, Necator americanus, researchers at the University of Nottingham set about changing the diet of a 'friendly' microscopic worm to assess the effectiveness of immune responses to anti-parasitic vaccines currently under development. And what better way to test this potential new model; by using their very own blood!

Dr. Veeren Chauhan, from the School of Pharmacysaid: "Our results show the 'friendly' nematode roundworm C. elegans, which usually eats harmless bacteria in the laboratory, can survive on diet of human blood —specifically Professor David Pritchard's blood. This 'friendly' microscopic worm contains key enzymes in its gastrointestinal tract, which are also found in the parasitic hookworm N. americanus. These enzymes are closely related to vaccine targets in the ground breaking Human Hookworm Vaccine Initiative."

"Haematophagic Caenorhabditis elegans" has been published in the academic journal *Parasitology*.

These findings support the theory that C. eleganscould be used as a surrogate model for the parasitic nematode N. americanus, with the potential to accelerate vaccine research against hookworm and other important parasitic diseases.

The hookworm Necator americanusis found in tropical climates and gets into the body through the skin, usually when trodden on barefoot. The worm then sheds its own skin, which is thought to trigger a diversionary immune response. If left untreated heavy infections result in anaemia and long-term discomfort and disability. These immunological observations inspired the team to explore the chemistry of the two surfaces in greater detail.

Hookworm research a decade on

It is ten years since David Pritchard, Professor of Parasite Immunology, at the University of Nottingham, hit the headlines after allowing 50 hookworms to burrow into his arm to test the effect these parasites have on humans. This work established the necessary safety and regulatory criteria with regard to human infection studies. Subsequently, these worms are now cleared for use in therapeutic and vaccine challenge trials

worldwide.

The Medicines and Healthcare products Regulatory Agency UK (MHRA) and US Food and Drug Administration (FDA) are now happy to allow patients and volunteers to be infected with hookworms, as a potential therapy for autoimmune diseasesor as a challenge infection post-vaccination for hookworm infection.

This time, as a healthy volunteer, he was able to simply donate his blood. This was fed to friendly C. elegans,to investigate whether they could ingest and survive on a diet of human red blood cells. If they could, they would serve as a tractable model to further our understanding of blood feeding parasites, to interrogate their responses to antibodies to vaccines currently under development, and to search for new targets in the nematode's intestine.

More information: Veeren M Chauhan et al. Haematophagic Caenorhabditis elegans, *Parasitology* (2018). DOI: 10.1017/S0031182018001518

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