

# High-protein diets help insects to fight against blood parasites

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*Spodoptera littoralis*. Credit: Professor Kenneth Wilson, Lancaster University

Scientists studying insects have identified a crucial biological mechanism responsible for increasing their survival against blood parasites.

The finding, in which a [high protein diet](#) is linked to increased survival, could be a key stepping-stone to discovering how diet could help us fight parasitic blood infections.

The study, led by researchers at Lancaster University and involving scientists in the UK and Australia looked at infected caterpillars. It revealed that those fed with [high-protein diets](#) survived for longer, and in greater numbers, than those with less protein in their food and that 'osmotic stress', not an enhanced [immune system](#), is the reason behind the results.

Dr. Robert Holdbrook, who conducted much of the laboratory work as part of his Ph.D. at Lancaster University, said: "Higher levels of protein and [amino acids](#) in the caterpillar's blood draws water out of the bacterial cells through osmosis. This process raises the concentration of solutes, which are basically all the other molecules needed by cells such as sugars and amino acids, within the bacteria. This higher solute concentration stresses the [bacterial cells](#) and slows down their growth."

The researchers, who conducted their research on a species of caterpillar called the African cotton leafworm (*Spodoptera littoralis*) and the bacterium *Xenorhabdus nematophila*, believe this is the first time osmotic stress has been found to combat parasitic bacteria in the blood.



*Spodoptera littoralis*. Credit: Professor Kenneth Wilson, Lancaster University

How diet influences host-parasite interactions is still poorly understood, with most previous research attention focused on the effects of key nutrients on host immune systems.

Dr. Sheena Cotter of the University of Lincoln, who is a co-author of the paper, said: "Until now, we have generally assumed that when diet increases resistance to [parasites](#) it is because the diet boosts the host's immune system by, for example, providing the building blocks for more immune cells. But our study showed that when we increase protein in the [diet](#), the bacteria grew less well, even when the insect's immune system was bypassed."

Although this study focused on caterpillars and their parasites, the findings could offer a possible avenue of research on humans and blood conditions.

Human blood exhibits natural variation in solute concentration, known as osmolality. But so far no clear link has been found between blood osmolality and parasite infections.

Professor Kenneth Wilson of Lancaster University, who led the study, said: "We don't know yet whether these findings also apply to humans with parasites in their [blood](#), for example malarial parasites or the bacteria that cause septicaemia, but this could be an exciting avenue for future research."

The research is outlined in the paper 'Osmolality as a Novel Mechanism

Explaining Diet Effects on the Outcome of Infection with a Blood Parasite', which has been published by the journal *Current Biology*.

**More information:** Osmolality as a Novel Mechanism Explaining Diet Effects on the Outcome of Infection with a Blood Parasite, *Current Biology* (2020). [DOI: 10.1016/j.cub.2020.04.058](https://doi.org/10.1016/j.cub.2020.04.058)

Provided by Lancaster University

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