

# Parasites in humans influence each other via shared food sources

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Over 1,400 species of parasites – viruses, bacteria, fungi, intestinal worms and protozoa – are able to infect humans. In most cases, the right medicine against a parasite cures the patient. If he or she suffers from an infection by two or more species of parasite at the same time, however, it soon becomes more difficult to diagnose and treat. Medication can even exacerbate the medical condition if one pathogen is killed off but the second flourishes. One reason is the little-understood interactions between the parasites that reside in the same host.

In a study published in *Proceedings of Royal Society B*, an international team of researchers including Professor Owen Petchey from the Institute of Evolutionary Biology and Environmental Studies at the University of Zurich presents a network that explains how different [pathogens](#) and parasite groups mutually influence each other in the human body. Surprisingly, the biologists discovered that the parasites are most likely to interact via the food source they share – not the immune response or directly through contact with other parasites.

## Complex overview with clear patterns

Co-infections are very common: Simultaneous infestations by different [intestinal worms](#), for instance, affect around 800 million people worldwide. In order to develop effective treatment approaches for co-infections, says Owen Petchey, we need to understand the structures of the parasite communities in a host – in this case individual humans – and

the [interactions](#) between the parasites better. The ecologists from Zurich, Liverpool, Sheffield and Edinburgh compiled a list of 305 parasite species, 124 resources in the host and 98 immune system components in a meta-study – then analyzed over 2,900 combinations of all these factors in an unprecedented manner.

The network displays clear patterns: The infected part of the body and the same food resource are the most common contact points that can lead to an interaction between the different parasites. "We found twice as many parasites fighting for the same energy source as parasites that elicit the same [immune response](#) and are able to interact in that way," explains Petchey. The manner in which the immune system responds to the individual pathogens seems to be of secondary importance, despite the fact that other studies pointed towards precisely this. The direct influence from one parasite to the next is also rarer, with the exception of HIV, Staphilococcus aureus and the Hepatitis C virus, which are known to interact directly with other pathogens.

## **Personalized medicine in the spotlight**

The network-like overview of the various interactions of [parasites](#) that can harm humans goes beyond the usual consideration of parasite pairs. "These results can serve as a basis for the development of new, personalized treatment schemes for infected patients," Petchey hopes. The biologist is currently testing his hypotheses of this synthesis study with different organisms.

**More information:** Emily C. Griffiths, Amy B. Pedersen, Andy Fenton and Owen L. Petchey. "Analysis of a summary network of co-infection in humans reveals that parasites interact most via shared resources." *Proceedings of Royal Society B*, March 12, 2014. [DOI: 10.1098/rspb.2013.2286](https://doi.org/10.1098/rspb.2013.2286)

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