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### Article

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# Microbiome analysis of malacopathogenic nematodes suggests no evidence of a single bacterial symbiont responsible for gastropod mortality

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Nematodes and bacteria are prevalent in soil ecosystems, and some have evolved symbiotic relationships. In some cases, symbionts carry out highly specialised functions: a prime example being entomopathogenic nematodes (EPNs), which vector bacteria (*Xenorhabdus* or *Photorhabdus*) into insect hosts, killing them to provide a food source for the nematodes. It is thought that the commercially available malacopathogenic (kills slugs and snails) biocontrol nematode *Phasmarhabditis hermaphrodita* vectors a bacterium (*Moraxella osloensis*) into slugs to kill them. To investigate this further we used a metagenomic approach to profile the bacteria present in the commercial strain of *P. hermaphrodita*, a wild strain of *P. hermaphrodita* and two other *Phasmarhabditis* species (*P. californica* and *P. neopapillosa*), after they had killed their slug host (*Deroceras invadens*). We show that these nematodes do not exclusively associate with one bacterium but a range of species, with members of the phyla Pseudomonadota, Bacillota, Actinobacteriota and Bacteroidota the most prevalent. The commercial strain of *P. hermaphrodita* had the least diverse bacterial community. Furthermore, we found that the bacterium *P. hermaphrodita* has been cultured on for 25 years is not the expected species *M. osloensis* but is actually *Psychrobacter* spp. and the only strain of the *Phasmarhabditis* species to associate with *Psychrobacter* spp. was the commercial strain of *P. hermaphrodita*. In summary, we found no evidence to show that *P. hermaphrodita* rely exclusively on one bacterium to cause host mortality but found variable and diverse bacterial communities associated with these nematodes in their slug hosts.

**Keywords:** Metagenomics, Nematodes, gastropod, Symbiosis, biocontrol, Bacteria, 16S / 18S ribosomal RNA gene analysis

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