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Editorial

Hedgehog Parasitology—A Nocturnal Risk to Human Health?

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A One Health approach to disease has never been more important. The COVID-19 pandemic, the Ebola outbreaks, the rising numbers of tick-borne diseases and the constant emergence of novel pathogens is constantly in the media. However, the impact which wildlife can have on disease transmission and carriage is frequently overlooked and, consequently, such studies are always welcome. Therefore, it is encouraging to see two studies recently published around hedgehog parasites, both by Alfaia et al., with one being a review of diagnostics methods and treatments of parasites [1], and one focusing on fenbendazole efficacy against *Capillaria* spp. [2].

The review [1] highlights the variation in parasites that hedgehogs can carry, and shows the potential zoonotic risks posed by both endoparasites, such as *Cryptosporidium*, and ectoparasites, such as mites, ticks, and fleas (which are notable vectors). Issues posed by coccidian species are a problem in many animals and hedgehogs do not appear to escape them either. The review does however highlight the fact that little is known about hedgehog parasites, and as such, further research needs to be conducted. For example, we know little about the role of hedgehogs as vectors for *Giardia*, or indeed the impact that it has on the hedgehogs themselves.

The experimental paper [2] reported gastrointestinal parasites in 76% (26/34) of Northern, white-breasted hedgehogs, with an average intensity of 1350 eggs per gram, at the rescue shelter and Budapest Zoo, suggesting issues with parasitism. Of the positive animals, *Capillaria* spp., was observed in 58% (15/26). Treatments on a small number of the animals showed that the use of the fenbendazole drug was 100% effective at removing *Capillaria* spp. in hedgehogs. Previously, at the same rescue shelter, other anthelminthic drugs were used but shown to have very limited effects on reducing the parasite load, suggesting a level of resistance or a lack of efficacy.

With declining hedgehog populations across much of the world, including in the United Kingdom where they are classed as vulnerable to extinction [3], such studies are valuable to conservation efforts. With an increase in the number of both formal and informal animal rescue shelters, as well as an increase in hedgehogs as pets, a better understanding of their common pathogens can only aide in their care.

However, it is important to appreciate the ability for hedgehogs to act as reservoirs of disease and the zoonotic potential that they may harbour. This poses potential risks to those that care for them, either as rescue shelter personnel, or those who keep pygmy hedgehogs as pets. As they are commonly nocturnal and relatively illusive animals, hedgehogs are often out-of-sight and out-of-mind, yet they may be regularly entering gardens and interacting or overlapping with outdoor domestic cats or fomites that pets such as dogs may later interact with. Indeed, anyone who has spent significant time dealing with hedgehogs will be only too aware of their propensity to carry fleas and ticks which they

Check for updates

Received: 18 February 2026
Accepted: 25 February 2026
Published: 9 March 2026

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can then potentially spread to pets [1,4]. The lack of medication which is licenced for use in hedgehogs also poses difficulties in dealing with infections.

It is heartening to see an increase in research into wild animal parasitology, especially around hedgehogs, which are struggling species in many countries. The role of infectious diseases, including parasitism in the struggles of hedgehogs, is unknown, but as is so often the case, further studies are needed. *Parasitologia* welcomes wild animal parasite studies, some which may use relatively small sample sizes as these are of interest and aid in developing the field. Obtaining large sample sizes for wild animals is often difficult for many reasons, but smaller sample sizes still provide vital and useful information to the field. The One Health principal links animals, humans and the environment for the benefit of all three fields, and the inclusion of wildlife in this is often overlooked but represents a vitally important niche to address and monitor for future disease outbreaks.

Conflicts of Interest: The authors declare no conflicts of interest.

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