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# Understanding *Giardia* infections among rural communities using the one health approach

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ABSTRACT

The epidemiology of giardiasis in rural villages in Peninsular Malaysia was examined in the context of the One Health triad that encompasses humans, animals and environment (i.e. river water). A cross-sectional study was carried out among five rural communities in Malaysia to determine the prevalence of *Giardia duodenalis* in humans, animals and river water. Fecal samples collected from humans and animals were examined by light microscopy. Water was sampled from the rivers adjacent to the target communities and investigated for the occurrence of *Giardia* cysts. The isolated cysts were further genotyped targeting the glutamate dehydrogenase and triosephosphate isomerase genes. The overall prevalence of *G. duodenalis* was 6.7% (18/269) and 4.7% (8/169) among humans and animals, respectively. *Giardia* cysts (mean concentration range: 0.10–5.97 cysts/L) were also found in adjacent rivers at four out of the five villages examined. At Kemensah and Kuala Pangsun, *Giardia* cysts were isolated from humans [rate: 3.7% each (of 54 each)], animals [rates: 6.3% (of 62) and 11.3% (of 16), respectively] and river water [average concentration of 9 samples each: 0.83 ± 0.81 and 5.97 ± 7.00, respectively]. For both villages at Pos Piah and Paya Lebar, 12.2% (of 98) and 6.1% (of 33) of collected human samples were infected, respectively whilst none of the collected animals samples in these villages were found to be positive. The river water samples of these two villages were also contaminated (average concentration: 0.20 ± 0.35 (of 9) and 0.10 ± 0.19 (of 3), respectively). In conclusion, *Giardia* cysts were simultaneously observed in the human-animal-environment (i.e., river water) interfaces in at least two of five studied communities highlighting a vital need to improve understanding on the interplay of transmission dynamics, the role of infected humans and animals in contaminating the water sources and the role of water as a vehicle of disease transmission in these communities. Indeed, this study illustrates the One Health approach which is to recognize that the optimal health of humans are interconnected with the well-being of animals and their environment.

## 1. Introduction

Emerging parasitic diseases pose a major threat to human and animal populations globally. Disease outbreaks cause enormous and long-term damage to the national and global economy. The emergence of these parasitic diseases are caused by changes in natural and anthropogenic factors which include climate change, population growth, agricultural inflation, and human activities (e.g. hunting and intrusion into wildlife habitats) (Chromicz et al., 2016). To minimize the risk factors for these disease emergences, surveillance activities that require communication and co-operation efforts across inter-disciplines sectors (One Health approach) is crucial (Dixon et al., 2014). Generally, the One Health approach is to promote integrated multiple disciplines approach to clinicians, researchers, agencies and governments by working locally, nationally and globally for the benefits of human, animal and the environment (Gibbs, 2014). In a nutshell, the One health concept is an initiative that links the triad of human, animal and the environment.

Among the emerging pathogens, *Giardia duodenalis* is one of the waterborne protozoan parasites that has significant impact on humans, animals and the environment, especially in water. This zoonotic

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