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## Enterobiasis in a wild captured Indian Langur

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**Abstract**

India is home to many species of non-human primates, including the Gray langur or the Hanuman langur (*Semnopithecus sp.*). *Enterobius vermicularis* is a common helminth parasite of humans affecting 200 billion people worldwide, which majorly includes children below the age of 10 years. An adult Gray langur was presented to the Wildlife Research & Training Centre, Gorewada, Nagpur, with a history of automobile accident from one of the protected areas of Maharashtra, India. The post-mortem examination revealed a complete fracture of the skull and multiple fractures in the right and left forelimb leading to haemorrhage, and multiple organ failure was found to be the cause of the death. During the post-mortem, the large and small intestine was examined for parasites and few roundworms were found in the caecum of the animal. The sample was found to be positive for the eggs of *Enterobius vermicularis*. Micrometry studies were conducted to measure the dimensions of the eggs. The parasite has been transmitted to humans from wildlife at the wildlife-human interface in the past. The study has significant implications for the One Health approach to safeguard public health.

**Keywords:** *Enterobius vermicularis*, Gray Langur, Hanuman Langur, wildlife, helminth

**Introduction**

India is home to many species of non-human primates, including the Gray langur or the Hanuman langur (*Semnopithecus sp.*). The Gray langur is a dominant old-world monkey species in India and is distributed throughout the geographical extent of the country. Recently, the species has encroached on human habitations due to reclining forest cover, habitat degradation, lack of water and other anthropogenic causes. Long term presence of the monkeys has been seen in areas with a consistent supply of food and water. Temples in India are home to many troops of monkeys who obtain their food from the offerings made by the visitors. In the rural context, the monkeys often raid the standing crops causing economic hardship to farmers. The close association of monkeys with humans is crucial for transmitting diseases as numerous diseases are shared between the two species. The contamination of water sources and food by the monkeys dwelling close to human habitations can facilitate the transmission of diseases and other infectious agents.

*Enterobius vermicularis* is a common helminth parasite of humans affecting 200 billion people worldwide, which majorly includes children below the age of 10 years (Kucik, 2004) [6]. The transmission of the parasite is mainly through the faeco-oral route, and surface contamination plays a vital role in the transmission of the disease (Dedeoglu & Kozan, 2011) [3]. In children below ten years, poor hygiene and crowding can encourage the spread of the infection. Though the infection can be treated with antihelminthic drugs like mebendazole, pyrantel pamoate and albendazole (Remfry 1978) [9], the circulation of the diseases continues even in developed countries. The disease has been identified in non-human primates like monkeys, gorillas (*Gorilla gorilla*), Chimpanzees (*Pan troglodytes*) (Yaguchi *et al.*, 2014) [10] Guinea baboons (*Papio papio*) Hamadryas baboons (*Papio hamadryas*) Barbary macaques (*Macaca sylvanus*), cynomolgus monkeys (*Macaca irus*) (Arjun *et al.*, 2015; Mbaya and Udendeye, 2011; Hashimoto and Honjo, 1966; Felt and White, 2005) [1, 7, 5, 4] from and others. The role of these non-human primates in transmitting the infection to humans has not been studied. There are a few reports on the prevalence of the infection in wild primates, the majority of these reports are from captive non-human primates. Very few cases from wild non-human primates are available. *Enterobius vermicularis* is transmitted to human communities close to the forests (Medkour *et al.*, 2020) [8]. This warrants close monitoring of the monkey troops close to the forests and parallel investigation of humans, especially the children at the wild-human interface.

The One Health approach can equip policymakers to better plan and monitor diseases in the wild-human interface. The current case report deals with detecting *Enterobius vermicularis* in the Hanuman langur.

### Case Presentation

An adult gray langur was presented to the Wildlife Research & Training Centre, Gorewada, Nagpur, with a history of automobile accident from one of the protected areas of Maharashtra, India. The animal was cared for in the intensive care unit, but the animal died on the same day due to persistent head injuries and internal organ damage. A post-mortem examination was carried out to gain insights into the cause of death. The post-mortem examination revealed a complete skull fracture and multiple fractures in the right and left forelimb leading to haemorrhage. Multiple organ failure was found to be the cause of the death. During the post-mortem, the large and small intestine was examined for parasites, and a few roundworms were found in the caecum of the animal. The faecal matter was collected from the rectum for microscopic examination. The sample was found to be positive for the eggs of *Enterobius vermicularis*. The adult worms were collected in warm formalin 10% and then mounted on slides using the standard technique. Using the Leica microscope, micrometry studies were conducted to measure the dimensions of the eggs. The mean length of the eggs was found to be  $55.19524 \pm 1.047605 \mu\text{m}$ , while the width was  $25.09524 \pm 1.508137 \mu\text{m}$ .



**Fig 1:** Eggs of *Enterobius vermicularis* seen under light microscope (20X)



**Fig 2:** Hatching of eggs of *Enterobius vermicularis* seen under light microscope (40X)



**Fig 3:** Proximal end of the adult parasite using light microscope (20X)



**Fig 4:** Distal end of the adult parasite using light microscope (20X)

### Discussion

The knowledge of the diseases prevalent in the wild is limited due to limited opportunities to investigate the samples from the wild. The number of parasites shared by humans and primates is large, and *Enterobius vermicularis* is a significant parasite due to its transmissibility to humans. The parasite has been transmitted to humans from wildlife at the wildlife-human interface. Due to the declining forest cover and human encroachment in the forest areas, the interaction of humans and wildlife has increased. Langur troops reside in close vicinity of humans in rural and urban contexts. The chances of transmission of the infection from monkeys to humans cannot be ruled out. The infected monkeys may contaminate water sources, food or surfaces, which may further act as a source of infection to humans.

Under the one health approach, it is important to screen wildlife at the human-wild interface for pathogens that are transmissible to humans. A similar case report from India was published in 2013 by Indian langur monkeys (*Presbytis entellus*) (Bhoyar *et al.*, 2013) [2]. However, no other report of the parasite has been reported from the country. Considering the distribution of the Indian langurs in the vicinity of the human settlements, it is crucial to screen the animals and humans for the prevalence of enterobiasis. The studies have

found correlation of appendicitis with enterobiasis (Yaguchi *et al.*, 2014) <sup>[10]</sup> and thus it is important to study the parasite in the wild animals to establish the transmission cycle.

In the present case, the parasite could be identified based on microscopic examination. The report of the parasite in a free-ranging Gray langur is significant as humans share the parasite. The work is preliminary but provides vital evidence of a common parasite in a species often neglected and has a substantial presence around human habitations. The findings are essential for the implementation of the principles of One Health.

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