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OCCURRENCE OF *ANCYLOSTOMA CANINUM* IN INDIAN JACKAL (*CANIS AUREUS INDICUS*) IN VIDARBHA REGION, MAHARASHTRA

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Abstract: An Indian Jackal (*Canis aureus indicus)* died in a road accident and was brought for post-mortem to the Department of Veterinary Pathology, Nagpur Veterinary College, Nagpur. The intestine of the jackal was collected and brought for examination of endoparasite in the Department of Veterinary Parasitology. The intestine was dissected and worms were collected in normal saline, washed with normal saline 5-6 times processed in 5% hot formalin and then fixed in 10% formalin. They were identified as *Ancylostoma caninum*. The jackal was from Gadchiroli district of Maharashtra state.
Keywords: *Ancylostoma caninum*, Indian jackal, *Canis aureus indicus*, Maharashtra.

Introduction

Hookworms (Nematoda: Strongylida: Ancylostomatoidae) are blood-feeding nematodes that parasitize the mammalian alimentary system (Popova, 1964). Regardless of the large diversity within this parasitic group, all Ancylostomatoidae species share basic morphologic, physiologic and life history traits that translate into similar consequences for their host. In humans and domestic animals, the deleterious effects of hookworms are well documented at the individual and population level, being one of the most significant neglected tropical diseases of humans (Bartsch et al., 2016), and an important cause or contributory factor of anemia and neonatal mortality in domestic dogs and cats (Traversa, 2012). Despite the potential deleterious impact in their hosts, there is no currently available summary on the number of hookworm species described and the significance of hookworm infection in free-ranging wild mammals.

The modification of landscapes and climate change create additional challenges for wildlife disease study, and it is predicted that these phenomena will modify the dynamics of nematode infections (Weaver et al., 2010, Weinstein and Lafferty, 2015). Therefore, improved description, analysis, and understanding of hookworm infections in wildlife are necessary to

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direct future research efforts and understand host-parasite relationships in a regional and global scale.

Hookworms are blood-feeding nematodes that parasitize the alimentary system of mammals. Despite their high pathogenic potential, little is known about their diversity and impact in wildlife populations. Hookworm infections cause anemia, retarded growth, tissue damage, inflammation and significant mortality in several wildlife species. Anemia has been documented more commonly in canids, felids and otariids, and retarded growth only in otariids. Many studies recorded significant differences in prevalence and mean intensity among regions related to contrasts in local humidity, temperature, and host population density. These findings, plus the ability of hookworms to perpetuate in different host species, create a dynamic scenario where changes in climate and the domestic animal-human-wildlife interface will potentially affect the dynamics and consequences of hookworm infections in wildlife. *Ancylostoma caninum* is a hookworm that occurs in the small intestine of dogs, foxes and other canines. It causes the loss of large quantities of blood from the host and is fatal depending on the magnitude of the challenge and resistance of the host. Infection typically occurs through either ingestion or skin penetration by infective larvae which then undergo more or less extensive migration through the tissue of the host before developing into adult hookworm. The infection is particularly endemic in the southern United States. *Ancylostoma caninum* larvae can cause accidental infection in humans called cutaneous larva migration or creeping eruption, which produces severe itching in the skin. It is the most common skin infection in tropical regions. It is also found in I number of subtropical regions around the world, including Central and South America, South Africa and Southern Asia.

Materials and Method

Indian jackal came for post-mortem at Nagpur Veterinary College, Nagpur. During post-mortem intestine was collected and after washing roundworms were collected for identification. Roundworms were preserved 5% hot formalin. Worms were observed under the microscope. Intestinal content was collected and processed by sedimentation and floatation techniques. Micrometry of the egg was done.

To execute the technique, placed fecal sample in a beaker, mixed thoroughly with 10–15 ml of water, repeated the process until level reached to 50 ml, and then poured through a wire mesh sieve into a sedimentation flask. Filled to the brim and left to settle for 20 minutes. Immediately decanted the supernatant, the 15 ml of water added to the sedimentation flask and shaken, Supernatant poured into a beaker, and allowed to settle for 20 more minutes, and

decanted again. Finally, last single drop of sediment was taken and placed on a glass slide, covered with a glass slip, and examined under the microscope (10x) for ova (Soulsby 1982). Gross specimens were preserved for identification of male and female characteristics.

Result and Discussion

After processing roundworms were identified based on characters given in Georgis' Parasitology for Veterinarians and Soulsby (1982) as *Ancylostoma caninum* male, 9mm-10mm in length with three pairs of teeth present in the buccal cavity.

The eggs measures of size 60u x 30u were collected from the collected intestinal content. This aligns with findings of hookworms in the study of parasitic infections in the red fox and golden jackal (Meshgi B *et al.,* 2009). Hookworms like *Ancylostoma caninum,* eggs were recovered from 3 months to 9-year-old wild dogs in Kruger National Park (Van Heerden J et al., 1994). The male is 10mm long and female is 14 mm long. The worms are rigid and reddish in color. Anterior end is bend dosed and the oral aperture is directed anterodorsally. Buccal capsule is deep. Dorsal gutter ends in a deep notch on the dorsal margin of which bears three teeth on either side in the depth of the capsule there is pair of triangular dorsal teeth and a pair of Centro lateral teeth.

All members of the Ancylostomatoidae family are hematophagous and have developed efficient systems to extract and digest their host blood (Hotez et al., 2016). Most hookworm species use their well-developed buccal capsules to attach to mucosal surfaces and cut-out pieces of the tissue to produce "wounds" that bleed, in part because of the secretion of several anticoagulant proteins (Periago and Bethony, 2012, Hotez et al., 2016). Since most hookworms live in the small intestine, this process creates a perfect environment for chronic blood loss, secondary bacterial infections and significant inflammation in the mucosae, impairing digestion and absorption (Seguel et al., 2017). Therefore, the main adverse effects of hookworms recorded in humans, domestic animals and wildlife species are anemia, retarded growth, secondary bacteremia and mortality (Traversa, 2012, Hotez et al., 2016, Seguel et al., 2017). The following section summarizes available evidence of such effects on wildlife hosts and explores potential drivers of those effects on wildlife populations.

Anemia is rarely documented in wildlife species infected with hookworms, because few studies include assessment of blood values. In wolves, *A. caninum* infection has been associated with iron deficiency anemia in pups (Kazacos and Dougherty, 1979). In Florida, USA, a young cougar was found markedly anemic due to *A. pluridentatum* infection (Dunbar

et al., 1994). In Michigan, USA, the reintroduced American martens (*Martes americana*) infected with hookworms (not species specified), were more likely to have anemia (Spriggs et al., 2016). The pups of Northern fur seals, California sea lions (Acevedo-Whitehouse et al., 2006), New Zealand sea lions (Acevedo-Whitehouse et al., 2009), Australian sea lions (Marcus et al., 2015b) and South American fur seals (Seguel et al., 2017), present with mild to severe anemia related to *Uncinaria* sp. infection. Hookworm-induced anemia is markedly regenerative in Australian sea lions (Marcus et al., 2015b). In New Zealand and California sea lions, a single nuclear polymorphism (SNP) is linked with the degree of hookworm-associated anemia (Acevedo-Whitehouse et al., 2006, Acevedo-Whitehouse et al., 2009).

There are numerous hookworm species described in a wide range of wild mammals. Carnivores are over represented in the literature, and therefore most of the negative effects of hookworm infection have been described in this group. This does not necessarily imply that hookworms are important pathogens only in carnivores; for instance, there is enough evidence to infer that hookworm infections are significant disease agents in ruminants and primates. These groups, however, are less represented and probably neglected regarding the study of hookworms. This could be in part due to the fact that most wild ruminants and primates live in areas of the planet traditionally underrepresented in terms of parasitology research (Falagas et al., 2006).

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