Short communication

Fatal infections in a captive *Pithecia irrorata* (primate) by *Porocephalus* sp. (Pentastomida)

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ABSTRACT

This work presents a case of sudden death of a non-human adult male primate, which belongs to the National Primate Center (CENP – Ananindeua – Pará – Brazil). The specimen was necropsied, and the anatomicopathologic exam showed a great collection of clotted blood in the right thoracic cavity, forming a mold. The aorta revealed an extensive lesion in its intima with a disruption area in its tissue. In the lungs, three encapsulated parasites were observed in subpleural location, specifically in the diaphragmatic, right apical and accessory lobes, measuring 05 mm diameter, which revealed a C-form by transparency analysis, characteristic of the nymphal stage of Pentastomida. Two cysts were dissected and the parasites demonstrated structural and morphometric patterns compatible with the nymph of *Porocephalus*. Histologically, encapsulated parasites were observed in the lungs, with inflammatory reaction in the underlying parenchyma, presence of exudate composed of fibrin, macrophages, detaching the eosinophils and presenting no granulomatous reaction. The aortic adventitial tissue presented development of granulation tissue, deposit of fibroid material in its margins, prevalence of eosinophils and free blood. The macroscopic and microscopic alterations in the aorta, as well as the presence of nymphs of Pentastomida in the lungs are data that base the hypothesis that the aortic lesion was responsible for the fatal picture of internal hemorrhage, and this picture was due to the migratory process of Pentastomida.

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1. Introduction

Pentastomida is an aberrant group of zoonotic endoparasites of vertebrates, with a questionable systematic position, since they present similarities to several taxonomic groups, with around 130 species, according to Almeida and Christoffersen (1999). Recently, Lavrov et al. (2004) performed a study to solve the group’s genetic position, determining the sequence of the mitochondrial DNA of *Armillifer armillatus*. Their data indicated that it belongs to a modified group of crustaceans, probably related to the brachiura.

Adult Pentastomids are found in the respiratory tract of carnivorous animals, usually of the Ophidia where immature stages (larvae and nymphs) are found in a variety of animals, mostly in mammals, has been found even in dog (Self, 1972; Brookins et al., 2009). These immature stages are found encysted in tissues of their intermediary host, and are associated with an identifiable clinical syndrome. The majority of nymph infections were identified in necropsy or incidentally during thoracic or abdominal surgeries (Lok and Kirkpatrick, 1987).

In humans, Pentastomes may be located in the viscera, acquired through ingestion of larvated eggs. On which case the person behaves like and intermediate host. Or they may...
reside in the nasopharynx following acquisition of nymphs of *Linguatula serrata*.

In the latter, the disease behaves as an aberrant definite host (Ma et al., 2002). The disease is often associated with the Pentastomida of the genus *Armillifer*, and the majority of cases in the last 20 years have been reported in China (Cum et al., 2005).

The cases in non-human primates are usually related to parasitism of the genera *Armillifer* and *Porocephalus* in animals of the Old World, and of the genus *Porocephalus* in animals of the New World (Cosgrove et al., 1970). This case reports the occurrence of pentastomiasis in a neotropical primate of the species *Pithecia irrorata*, vulgarly known as Parauacu. This neotropical primate lives in groups of 2 to 8 individuals in an area approximately 25 hectares in various types of forests distributed geographically throughout the states of Amazonas, Rondônia and Mato Grosso, in the south of the Amazon River, west of the rivers Tapajós and Juruema up to the Juruá River, and south of the Guaporé River. They eat leaves, fruits, seeds, flowers and insects (CENP, 2005).

The objective of this work is to describe and discuss the necropsy findings and consequences of the infection by Pentastomida in *Pithecia irrorata* specimens, from Brazil’s National Primate Center – Centro Nacional de Primatas (CENP).

2. Materials and Methods

In the years 2003 and 2004, the Pathology Section of CENP necropsied 131 primates of different species, and one case of sudden death in an adult male neotropical primate of the species *P. irrorata*, from CENP’s external exhibition cage, was reported. The animal was found in the morning and sent to be necropsied. During the anatomicopathological exam, parasitic cystic lesions were noticed, and one was extracted for histopathological analysis. The sample was fixed in 10% buffered formalin, and was processed with inclusion in CENP’s Laboratory of Histopathology, sectioned at 5 μ, and stained by Hematoxylin-Eosin.

The remaining two samples were dissected to remove the specimens and these were processed in the Laboratory of Veterinarian Parasitology of the Institute of Health and Animal Production – Laboratório de Parasitologia Veterinária do Instituto da Saúde e Produção Animal – of the Universidade Federal Rural da Amazônia, according to the methodology for Copepoda crustaceans suggested by Amato et al. (1991).

3. Results

3.1. Necroscopic findings

The dead body presented a good muscular and adipose conformation. The organs in the abdominopelvic cavity revealed normality, except for the liver, which was characterized by atrophy and its surface seemed like orange rind, especially on its visceral face. While opening the thoracic cavity, the presence of a great collection of clotted blood was observed in the right side, forming a mold of the cavity.

The lungs were slightly hyperemic, with habitual cadaveric spasm. Three cystic formations were observed in subpleural location, in the diaphragmatic, right side filling the available space and accessory lobes, measuring about 05 mm in diameter. They revealed a C-form by transparency analysis (Fig. 1), and were still alive after dissection.

The analysis of the aorta showed an extensive lesion in the intima with a perforation area, what caused hemothorax and the death of the animal.

3.2. Identification of parasites

Morphologically, the two parasites dissected were whitish, vermiform, presented a C-form, and were thickly

Fig. 1. Lung after fixation, presenting a formation of parasitic cyst in the accessory lobe.
clavate (Fig. 2). They revealed characteristics of a nymph-stage Pentastomida, with an average of 36 rings and an average size was 6.3 mm by 1.4 mm of length and width, respectively. The analysis of the anterior extremity revealed the presence of two pairs of hooks around the mouth, with compatible characteristics with those referred by Self (1972) for the genus *Porocephalus*.

3.3. Histopathologic description

The result of the histological analysis of the lung showed chronic interstitial pneumopathy and emphysemic (compensatory) areas. In segments of pleura we observed fibrinous infiltration and an inflammatory reaction of the subjacent pulmonary parenchyma, an exudate composed of fibrin, macrophages and detached eosinophils, with no granulomatous reaction (Fig. 3). In the subpleura and in the superficial parenchyma, we observed encapsulated parasites which presented with characteristics of nymphs of Pentastomida.

Noticeable alterations were observed in the aorta, which presented an extensive inflammatory reaction in its subaortic mediastinal connective tissue, with plasmatic fibrinous infiltration and presence of inflammatory cells, predominantly eosinophils and free blood. We could also observe the development of granulation tissue and severe
lesion with rupture of the aortic wall, followed by intense mural hemorrhage.

4. Discussion

The genus *Porocephalus* comprise the species *P. crotaali*, *P. clavatus*, *P. stilesi* and *P. subulifer*, which displayed complex cycle, with the presence of rodents, herbivores, carnivores and primates as intermediary hosts. They get infected by ingesting larvated eggs passed by ophidians, generating, after the migratory process, encysted nymphs in the peritoneal cavity, liver, spleen, kidneys, lungs and ganglions (Martinez et al., 2000; Tropical Medicine Central Resource, 2005).

Cases of pentastomiasis in several species of animals have been reported. They include snakes (Martinez et al., 2000), fish (Boyce et al., 1987), humans in China (Pan et al., 2005), in Canada (Guardian et al., 1991), and other countries. In non-humans primates, Heuschele (1961) reported infection in the omentum, mesentery, liver, spleen and pleura cavity in *Cercopithecus hamlyni*; Fox et al. (1972) verified infection in the cerebral cortex of *Saimiri sciureus*; and Lok and Kirkpatrick (1987) reported infection in the omentum, mesentery and lungs of the species *Macaca fascicularis* and *Cebus capucinus*. Moreover, Cosgrove et al. (1970) observed that 29% of their primates were infected with *Porocephalus clavatus* primarily in the lungs.

Regarding the infection by *Porocephalus* in our case, the possibility of the animal having acquired the infection by ingestion of food contaminated with eggs of the Pentastomida must be considered. However, it was not possible to determine the interrelationship with the definitive hosts, which are generally ophidians (Cosgrove et al., 1970; Martinez et al., 2000). It is also important to highlight the fact that this species does not have the habit of eating snakes, but other primates do, such as the Callitrichidae (Auricchio, 1995).

Durden et al. (1985) reported that the eggs of Pentastomida released with the ophidian’s nasal secretions can be fixed to the vegetation, and that vertebrate animals, notably mammals, can ingest those eggs during forage then act like intermediary hosts. Hypothetically, this was not the case, since the foods offered to the animals are hygienically manipulated and treated. Furthermore, considering that our monkey was housed in an outdoor exhibit, we cannot rule out the possibility of indirect contamination of the food by arthropods, which are mechanical vectors of eggs of the parasite.

Histologically, it was observed that the parasites were alive and encapsulated in the lungs, with inflammatory reaction in the subjacent pulmonary parenchyma, presence of exudate composed of fibrin, macrophages and detaching the eosinophils. A granulomatous reaction was not observed and it had not been reported by Guardian et al. (1991) and Pan et al. (2005) in human infections by the Pentastomida *Armillifer* either.

The presence of granulation tissue with predominance of eosinophils in the aorta is characteristic of a chronic parasitic lesion. This fact, together with the gross alteration and the presence of Pentastomida in the lungs, base the hypothesis that the aortic lesion, responsible for the internal hemorrhage and the sudden death, was an effect of the Pentastomida’s migratory process.

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References


