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Cestode fauna of feral pigeons in Thessaloniki; Northern Greece

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Summary

The common pigeon (*Columba livia*) is adapted to a variety of habitats; including big cities and rural areas everywhere in the world. Several studies confirm that feral pigeons pose a considerable health risk to the livestock and human population. They may serve as a reservoir for several pathogenic agents that can be transmitted to poultry; wildlife; domesticated pets and humans. The aim of this survey was to investigate the cestode species present in feral pigeons in Thessaloniki; Northern Greece. A total of 136 adult feral pigeons were necropsied and the cestodes recovered were preserved for identification using morphological keys. Ninety-six (70.58 %) of them were found to be infected with cestode parasites; which were identified to be *Raillietina* spp.: 84 (61.76 %) were infected with *R. echinobothrida*; 20 (14.7 %) with *R. cesticillus* and 8 (5.88 %) with *R. tetragona*. Single infection was recorded in 80 birds (83.3 % of the infected population); while a significantly lower number; i.e. 16 birds (16.7 %); had a mixed infection with *R. echinobothrida* and *R. cesticillus* ($p \leq 0.05$). The current study confirms that feral pigeons in Northern Greece are heavily infected with cestode parasites. Therefore; it was concluded that feral pigeon management programmes and public education should be implemented to reduce the risk of a pigeon-to-human or livestock transmission of pathogenic agents and parasites in the country.

Keywords: *Raillietina* spp.; cestodes; pigeons; feral; Greece

Introduction

The common pigeon or rock pigeon (*Columba livia*) is found almost everywhere in the world. It is adapted to a variety of habitats, including big cities and rural areas and can travel long distances, being a strong flyer. Pigeons feed on a wide range of food items, such as grains, slugs, earthworms, insects etc, which in many instances may carry parasitic infective stages (Ghazi *et al*., 2002; Kozhokov, 2007; Adang *et al*., 2008, 2009). Several studies exist in the literature confirming that feral pigeons pose considerable health risk to livestock and human population. They may serve as a reservoir for several pathogenic agents that can be transmitted to domestic animals, wildlife, and humans via their excreta, secretions, or dust from feathers. Some pathogenic agents can be also transmitted by consumption of infected pigeons. In addition, they are source of antigens causing allergic diseases (Haag-Wackernagel *et al*., 2010).

Very little information is available for the parasite fauna of wild birds and no recent data exist for feral pigeons in Greece. The aim of this survey was to investigate the cestode genera present in feral pigeons in Thessaloniki, Northern Greece.

Materials and methods

A total of 136 adult feral pigeons from the area of Thessaloniki were necropsied according to standard procedures. The digestive tract was removed, cut longitudinally to expose its content and examined under a stereoscope. The cestodes recovered from the small intestine were preserved into vials containing glycerine in alcohol 80º (1:17 v/v) for identification using morphological keys provided by Yamaguti (1959), Soulsby (1982) and Khalil *et al*. (2006). T-test was used to compare the number of birds with single and mixed infections. The level of significance was set at $p \leq 0.05$.

Results

Out of the 136 pigeons examined, 96 (70.58 %) were infected with cestode parasites, which were identified to be *Raillietina* spp. More precisely, 84 (61.76 %) pigeons were infected with *R. echinobothrida*, 20 (14.7 %) with *R. cesti-*

Fig. 1. The rostellum of a *Raillietina echinobothrida* tapeworm of the common pigeon (*Columba livia*)

cillus and 8 (5.88 %) with *R. tetragona*. Single infection was recorded in 80 birds (83.3 % of the infected population), while a significantly lower number, i.e. 16 birds (16.7 %), had a mixed infection with *R. echinobothrida* and *R. cesticillus* ($p \leq 0.05$).

R. echinobothrida has a rostellum with 200 hooks, 10 – 13 µm long, in two rows and armed suckers with 8 – 10 rows of hooks (Fig. 1). *R. cesticillus* bears a wide rostellum armed with 400 – 500 small hooks, while the suckers are unarmed (Fig. 2). *R. tetragona* has a rostellum with only one row of minute hooks, 6 – 8 µm long and the suckers are oval in shape armed with 8 – 10 rows of small hooks, half the size of the ones found in *R. echinobothrida* (Fig. 3). A typical *Raillietina* spp. egg capsule is shown in Fig. 4.

Fig. 2. The rostellum of a *Raillietina cesticillus* tapeworm of the common pigeon (*Columba livia*)

Discussion

The current study confirms that feral pigeons in Northern Greece are heavily (70.58 %) infected with cestode parasites. It is expected wild or feral birds to be infected with parasites, since they feed in different places by travelling long distances and their diet largely contains intermediate/paratenic hosts of tapeworms, such as earthworms, snails, ants etc.

All the cestodes identified in the pigeons of this study belonged to the genus *Raillietina*. This comes in good agreement with similar studies in other parts of the world, reporting that the most common among the internal parasites of the rock pigeon are the gut-tape worms of the genus *Raillietina* (Dede and Richards, 1998; Ghazi *et al*., 2002; Dehlawi 2006; Adang *et al*., 2008). However, in a previous survey carried out in Greece, including several avian wildlife species, *Raillietina* spp. was detected only in one common buzzard (*Buteo buteo*) out of the 33 necropsied birds of this species (Papazachariadout al., 2008). This tapeworm has a cosmopolitan distribution and is of major clinical importance for poultry. Heavy infections with *Raillietina* spp. tend to cause blockage of the gut of the host bird with secondary interactions causing damage to the intestinal tissues and contribute to nutrient depletion (Ghazi *et al*., 2002).

Fig. 3. The rostellum of a *Raillietina tetragona* tapeworm of the common pigeon (*Columba livia*)

Significantly higher number of the infected birds had single infection ($p \leq 0.05$), i.e. 80 birds (83.3% of the infected population), compared to the ones that had a mixed infection with *R. echinobothrida* and *R. cesticillus*, i.e. 16 birds (16.7 %), while no triple infection was recorded. Adang *et al*. (2008, 2009) also recorded in a similar study that single infection was higher than mixed ones. Therefore, they suggested that the higher prevalence of single species infection depends on the order of initiation of infection in the host as the first to infect the host may acquire higher micro-habitat and establishment advantage making less suita-

Fig. 4. Typical *Raillietina* spp. egg capsule of the common pigeon (*Columba livia*)

ble for late entrants. Also, food preference or higher availability of certain intermediate hosts may influence the establishment of *Raillietina* species.

Feral pigeons may represent a significant source of infection for domestic or wild birds (Papazachariadou *et al*., 2008; Gortazar *et al*., 2010). They share common parasites and they may transfer with their faeces parasite eggs over long distances. Besides the helminths, other parasites or pathogens may also be disseminated to the environment with feral pigeons. Domestic pigeons from Northern Greece were found to be 5.8 % seropositive for *Toxoplasma gondii*, while no specific antibodies in feral ones were detected (Diakou *et al*. 2011). The results of a cross-sectional prevalence study carried out by Salant *et al*. (2009) suggested that pigeons may serve as sentinels for the environmental spread of *T. gondii*. Additionally to parasites, feral pigeons bear the risk of zoonotic transmission of *Chlamydia psittaci* to humans by close contacts (Geigenfeind *et al*., 2011). De Sousa *et al*. (2010) reported that 7.94 % of the tested pigeons transferred *Salmonella*, including *S. typhimurium* and *S. enteric*, 5.5 % were seropositive for Newcastle disease virus and 0.83 % seropositive for *T. gondii*. Furthermore, feral pigeons may pose a considerable health risk to the human population. Consumption of raw or undercooked pigeon meet could be a source for *Toxoplasma* infection. Breeding and roosting sites of pigeons harbour parasites that may infest humans. Dermatologists should be aware of the possibility of an infestation with ectoparasites deriving from feral pigeons, such as the bedbug *Cimex lectularius*, the pigeon tick *Argas reflexus* and the red mite *Dermanyssus gallinae* (Haag-Wackernagel *et al*., 2010). In addition, inhalation of avian antigens in dust and air can cause allergies such as hypersensitivity pneumonitis.

Feral pigeon management programmes and public education should be implemented to reduce the risk of a pigeon-to-human or livestock transmission of pathogenic agents and parasites.

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