Prevalence of intestinal parasitic infections of carrier pigeons from central Poland in the years 2012-2019

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Summary

The aim of the study was to establish the prevalence of intestinal parasitic infections of carrier pigeons from central Poland depending on the year and season. The coproscopic method (flotation with saturated NaCl) was used to examine 324 fecal samples from carrier pigeons. The average prevalence of parasitic infections reached 84.56% (274/324). Parasites such as coccidia of the genus *Eimeria* (80.86%), nematodes of the genera *Capillaria* (32.71%) and *Ascaridia* (13.58%) were detected. Infection with tapeworms (*Raillietina*) was observed (0.3%) only in one fecal sample. Coccidiosis was the most prevalent infection during the whole period of the study (2012-2019), ranging from 70.03% in the 2014-2015 period up to 90.5% ($P \leq 0.02$) in 2012-2013. Infections with *Capillaria* ($P \leq 0.05$) and *Eimeria* were diagnosed more frequently in the autumn-winter seasons than in spring-summer.

Keywords: pigeon, intestinal parasites, season, year

Pigeon breeding is very popular in Poland. Currently, about 41,800 members are united in the Polish Association of Racing Pigeon Breeders and their number is still growing (9). Control of parasitic infections in pigeons is a great challenge for veterinary surgeons. Keeping birds in a large numbers is one of the important factors in the spread of parasitic infections among these animals. Numerous studies on the prevalence of pigeon parasites have been reported in Poland (3, 15, 22). However, only a few studies have included the association between the season of the year and the prevalence of helminth infections (2, 17, 23). Analysis of the influence of the season of the year on the prevalence of parasitic infections might provide further insight into the ecology of pigeon parasites species and may facilitate the implementation of the certain control measures (17).

The aim of the study was to establish the prevalence of parasitic infections of carrier pigeons from central Poland depending on the year and season.

Material and methods

The coproscopic studies were conducted from January 2012 to December 2019 in Warsaw. A total of 324

pooled fecal samples were collected from different parts of each loft from 7 districts in the territory of the Masovian voivodeship (Fig. 1). The samples were declared as derived

Fig. 1. The origin of samples marked on map of the Masovian voivodeship

from racing pigeons. Before examination, each collective sample was mixed and 5 g sample of feces was analyzed using the flotation method (saline solution, specific gravity 1.2). Fecal samples were examined during each of the four biennial periods (2012-2013, 2014-2015, 2016-2017, 2018-2019), and six two-month periods (January-February, March-April, May-June, July-August, September-October, November-December) for prevalence of gastrointestinal parasites. Before coproscopy fecal samples were stored at a temperature of +4°C, and were examined within 3 days. The influence of the four biennial periods and six two-month periods on the prevalence of intestinal parasites was determined using the Pearson's chi-square test and Fischer's exact test with the SPSS 21.0 Statistical Package computer program. Two levels of significance were assigned: $P \leq 0.01$ as highly significant and $P \leq 0.05$ as significant.

Results and discussion

In total, parasites were detected in 274 (84.56%) out of 324 fecal samples. Parasites such as coccidia of the genus *Eimeria* (80.86%), nematodes of the genera *Capillaria* (32.71%) and *Ascaridia* (13.58%) were detected. Infection with tapeworms (*Raillietina* spp.) was observed only in one fecal sample (0.3%). Figure 2 presents the prevalence of the infections during the whole period. Coccidiosis was the most prevalent infection. It oscillated between 70.03% and 90.5%. The highest prevalence of parasitic infections was noted in first examined period 2012-2013 (*Eimeria* – 90.5%, *Capillaria* – 39%). The prevalence of roundworm infection has successively increased twice during the investigated years from 9.5% (2012-2013) to 15.4% (2014-2015) and from 12.6% (2016-2017) to 22% (2018-2019). Mixed infections were found in 36.11% ($N = 117$) of the birds. Coinfections caused by two genera (*Eimeria* and *Capillaria*) were observed in 65.81% samples and mixed infections caused by three genera of parasites (*Eimeria*, *Capillaria*, *Ascaridia*) were detected in 18.8% of fecal samples. Table 1. presents seasonal prevalence of infections in the whole examined period 2012-2019. The highest prevalence of all infections was observed in November and December. *Capillaria* eggs ($P \leq 0.05$) and *Eimeria* oocysts were detected in fecal samples more frequently in the season of autumn-winter than in the spring-summer season. The influence of the season on roundworm infection was not unequivocal.

The study showed high prevalence of intestinal parasitoses in pigeons from the Mazowieckie Voivodeship caused by parasites of the genera *Eimeria*, *Capillaria* and *Ascaridia*. This study also showed extremely low prevalence of tapeworm infection. However, it should be emphasized that the results of the fecal flotation method in pigeons infected with tapeworms may be false negative, and the most sensitive method for the diagnosis of the infections with the cestodes of the family Davaineidae is microscopic examination of the mucosal scraping from the small intestine (21). Thus,

Fig. 2. Prevalence of parasitic infection of carrier pigeons from central Poland depending on the year

Tab. 1. Prevalence of parasitic infection of carrier pigeons from central Poland depending on season (months)

Months	Prevalence % / n <i>Eimeria</i>	P	Prevalence % / n <i>Capillaria</i>	P	Prevalence % / n <i>Ascaridia</i>	P
Jan-Feb	74.0% / 77	0.37	31.7% / 33	0.05	15.4% / 16	0.19
Mar-Apr	82.2% / 37		22.2% / 10		6.7% / 3	
May-Jun	80.6% / 29		27.8% / 10		8.3% / 3	
Jul-Aug	83.7% / 36		23.3% / 10		11.6% / 5	
Sept-Oct	87.5% / 28		43.8% / 14		9.4% / 3	
Nov-Dec	85.9% / 55		45.3% / 29		21.9% / 14	

Explanation: $P \leq 0.01$ as highly significant; $P \leq 0.05$ as significant

tapeworm infections were not included into statistical analyses because of extremely rare detection in coproscopic examinations.

There are 3 *Eimeria* species in domestic pigeons such as *Eimeria labbeana*, *E. columbarum*, or *E. columbae*. All these three species were detected in these birds in Poland (3, 15). Similar studies on the prevalence of intestinal parasites in pigeons were conducted in south-eastern Poland (22). That research also showed the high prevalence of intestinal parasitic infection, and the most prevalent was coccidiosis (22). Similar results were observed in other studies. Various reports from Poland indicated the prevalence of infection with these protozoa was between 4.7% and even 100% (3, 6, 12). Balicka-Ramisz and Pilarczyk (2014) showed that the most prevalent infection in pigeons in Poland was caused by *E. labbeana*.

In this study the prevalence of nematode infections (*Capillaria* and *Ascaridia*) was significantly lower than *Eimeria* infections. In the Lower Silesian Voivodship, the prevalence of infection with these nematodes was found at a much higher level: *Capillaria* – 48.1%, *Ascaridia* – 30.4% (13). Similarly the study from south-eastern Poland showed a lower prevalence of nematode infections: *Capillaria* (35.8%), *Ascaridia* (12.5%) (22). On the contrary in Pomerania (northern

Poland), eggs of these nematodes were found much less frequently in pigeon feces: *Capillaria* – 8.2%, and *Ascaridia* – 7% of fecal samples (6). The only species of the genus *Ascaridia* in pigeons is *A. columbae* (4). This species was detected in Poland in many studies (5, 22). Among various species of the genus *Capillaria* infecting pigeons only *C. columbae*, currently known as *Baruscapillaria obsignata*, was detected in these animals in Poland (14, 19, 22).

Coprosopic examination of pigeon feces conducted in Slovenia also showed a high prevalence of coccidia (71.9%) and rather low of nematode infection, which ranged from 4.3% (*Ascaridia*) to 26.6% (*Capillaria*) (8). Similar results were obtained in India (*Eimeria* – 75%, nematodes – 5%) and in Turkey (*Eimeria* – 45%, *Capillaria* – 12.1%, and *Ascaridia* – 5.1%) (10, 16). Moreover, Sari et al. (2008) detected eggs of nematodes *Heterakis gallinarum* (3.7%) and *Syngamus* sp. (1.7%) in pigeon feces (16). In the studies from Libya and on pigeon parasites fecal examination revealed eggs of nematodes (*Capillaria* – 4%, *Ascaridia* – 22%) and also adult tapeworms such as: *Raillietina tetragona* (2%), *Raillietina echinobothrida* (32%), *Raillietina cesticillus* (4%) (1). Infections of intestinal parasites were much more common in birds from Pakistan, *Capillaria* eggs were found in 67.2% pigeon feces, and roundworm eggs in 32.8% of fecal samples (20).

The influence of the season of the year on the prevalence of the intestinal parasitic infections is not unambiguous. Researchers from Nigeria showed higher prevalence of coccidiosis during wet seasons (8.96% – Jun-Aug) in comparison to dry seasons (5.98% – Feb-Apr) ($P < 0.05$) (2). However, in other studies opposite trends have been observed. In Turkey the highest prevalence of *A. columbae* was observed in the autumn months (17). This study showed a very high prevalence of *Eimeria* infection during all seasons (80.6-87.5%), and the prevalence of coccidiosis subtly decreased to 74% in winter months (Jan-Feb). This process could be explained by the biology of the parasite. Oocysts are released into the environment in their unsporulated form. In optimal conditions of temperature and humidity sporulation process takes at least 24 h. The sporulated oocysts are an infective form of the parasite and may cause the infection in other hosts. However, low temperature may inhibit the sporulation process. Thus, decreased number of infective oocysts in the environment in cold months may have an influence on decreased prevalence of infection in the herd in winter (7).

The prevalence of nematode infections was more dynamic during all seasons (Tab. 1). It is suspected that anthelmintic treatments may play a role in this phenomenon. In Poland, one of the periodic dewormings is recommended in pigeons in early spring and autumn, which allows birds to prepare better for breeding and flights season (6, 18). That could explain the

rapid decline in the prevalence of nematode infections (*Ascaridia* and *Capillaria*) in the spring months. It should be emphasized there are only few therapeutics officially registered for the control of pigeon endoparasites in Poland (11). Levamisole is the only drug which can be used against infections of the trachea and intestinal nematodes of birds (*Syngamus*, *Ascaridia*, *Heterakis*, *Capillaria*, *Amidostomum*). However, it is not an effective drug against *Eimeria* infection. There is currently no officially registered drug for the treatment of eimeriosis in pigeons in Poland, despite the well known effectiveness of toltrazuril (11, 12). The rapid decrease of prevalence of roundworm infection in pigeons in the autumn months (Sept-Oct) could be also connected with autumn deworming (18). However, in case of capillariosis in the same period was observed opposite trends, prevalence of infections increase from 23.3% (Jul-Aug) to 43.8% (Sept-Oct). The reasons for the significantly increasing prevalence of *Capillaria* infections could be connected with the resistance of these nematodes to the anthelmintics commonly used in control and their schematic use without the prior diagnosis. Capillariosis in many flocks of pigeons is becoming a dominant problem. Elimination of the mentioned parasite due to the long survival of infective forms in the environment is very difficult (11, 22).

The McMaster method was not used in this study. Thus the authors cannot exclude that in some cases of infected animals the number of parasites was low. Nevertheless these animals may infect other pigeons, and the presence of asymptomatic carriers in the flock may be one of the factors influencing on the persistence of parasitic infections.

Based on many studies, it can be concluded that pigeons are a reservoir of many endoparasites. In Poland and selected parts of Europe, the most commonly found parasites are coccidia of the genus *Eimeria*. However, the prevalence of the genera *Capillaria* and *Ascaridia* varied in European countries.

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