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# Current challenges in addressing invasive diseases in domestic pigeons: Insights from our research

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**Current challenges in addressing invasive diseases in domestic pigeons: Insights from our research**

Summary

**The current study aims to highlight the ongoing challenges in addressing invasive diseases within pigeon flocks in the Lublin region. The study material comprised bird faecal samples from 69 flocks (39 fancy pigeon flocks and 30 racing pigeon flocks) with a total estimated bird count of 7,490, as declared by the owners. Parasite forms were confirmed in samples from 56/69 flocks, indicating a prevalence of 81.2% across the study, 87.2% in fancy pigeon flocks and 73.3% in racing pigeon flocks. The identified parasites included protozoa of the genus *Eimeria*, roundworms *Ascaridia columbae*, nematodes *Capillariidae*, *Ornithostrongylus quadriradiatus*, and *Syngamus trachea*, cestodes and *Trichomonas gallinae*. The analysis revealed that coccidiosis was the predominant invasion in both racing and fancy pigeon flocks. Comparing the two types of breeding (racing pigeons and fancy pigeons), fancy pigeon flocks were more susceptible to parasitic invasions.**

**Keywords: pigeon, parasites, prevalence, flocks**

The exponential growth in pigeon breeding has led to an increased focus on parasitological testing in veterinary practices and diagnostic laboratories. Pigeon breeding encompasses primarily racing pigeons (homing pigeons), fancy pigeons and meat pigeons, which are the least popular of the three groups. Living in flocks, pigeons are highly susceptible to infectious and invasive diseases, which significantly affect their health and the overall breeding success (7, 11, 13, 18). Beyond the inherent density of these avian groups, additional risk factors emerge, particularly in racing pigeons exposed to birds from other flocks while racing. Similar threats arise from introducing new birds into a native flock without prior examination and adherence to quarantine conditions. Another challenge is the possibility of asymptomatic carriers harbouring multiple pathogens and the difficulty of diagnosing invasive diseases during prepatent periods. The contamination of birds' habitats by invasive parasite forms or the presence of infected intermediate hosts (annelids, arthropods, molluscs) in the environment also constitutes a critical, yet underestimated factor. These circumstances underscore the necessity of frequent parasitological examinations. Early detection of infestations makes it possible to slow down their spread within the flock and minimise environmental contamination. Unfortunately, preventive parasitological examinations, crucial for bird health, remain relatively infrequent. Typically, bird owners initiate diagnostic measures only when clinical signs manifest themselves, allowing invasive pathogens to persist in the flock and contribute to recurring invasions through environmental contamination. A distinct challenge in the management of parasitic diseases in pigeons lies in the proper use of antiparasitic agents, especially antihelminthics. The limited variety of pharmaceutical options available in the pigeon market contributes to the repetitive use of the same active substances (5, 10), often at inadequate doses. This is fostering the development of drug-resistant parasite strains, leading to prolonged infestations in flocks. Moreover, the practice of "deworming" without prior diagnosis may lead to ineffective control of parasites that require targeted chemotherapeutics and tailored treatment. The current study aims to highlight the ongoing challenges in addressing invasive diseases within pigeon flocks in the Lublin region.

## Material and methods

The research was conducted at private veterinary practices and the parasitology laboratory of the Department of Parasitology and Fish Diseases at the University of Life Sciences in Lublin from January to November 2023. The study material comprised bird faecal samples from 69 flocks (39 fancy pigeon flocks and 30 racing pigeon flocks) with a total estimated bird count of 7,490, as declared by the owners. Testing was carried out in response to ongoing diseases in 48 flocks (29 fancy pigeon flocks and 19 racing pigeon flocks) or as part of preventive flock inspections (9 fancy pigeon flocks and 12 racing pigeon flocks). The owners selected 3 to 6 faecal samples from each flock, which resulted in a total of 332 samples examined. Some of the tests involved samples obtained directly from birds delivered to the veterinary practice (204 samples from 41 flocks), which were also screened for trichomoniasis based on mucus samples from beak cavities and the crop.

The faeces were examined by the flotation method according to Willis (1921) (8), employing a saturated solution of NaCl and sucrose with a specific gravity of 1.25 g/ml. Each time, 3 grams of faecal samples were tested, and the study considered the presence of parasite forms as well as data on sample characteristics indicating the presence or absence of diarrhoeas. The trichomoniasis test involved taking a mucus sample from the pigeons' crop with a glass rod, suspending it in a few drops of warm saline on a glass slide with a cavity, and covering it with a cover glass. The sample was then scrutinised under a biological microscope at 100 × and 400 × magnifications to detect the characteristic twitching motion of trichomonas.

The taxonomic classification of the detected parasite oocysts/eggs was carried out on the basis of morphometric analysis based on keys for determining the dispersal forms of internal parasites of vertebrates (8, 9) using an Olimpus BX51 light microscope with Nomarski interference contrast (DIC) and integrated Cell software from Olimpus. Oocysts and eggs were measured to determine their length, width and the length to width quotient (SI – shape index).

The results were processed statistically by the Statistica 13.1 program with a StatSoft medical application. Prevalence was calculated as the proportion of positive fecal flock samples in the sampled flocks. Invasion was considered as a binary factor (PRESENCE/ABSENCE of dispersion forms of parasites). The precision of this estimate was ensured by calculating the ± 95% confidence interval of the proportion. The data were tested for normal distribution with the Kolmogorov-Smirnov test. When comparing the two groups, we used the Mann-Whitney U test. $P < 0.05$ was considered statistically significant.

## Results and discussion

Parasite forms were confirmed in samples from 56/69 flocks, indicating a prevalence of 81.2% (95% CI, 71.7-90.6) across the study, including 34/39 fancy pigeon flocks (87.2%) (95% CI, 76.2-98.2) and 22/30 racing pigeon flocks (73.3%) (95% CI, 56.5-90.1). The identified parasites included protozoa of the genus *Eimeria* 34/69 (49.3%) (95% CI, 37.2-61.4), roundworms *Ascaridia columbae* 20/69 (29%) (95% CI, 18.0-40.0), nematodes *Capillariidae* 28/69 (40.6%) (95% CI, 28.7-52.5), *Ornithostrongylus quadriradiatus* 7/69 (10.2%) (95% CI, 2.8-17.5), *Syngamus trachea* 7/69 (10.2%) (95% CI, 2.8-17.5), eggs of tapeworms 6/69 (8.7%) (95% CI, 1.9-15.5), and *Trichomonas gallinae* 20/69 (29.0%) (95% CI, 18.0-40.0). Individual flocks exhibited single or multispecies invasions (mixed invasions involving different families and types of parasites). Mono-invasions prevailed in the flocks of racing pigeons, whereas the flocks of fancy pigeons were affected mostly by mixed invasions. Mono-invasions occurred in 27.5% (95% CI, 16.7--38.3) of flocks, including 20.5% (95% CI, 7.3-33.8) of fancy pigeon flocks and 36.7% (95% CI, 18.4-55.0) of racing pigeon flocks. Dual invasions were found in 18.8% (95% CI, 9.4-28.3) of flocks, including 25.6% (95% CI, 11.3-40.0) of fancy pigeon flocks and 10% (95% CI, 0.0-21.4) of racing pigeon flocks. Mixed invasions with three types of parasites were found in 24.6% (95% CI, 14.2-35.1) of flocks, including 23.1% (95% CI, 9.2-36.9) of fancy pigeon flocks and 26.7% (95% CI, 9.9-43.5) of racing pigeon flocks. Invasions with four types of parasites were observed only in fancy pigeons, in 10.3% (95% CI, 0.3-20.2) of flocks (overall prevalence of quadruple invasions was 5.8%; 95% CI, 0.1-11.5), whereas invasions with five types of parasites were detected in 5.1% (95% CI, 0.0-12.4) of fancy pigeon flocks (overall prevalence of penta-invasion was 2.9%; 95% CI, 0.0-7.0). Detailed results illustrating the incidence of invasions

**Tab. 1. Prevalence of parasites in pigeon flocks**

| Breeding type | Diarrhea | | | Overall prevalence | | | *Eimeria* | | | *Trichomonas* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | n/N | ± 95% CI | % | n/N | ± 95% CI | % | n/N | ± 95% CI | % | n/N | ± 95% CI |
| Fancy pigeons | 61.5 | 24/39 | 45.5-77.5 | 87.2 | 34/39 | 76.2-98.2 | 51.3 | 20/39 | 34.9-67.7 | 28.2 | 11/39 | 13.4-43.0 |
| Racing pigeons | 40.0 | 12/30 | 21.4-58.6 | 73.3 | 22/30 | 56.5-90.1 | 46.7 | 14/30 | 27.7-65.6 | 30.0 | 9/30 | 12.6-47.4 |
| Overall | 52.2 | 36/69 | 40.1-64.3 | 81.2 | 56/69 | 71.7-90.6 | 49.3 | 34/69 | 37.2-61.4 | 29.0 | 20/69 | 18.0-40.0 |
| Breeding type | *Ascaridia* | | | *Ornithostrongylus* | | | *Capillariidae* | | | *Syngamus* | | |
| | % | n/N | ± 95% CI | % | n/N | ± 95% CI | % | n/N | ± 95% CI | % | n/N | ± 95% CI |
| Fancy pigeons | 41.0 | 16/39 | 24.9-57.2 | 15.4 | 6/39 | 3.5-27.2 | 48.7 | 19/39 | 32.3-65.1 | 10.3 | 4/39 | 0.3-20.2 |
| Racing pigeons | 13.3 | 4/30 | 0.4-26.2 | 3.3 | 1/30 | 0.0-10.2 | 30.0 | 9/30 | 12.6-47.7 | 10.0 | 3/30 | 0.0-21.4 |
| Overall | 29.0 | 20/69 | 18.0-40.0 | 10.1 | 7/69 | 2.8-17.5 | 40.6 | 28/69 | 28.7-52.5 | 10.1 | 7/69 | 2.8-17.5 |

**Tab. 2. Prevalence of mono and multispecies invasions in pigeon flocks**

| Breeding type | Mono-invasion | | | Double invasion | | | Triple-invasion | | | Quadruple-invasion | | | Penta-invasion | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | n/N | ± 95% CI | % | n | ± 95% CI | % | n | ± 95% CI | % | n | ± 95% CI | % | n | ± 95% CI |
| Fancy pigeons | 20.5 | 8/39 | 7.3-33.8 | 25.6 | 10 | 11.3-40.0 | 23.1 | 9 | 9.2-36.9 | 10.3 | 4 | 0.3-20.2 | 5.1 | 2 | 0.0-12.4 |
| Racing pigeons | 36.7 | 11/30 | 18.4-55.0 | 10.0 | 3 | 0.0-21.4 | 26.7 | 8 | 9.9-43.5 | 0.0 | 0 | 0.0-0.0 | 0.0 | 0 | 0.0-0.0 |
| Overall | 27.5 | 19/69 | 16.7-38.3 | 18.8 | 13 | 9.4-28.3 | 24.6 | 17 | 14.2-35.1 | 5.8 | 4 | 0.1-11.5 | 2.9 | 2 | 0.0-7.0 |

in different pigeon groups are presented in Table 1 and Table 2.

The fancy pigeon flocks were more susceptible to parasitic invasions than the racing pigeons flocks (Fig. 1), but the difference was not statistically significant. These observations are consistent with the findings of Raś-Noryńska et al., Stenzel and Koncicki (12, 18). Fancy pigeons were nearly three times as likely to be infected with nematodes of the genus *Ascaridia*, and it was the only invasion whose prevalence showed statistical significance among both pigeon flocks (Fig. 2). A similar relationship, albeit in slightly smaller proportions, was observed for the nematode *Capillaria*, the most frequently found nematode in the studied flocks. Other parasites, such as nematodes *Ornithostrongylus quadriradiatus*, protozoa of *Eimeria* spp., and tapeworms, were more frequently found in the fancy pigeon flocks.

The analysis revealed that coccidiosis was the predominant invasion in both racing and fancy pigeon flocks. This aligns with findings of many other authors (1-4, 6, 9, 11, 12, 14, 15, 18, 19). Invasions of lower intensity may be asymptomatic, serving as a natural vaccine agent. The understanding of the invasive disease status of the flock and its correct interpretation make it possible to take advantage of natural immunological phenomena, which reduces the risk of drug-resistant strains (16). The results of the present research additionally highlight the alarmingly frequent occurrence of nematode infestations, particularly those by the family *Capillariidae*. This invasion has emerged as dominant, especially in recent years, a trend confirmed by the findings of various authors (1, 3, 4, 6, 11, 13, 15, 17-19). The nematode *Capillaria obsignata* appears to play a significant role in inducing pathological changes in the gastrointestinal tract, leading to manifestations such as diarrhoea. The remarkably high prevalence of *Capillariidae* invasions can be attributed to several factors. Mistakes in dehelminthization procedures, including treatment without prior diagnosis of the infestation, the use of substances inappropriate for the given parasite and incorrect dosages contribute to ineffective control of capillariasis. The presence of *Capillariidae* in flocks is made possible by the low susceptibility of these nematodes to commonly used anthelmintics. Additionally, the extended survival period of invasive forms in the environment poses challenges for effective control (10, 17). The birds included in the study exhibited diverse clinical statuses, with 52.2% of the samples showing signs of diarrhoeal faeces (61.5% for fancy pigeons, 40.0% for racing pigeons). This sign was observed especially in infections with *Capillariidae* and *Ascaridia* nematodes and *Eimeria* spp. protozoa, which suggests a significant contribution

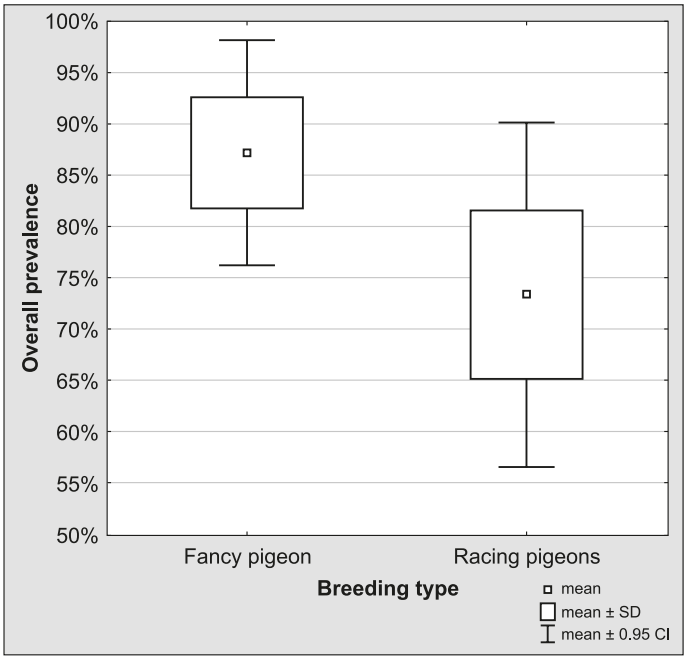


**Fig. 1. Comparison of the overall prevalence of parasite invasions in both groups of pigeons**

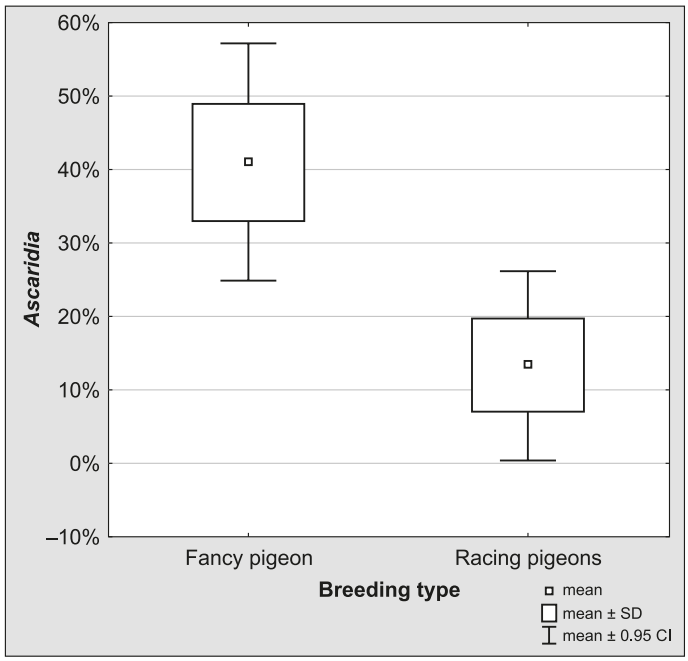


**Fig. 2. Comparison of the prevalence of the genus *Ascaridia* in both groups of pigeons**

of these parasites to the pathogenesis of pigeon gastrointestinal disorders. The flocks of fancy pigeons were infected with a variety of parasites, and mixed invasions in those flocks often involved up to five types of parasites. Parasites were also present in flocks in which no clinical signs were observed, including invasions by roundworms, *Capillariidae*, coccidia, and protozoa of the genus *Trichomonas*. Mono-infestations were the most common in such cases. The asymptomatic course of infestation was generally associated with a low infestation intensity or a good nutritional status of the bird and other factors contributing to a relatively high level of its immunity. The racing pigeon group exhibited a higher prevalence of asymptomatic protozoan infections by the genus *Eimeria* and *Trichomonas*, while the fancy pigeon group demonstrated this trait for nematodes of the family *Capillariidae* and genus *Ascaridia*. This condition in racing pigeons may be attributed to their higher exposure to protozoan infestations during racing. Conversely, persistent nematode infestations in the flocks of fancy pigeons may indicate environmental contamination with invasive forms of nematodes characterised by extended survival rates. The demonstration of these infestations provides essential information for flock owners, emphasising the need for preventive measures, including environmental hygiene and chemoprevention. Similar findings are reported by other authors, who describe various types of parasites in this group of birds (11, 15, 19). These findings underscore the fact that only the awareness of the risks and systematic preventive treatments can protect flocks from the spread of many dangerous diseases.

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