Full Length Research Paper

Pathological study of parasitism in racing pigeons: An indication of its effects on community health

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Several non-official reports from different clinics, governmental veterinary head-quarters and bird keepers indicate that most of the young pigeons die with suspicious infection to parasites. In addition, the pigeon owners were complaining of skin itching on their head. Thus, this research was conducted to determine the pathological study of parasitism in racing pigeons with an indication of its effects on community health. It was carried out from May to September 2011, by an experimental study on 250 (168 adults and 82 nestlings) blood and faecal samples (Soulsby, 1982) randomly collected from suspected pigeons (mostly young) and 25 specific free pathogen birds as control. Tissue samples of both infected and control birds were removed and compared with samples of the histological study. Moreover, 12 hair samples taken from pigeon owners were checked for external parasites. The data indicate prevalence rate of various helminthes including Raillietina achinobothridia (10.4%), Syngamus trachea (8.4%), Capillaria colombae (6%) and Ascaridia colombae (8.4%). The results reveal some protozoan infections including Haemoproteus colombae (20.8%), Trichomonas gallinae (26.8%) Cryptosporidium sp. (1.2%) and Eimeria sp. (21.6%) and also ectoparasites including Lipeurus sp. (3.2%), Menopen galliniae (15.2%), Ceratophyllus colombae (10.4%) and Louse fly (12%). Multiple infections observed with internal parasites were 19/4%. However, co-infection of internal and external parasites was 24.4%. Meanwhile, five out of the 12 hair samples taken from pigeon owners were infected with the fleas (C. colombae) and lice (M. galliniae) as seen by the clinical manifestation of allergic urticarial reaction and itching. Histological studies showed a visible vascular congestion and a massive lymphoplasmacytic infiltration inside the smooth muscular layer of the small intestine of infected pigeons. This result indicates that pigeons and their owners may be at high risk of single or multiple parasitic infections.

Key words: Endoparasite, ectoparasites, ovum, birds, fleas, epidemiology.

INTRODUCTION

Pigeons are seen in most regions of the world except in the poles. Pigeons live side by side with human and other animal species in nature and they are bred as a source of food, a hobby, symbol and for experimental aims (Cooper, 1984; Harlin, 1994).

Pigeons are probably the most common nuisance bird. They have adapted to life in the city, and they seem to be everywhere in urban environments. Unfortunately, the bird lovers of the world feed them, and they have developed a dependence upon people, thus reinforcing their dependency upon urban areas. They roost on signs, ledges, almost anywhere, and they bring nesting material and leave droppings everywhere. Pigeons, as everyone knows are swimming with filth and disease (Balicka-Ramis et al., 2007; Rehman, 1993). Those who watch these birds can barely imagine how detrimental their disorderly reproduction may be and how many risk they cause to human health (Tietz-Marques et al., 2007).

Pigeons can carry or transmit pigeon Encephalitis,
Histoplasmosis, Newcastle disease, Ornithosis Cryptococcosis, Cocci
diosis, Toxoplasmosis, Pseudotuberculosis, and Salmonellosis. Pigeons can carry 
 fleas, ticks, mites, and other parasites (Balicka-Ramis et al., 2007; Rehman, 1993). It 
interacts with man and other domestic and wild birds portend it as a potential carrier of 
zoonotic parasites (Adang, 1999). Several health problems can affect pigeon, but parasite 
infections play a major role. Information on the parasitic infection of domesticated 
pigeon in different region of Iran appears to be poorly documented (Radter et al., 2011). The 
prevalence of pigeon parasites was studied on south Khorasan, Iran, were A. colombae (16.66%), 
Cotugnia digonopora (13.79%), Raillietina achinobothridia (32.35%), Menopon galline (44.11%), 
Pseudolynchia canariensis (63.72%), Columbicola colombae (79.41%), Cryptosporidium oocyst 
(2.94%), Eimeria sp. (40.19%) and Haemoproteus colombae (47.05%). In Costa Rica, Haemoproteus sp. was detected in 
4.8% of birds; in Queensland, Australia, a total of 3, 059 birds were examined and Haemoproteus sp. was 
found in 31.4% of them (Valkiunas et al., 2004; Adlard et al., 2004). In the state of Minas Gerais, in southeastern 
Brazil, a research study with free living pigeons showed that all pigeons were infested with P. canariensis a blood 
feeding louse fly and with H. colombae and Eimeria sp. oocysts. A. colombae was detected in 4.91% of pigeons 
and 3.27% was presented with mixed infections caused by A. colombae and Raillietina sp. (Tietz-Marques et al., 
2007).

The aim of this study was to determine the presence of ectoparasites and endoparasites in pigeons 
that assemble around the public squares of cages and to check the pigeon owners to see if there is any 
relationship of common ectoparasites between man and birds.

MATERIALS AND METHODS

Study area

Several non-official reports from different clinics, governmental 
 veterinary headquarters and bird keepers indicated that most of the 
 young pigeons die with suspicious infection of parasites. In addition, 
the pigeon owners were complaining of skin itching on their head. 
Thus, this research was conducted to determine the pathological 
study of parasitism in racing pigeons with an indication of its effects 
on community health of Ilam city, located in the western part of Iran 
sharing 465 km common border line with Iraq, and having sub 
climatically environmental condition.

Birds

This research was carried out from May to September 2011, by an 
experimental study on 250 (168 adults and 82 nestlings) blood 
and faecal samples (Soulsby, 1982) randomly collected from suspected 
pigeons (mostly young) and 25 specific free pathogen birds as 
control. Tissue samples of both infected and control birds were 
removed and compared with samples of the histological study. Moreover, 12 hair samples taken from pigeon owners were checked 
for external parasites. Care was taken to avoid any contamination 
been brought from outside into the animal house located at the 
School of Veterinary Sciences, Ilam University.

Sampling from pigeons

The tray at the bottom of cages of the control and experimental 
pigeons were completely washed and disinfected. Fresh faeces (at 
least 3 g) were collected from each bird. Data were collected 
according to the questionnaire form prepared before including 
information regarding, no. of birds, no. of death, no. of sick birds, 
weight of birds, environmental temperature, information regarding 
the previous medicine used for birds from 30 days, no. of feed per 
day, feed ingredient, the owner’s name, date of sampling and 
characteristic of bird, and the samples were quickly tested in a 
laboratory.

Sampling from bird keepers

12 owners of pigeon were engaged with the birds for more than 2 h 
per day and they had a history of itching on their head; the person 
in charge of checking their hairs for ectoparasites said that the 
complaint about itching may be due to ectoparasites. For this 
purpose, we placed a white cloth around the neck of the person and 
then combed his hair with cotton mixed with ether. A trial was made 
to comb the hair from each direction, and then the cloth was placed 
in the jar and then a sample of the jar was taken for identification 
under the microscope.

Diagnostic methods

Faecal samples of control and experimental birds were examined 
by direct smear method, whereas egg per gram (EPG) was counted 
by modified McMaster technique and centrifugal flotation method 
using Sheather’s saturated sugar solution (Soulsby, 1982). The 
ectoparasites were collected as described by Soulsby (1982), 
b Briefly after killing the pigeons by anaesthesia, they were imme- 
diately placed in a polythene bag and the samples were collected 
after leaving the pigeons, 90% of the samples collected were dead 
pigeon. The nest material for ectoparasites was preserved for 
identification purposes in 70% alcohol. Subcutaneous nodules of 
each bird were fixed in 10% potassium, heated for 20 min in a jar 
and after preparation of samples 

The blood samples were collected from control and other 
experimental groups of the birds using an insulin syringe inserted 
through a brachial vein catheter. Each sample proceeded, fixed and 
stained with Giemsa dyes. For diagnosis of Trichomonas gallinae, 
et and sterile swab were taken from surface of the mouth, throat 
and larynx of birds, and after preparation of slide smears, the 
samples were studied under the light microscope. All parasites 
were identified using the parasitological keys (Soulsby, 1982).

For internal parasites in the entire alimentary tract, the respiratory 
system, liver, heart, kidney and reproductive tract were searched 
and examined. The parasites were removed and washed by water 
and a number of nematodes were cleared in lacto phenol for 
identification and cestodes were fixed in 10% formalin and stained 
with carmine acid for further studies. SPSS version 9.0 for Windows 
was used for statistical analysis of the experimental data.

Histological study

Tissues of different organ including: thymus, intestine (jejunum, 
ceaca) liver of the infected and control birds were separated and
preserved in 5% formalin. Tissues were prepared for microtome, cut in 8 μM and stained in haematoxylin and eosin. Slides were studied on Olympus camera attached haematoxylin microscope. Observation was recorded and microphotography was done for projection slides and photographs.

Statistical analysis

The computer software, SPSS Version 9.0 for windows (SPSS Inc., Chicago, IL, USA) and Chi-Square tests were used for statistical analysis.

RESULTS

Out of the 250 pigeon samples, 224 (89.6%) were positive with at least one parasitic infection. Among them, 16.62% had multiple infections with internal parasites, 20.08% were infected with ectoparasites and 27.23% presented infections with both internal and external parasites. The entire experimental birds control was free of any internal and external parasites (Table 1).

Symptoms of worms consist of weight loss and in case of severe multiple worm infestation, diarrheal were seen in the pigeons. Infected young birds grew slowly and were even losing much body weight resulting in high rate of mortality.

The data indicate prevalence rate of various helminthes including R. achinobothridia (10.4%), Syngamus trachea (8.4%), Capillaria colombae (6%) and A. colombae (8.4%). The results reveal some porotozan infections including: H. colombae (20.8%), T. gallinae (26.8%) Cryptosporidium sp. (1.2%) and Eimeria sp. (21.6%), and also ectoparasites including Lipeurus sp. (3.2%), Menopen gallinae (15.2%), Ceratophyllus columbae (10.4%) and louse fly (12%). Multiple infections observed with internal parasites were 19/4%. However, co-infection of internal and external parasites was 24.4%. Meanwhile, five out of the 12 hair samples taken from pigeon owners were infected with fleas (C. columbae) and lice (M. gallinae) as seen by the clinical manifestation of allergic urticarial reaction and itching (Table 2). The nest of the pigeon was checked for external parasites and we found C. columbae and M. gallinae. The maximum and minimum environmental temperature of the area measured was 32 and 43°C and the maximum humidity of the area was 6%.

Histological finding

A comparison of control and infected tissues shows that the thymus and intestinal tissue sample of infected young and adult birds became very small due to the infection, oedematous or with petechial haemorrhages. Histological studies showed a visible vascular congestion and a massive lymphoplasma cartic infiltration inside the smooth muscular layer of the small intestine of infected pigeons. Multiple haemorrhages were seen in the mucosa of the intestine and ceaca. Patches of necrotic epithelial cells and multifocal areas of lymphocytic infiltrates in mucosa of jejenum of infected pigeon were observed. Extensive zone of necrosis were seen in infected young pigeon. The intestinal villous atrophy and shortening of microvilli were observed in infected birds. A cross-section of liver from pigeons infected by internal parasites showed massive congestion of central vein and dilation of hepatic sinusoids. (Figures 1 to 4).

The 12 hair samples of pigeon owners were checked for external parasites, five of which were carrying lice (M. gallinae) and one was found with fleas (C. columbae); all of the five infected pigeon owners had a feeling of itching on their head with allergic urticarial reaction.

DISCUSSION

Parasites are emerging as a significant avian pathogen on a global scale, both ecologically and economically. However, important gaps remain in our understanding of its epidemiology and pathogenicity in wild populations, particularly in non-native hosts.

In Iran, only few studies have been carried out in relation to parasite infections in pigeons. This is the first study that is used to compare the prevalence and intensity rates of parasites among pigeon species in the Ilam province of western part of Iran. Categorization of birds into adult pigeon and nestling showed that Eimeria sp. were significantly more prevalent in nestling than in

<table>
<thead>
<tr>
<th>Parasite</th>
<th>No. of infection</th>
<th>Overall percentage*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adult No.</td>
<td>Adult %</td>
</tr>
<tr>
<td>Multiple infection with internal parasites</td>
<td>23</td>
<td>13.69</td>
</tr>
<tr>
<td>Multiple infection with external parasites</td>
<td>27</td>
<td>16.07</td>
</tr>
<tr>
<td>Multiple infection with internal and external parasites</td>
<td>37</td>
<td>22.02</td>
</tr>
<tr>
<td>Total pigeon</td>
<td>168</td>
<td></td>
</tr>
</tbody>
</table>

*Out of 224 infected pigeon.
Table 2. Prevalence of endoparasites and ectoparasites in pigeons.

<table>
<thead>
<tr>
<th>Parasite</th>
<th>No. of infection</th>
<th>Overall percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adult</td>
<td>Nestling</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td><strong>Helminths</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Railiellina sp</td>
<td>21</td>
<td>12.5</td>
</tr>
<tr>
<td>Syngamus trachea</td>
<td>19</td>
<td>11.3</td>
</tr>
<tr>
<td>Capillaria sp</td>
<td>15</td>
<td>8.92</td>
</tr>
<tr>
<td>Ascaridia colombae</td>
<td>18</td>
<td>10.71</td>
</tr>
<tr>
<td><strong>Ectoparasites</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipeurus sp</td>
<td>6</td>
<td>3.57</td>
</tr>
<tr>
<td>Louse fly</td>
<td>19</td>
<td>11.3</td>
</tr>
<tr>
<td>Ceratophylus columbae</td>
<td>18</td>
<td>10.71</td>
</tr>
<tr>
<td>Menopen gallinae</td>
<td>21</td>
<td>12.5</td>
</tr>
<tr>
<td><strong>Protozoan</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemoproteus columbae</td>
<td>42</td>
<td>25</td>
</tr>
<tr>
<td>Trichomonas gallinae</td>
<td>38</td>
<td>22.6</td>
</tr>
<tr>
<td>Cryptosporidium sp</td>
<td>3</td>
<td>1.78</td>
</tr>
<tr>
<td>Eimeria sp</td>
<td>23</td>
<td>13.96</td>
</tr>
<tr>
<td><strong>Total parasites</strong></td>
<td>243</td>
<td>13.96</td>
</tr>
</tbody>
</table>

 adultos, while helminthiasis due to *T. gallinae*, *H. colombae* and *C. columbae*. *Eimeria* sp. were significantly higher in adults than nestling pigeon (p<0.05). *Louse fly*, *C. columbae* and *H. columbae* were significantly higher in adults pigeon than in nestling (p<0.05). The present study is more or less similar to the result that has been previously reported by Radlar et al. (2011) and Msoffe et al. (2011).

The helmenthes have been identified in this study including *R. achinobothridia*, *S. trachea*, *Capillaria columbae* and *Ascaridia columbae*. The present results are similar to those of previous reports which showed that *R. achinobothridia*, *S. trachea*, *C. columbae* and *A. colombae* were more pronounced than the other helmenthes parasites in pigeons (Gicik and Arslan, 2001; Razmi et al., 2007; Sari et al., 2008). *R. achinobothridia* and *A. colombae* were shown to be important in helminthes of pigeons. Although, these are generally
considered to be relatively harmless parasites, it will be interesting to study the reason why pigeons are more susceptible to helminthes as compared to other birds.

Protozoa parasites that were identified in this research study consist of *H. colombae*, *Ttichomonas gallinae*, *Cryosporidium* and *Eimeria* which is similar to the report of Radfar et al. (2011). They worked on the external and internal parasites of the pigeon from the east of Iran. A comparison of the results of this research with that of previous study shows that the percentage prevalence of parasites is less than that reported by Tietz-Marques et al. (2007). All the samples collected from *Eimeria* infected pigeons were infected by multiple parasites, showing the associations between *Eimeria* sp. and other parasites that are in agreement with Tietz-Marques et al. (2007). In 13.96% of the adult pigeon and 37.8% of the nestling pigeon, *Eimeria* oocysts were detected. Coccidiosis is one of the important protozoan diseases found in birds. The disease has a subclinical course in adults but young pigeons exhibit such symptoms of clinical coccidiosis as fluffy feathers, anorexia and watery diarrhoea with mucus (Radfar et al., 2011 and Levine, 1985). The highest overall percentage rate of parasitic infection was *T. gallinae* (26.8%) that is in agreement with the report of
Bahrami et al. (2008). The reason for high prevalence may be due to the fact that the transmission of the parasites occurs generally when the adults feed their young ones but can also occur through food in feeders and water (Kocan and Knisley, 1970). Adult birds may remain infected for a year or more and are a constant source of infection for their young ones (Soulsby, 1982). The results of the present study demonstrated lower rates of blood parasites than the other few studies carried out in Birjand, Iran for *H. colombae* (Radfar et al., 2011). The investigation of the prevalence of blood parasites in pigeon and other birds in Costa Rica, Alaska, and Japan revealed lower rates than 10%; in the United States, Colombia, Bulgaria and in Queensland, Australia, the prevalence rates ranged from 20 to 32% for *Heamoproteus* sp. (Valkiunas et al., 2004; Adlard et al., 2004; Deviche et al., 2001; Muratak, 2002; Rodrigues and Matta, 2001; Garvin et al., 1993; Shurlinkov and Golemansky, 2002).

In this study, we collected ectoparasites, which include feather lice (*Lipeurus, M. gallinae*), pigeon fleas (*C. columbae*) and louse fly. Radfar et al. (2011) reported four species of ectoparasites: *P. canariensis*, *C. columbae, M. gallinae* and *Laminiosiopes cysticola* from east of Iran.

Also in this study, five persons were reported with lice and fleas (same species of parasites collected from the pigeons nest) and all of them had itching in their head and allergic urticarial reaction. Haag Wackermagel (2004) reported the concerns of a married couple who was repeatedly invaded by pigeon fleas (*C. columbae*) over a period of two months. The source of the fleas was a pair of breeding pigeons (*Columba livia*). The birds’ nest was immediately located in the attic on top of the couple’s apartment, and the fleas found their way along an unsealed heating pipe. The couple encountered up to 40 bites per night. With the invasions repeated almost every night, the man gradually developed allergic urticarial reaction. However, the most traumatic experience for the couple was to learn that they were invaded by fleas (initially, they had presumed they were bothered by mosquitoes). This information resulted in severe psychological distress with phobic reactions and insomnia. Despite the successful removal of the fleas and the pigeons that were source of the pest, the parasitophobia of the man persisted over four months. This case was discussed from the broader aspect of health risks related to pigeons and animal fleas.

**Conclusion**

Clean, sanitary lofts are the most beneficial to keeping worms in check, but since pigeons often mingle with many hundreds of other birds, a bird can become infected through ingestion of worm eggs from the basket or through contact with stray pigeons. Therefore, it is advisable to develop a preventative worming program in which all birds are wormed at least twice a year. The use of mask and cap for pigeon owners could protect them from the allergic reaction.

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REFERENCES


