

# Changes in bacterial microflora in young carrier pigeons during the race season

## Abstract

Pigeons are during the race season exposed to various adverse effects. Increased stress during the race is an important factor that significantly affects their health and composition of bacterial microflora. The aim of this study was to observe the changes in bacterial microflora and health status of 60 young carrier pigeons in age 6 - 7 months during the race period. At the beginning and at the end of the race season were taken the samples of swabs from cloaca, oropharynx and infraorbital sinuses of the young carrier pigeons. The predominant gram-positive bacterial strains isolated in the samples from cloaca were *Ent. faecalis*, *Ent. faecium*, *E. columbae* and *Str. faecalis* in both collections of the pigeon gastrointestinal tract. At the beginning race season in swabs from oropharynx were most isolated strains *Ent. gallinarum*, *E. coli* and *Ent. faecalis*. At the end of race season were isolated from oropharyngeal swabs *Ent. columbae*, *Ent. faecalis* and coagulase negative staphylococci (*S. xylosus*, *S. schleiferi* and *S. epidermidis*), which also act as an opportune pathogen for immuno depression. Comparing the most common diseases of pigeons, we found an increased incidence of coccidiosis (40.4%), trichomoniasis (17.3%), endoparasitosis (11.5%) and respiratory syndrome (7.7%) after the race season. The enterococcal and streptococcal intestinal flora of young pigeons during the race season is dominated and composed of mainly host specific bacteria by *Ent. faecalis*, *Ent. faecium*, *Ent. columbae*, *Str. gallolyticus* and *Str. faecalis*. The increased incidence of diseases in pigeons during the race season may affect the presence of commensal bacteria especially coagulase negative and positive staphylococci.

**Keywords:** carrier pigeons, race season, intestinal flora, *enterococcus* spp, *staphylococcus* spp

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## Introduction

One of the fastest developing spheres of animal breeding is keeping domestic pigeons. The current use of pigeons for sport activities with rising demands on the fly speed, good form and magnificent orientation skills also increases demands for correct care, zoo-hygiene conditions and balanced nutrition.<sup>1</sup> The most vulnerable to infections are carrier and sporting pigeons, as they perform a large number of flights in the so-called racing season. This leads to substantial exhaustion of birds and, consequently, increases their susceptibility to various diseases, including infections with coccidiosis, salmonellosis, paramyxoviruses, cirkoviruses, trichomoniasis and respiratory infections.<sup>2,3</sup> Particularly young pigeons are exposed to increased physical demands during the race season, which may have a negative impact on the change in the composition of the bacterial microflora.<sup>1,4</sup> About the composition of micrococcal flora in the intestines and faeces of pigeons is little known. The intestinal microflora of gallinaceous birds such as chickens and turkey is probably different from that of pigeons. Pigeons possess only rudimentary developed caeca, the part of the intestines, which harbours the most abundant and diversified microflora. It has been suggested that birds such as passerines, which do not possess developed caeca, do not have a permanent gut flora.<sup>4,5</sup> The aim of this study was to observe the changes in bacterial microflora and health status in 60 young carrier pigeons during the race period.

## Material and methods

### Animals and samples

The study included young pigeons in age 6-7 months, which for two

months completed seven races at a distance of 100-300km. Clinical examination was performed according to Scullion FT, Scullion.<sup>6</sup> Faecal samples, swabs of the cloaca, oropharynx and infraorbital sinuses were collected from 60 young carrier pigeons at the beginning of race season originated from holding on east of Slovakia. On the end of race season were taken samples of swabs from 52 pigeons because 8 pieces were lost during the races.

### Laboratory analysis

The floatation technique was used for detecting coccidiosis and endoparasitosis from faecal samples according to Dranzoa et al.<sup>7</sup> Determination of trichomoniasis from swabs of the oropharynx and crop as well as detection of ectoparasitosis was performed according to Stenzel T, Koncicki.<sup>8</sup> Each sample was cultivated on conventional nonselective media (blood agar) and selective media (Endo agar) under aerobic conditions. Fermentative gram-negative rods of the family Enterobacteriaceae were determined by standard biochemical procedures using Enterotest 24 and Enterotest 16 (Lachema, Czech Republic). Staphylococci and Streptococci were identified according to their characteristics growth on blood agar (Oxoid) and by standard biochemical procedures using Staphytest and Streptotest (Lachema). According to the criteria of Facklam and Collins<sup>9</sup> were identified enterococci and by their biochemical activities using En-coccus test (Lachema).

### Statistical analysis

Statistical analysis was performed using software Chi square test for comparison of the most common diseases of pigeons before and after race season. A *paired t-test* was used to evaluate whether

the differences between isolated strains from swabs of the cloaca, oropharynx and infraorbital sinuses at the beginning and at the end of race season are significant or not. Differences were considered as significant at the level of 0.05 or less.

## Results and discussion

Microbial flora of the pigeon gastrointestinal tract is characterized by occurrence of *E. coli* and enterococci. *Escherichia coli* are usually commensal, but can also act as an opportune pathogen. Several factors are needed for *E. coli* to cause disease in pigeons, such as stress or

adenoviral or herpesviral infection.<sup>4,10</sup> In our study the enterococcal and streptococcal intestinal flora of pigeons was dominated. The predominant gram-positive bacterial strains of both collections from swabs of cloaca are *Ent. faecalis*, *Ent. faecium*, *Ent. columbae*, *Str. faecalis* and *Str. gallolyticus* (Table 1). Among the most frequent enterococcal species isolated from feral pigeons in Brno<sup>11</sup> were *Ent. faecalis* and *Ent. faecium*, while *Ent. columbae* occurred only in a minority of the samples. Enterococci of feral pigeons were also studied in Belgium,<sup>5</sup> where *Ent. columbae* was the most frequent gram-positive facultative anaerobic component of the pigeon intestinal flora.

**Table 1** Young pigeons-before race season

Isolated Bacteria	Pigeons (60)		Cloaca		Oropharynx		Infraorbital Sinuses	
	n	%	n	%	n	%	N	%
<i>E. coli</i>	56	93.3	49	81.6	5	8.3	2	3.3
<i>Ent. faecalis</i>	39	65.0	30	50.0	5	8.3	4	6.6
<i>Ent. columbae</i>	35	58.3	29	48.3	4	6.6	2	3.3
<i>Ent. faecium</i>	29	48.3	27	45.0	2	3.3	-	-
<i>Ent. gallinarum</i>	22	36.6	10	16.6	8	13.3	4	6.6
<i>Str. faecalis</i>	9	15.0	7	11.6	2	3.3	-	-
<i>S. intermedius</i> <sup>1</sup>	8	13.3	1	1.6	4	6.6	3	5.0
<i>Str. gallolyticus</i>	4	6.6	3	5.0	1	1.6	-	-
<i>Ent. mundtii</i>	4	6.6	3	5.0	1	1.6	-	-
<i>S. epidermidis</i> <sup>2</sup>	4	6.6	-	-	3	5.0	1	1.6
<i>S. schleiferi</i> <sup>2</sup>	4	6.6	-	-	2	3.3	-	-

Legend: n: Number of isolated strains from total 60 investigated pigeons, Coagulase positive staphylococci<sup>1</sup> – *Staphylococcus intermedius*, Coagulase negative staphylococci<sup>2</sup> – *Staphylococcus epidermidis*, *Staphylococcus schleiferi*

The presence of *Ent. columbae* and *Str. gallolyticus* in the pigeon intestinal tract was confirmed by Devriese et al.<sup>12,13</sup> Bacteria *Str. gallolyticus* is an opportunistic pigeon pathogen, which was formerly indiscernible from *S. bovis*.<sup>10</sup> Bacteria *Ent. cecorum* is associated with a wide variety of animal species.<sup>14</sup> After race season in monitored holding from cloacal swabs were dominated enterococcal strains by *Ent. faecalis*, *Ent. Columbae*, *Ent. Faecium*, *Ent. Gallinarum* and *Ent. Cecorum*. Important part of isolated bacteria from cloacal swabs was *E. coli* and *Str. gallolyticus*. The most frequently bacteria isolated from

oropharyngeal swabs of both collections were *E. coli*, *Ent. faecalis*, *Ent. columbae* and *Ent. faecium*. In an increased number ( $P < 0.05$ ) were isolated coagulase negative (*S. epidermidis*, *S. schleiferi*, *S. xylosus*) and positive (*S. aureus*, *S. intermedius*) staphylococci after race season from oropharynx and infraorbital sinuses swabs, which also act as an opportune pathogen for immuno depression (Table 2). The incidence of diseases in pigeons during the racing season may affect the presence of bacterial microflora.<sup>15</sup>

**Table 2** Young pigeons – after race season

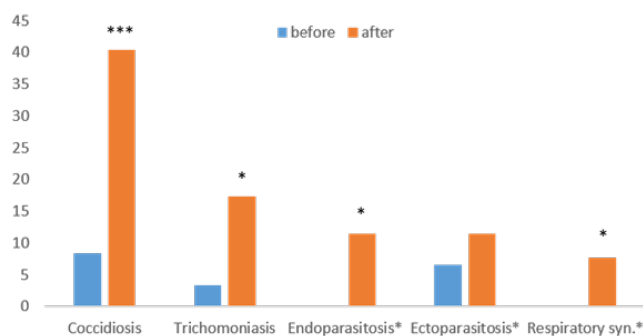
Isolated Bacteria	Pigeons (52)		Cloaca		Oropharynx		Infraorbital Sinuses	
	n	%	n	%	N	%	n	%
<i>Ent. faecalis</i>	40	76.9	32	61.5	5	9.6	3	5.7
<i>E. coli</i>	34	65.3	31	59.6	2	3.8	1	1.9
<i>Ent. columbae</i>	30	57.6	21	40.3	6	11.5	3	5.7
<i>Ent. faecium</i>	21	40.3	16	30.7	4	7.6	1	1.9
<i>Str. faecalis</i>	21	40.3	18	34.6	1	1.9	2	3.8
<i>Str. gallolyticus</i>	14	26.9	6	11.5	5	9.6	3	5.7
<i>Ent. gallinarum</i>	11	21.1	7	13.4	3	5.7	1	1.9
<i>S. intermedius</i> <sup>1</sup>	10	19.2	1	1.9	8	15.3	1	1.9

Table Continued...

Isolated Bacteria	Pigeons (52)		Cloca		Oropharynx		Infraorbital Sinuses	
	n	%	n	%	N	%	n	%
<i>S. xylosox</i> <sup>2</sup>	9	17.3	1	1.9	6	11.5	2	3.8
<i>Ent. cecorum</i>	8	15.3	7	13.4	1	1.9	-	-
<i>Bacillus</i> spp.	8	15.3	-	-	7	13.4	1	1.9
<i>Ent. casseliflavus</i>	7	13.4	6	11.5	1	1.9	-	-
<i>S. epidermidis</i> <sup>2</sup>	7	13.4	1	1.9	4	7.6	2	3.8
<i>Ent. mundtii</i>	6	11.5	2	3.8	4	7.6	-	-
<i>S. schleiferi</i> <sup>2</sup>	5	9.6	1	1.9	3	5.7	1	1.9
<i>Str. alactolyticus</i>	4	7.6	2	3.8	2	3.8	-	-
<i>Ent. hirae</i>	3	5.7	2	3.8	1	1.9	-	-
<i>Ent. durans</i>	3	5.7	2	3.8	1	1.9	-	-
<i>S. aureus</i> <sup>1</sup>	3	5.7	-	-	3	3.8	-	-
<i>S. simulans</i> <sup>2</sup>	2	3.8	-	-	1	1.9	1	1.9
<i>S. warneri</i> <sup>2</sup>	2	3.8	-	-	2	3.8	-	-

Legend : n: Number of isolated strains from total 52 investigated pigeons, which for two months completed all races, Coagulase positive staphylococci<sup>1</sup> – *Staphylococcus aureus*, *Staphylococcus intermedius*, Coagulase negative staphylococci<sup>2</sup> – *Staphylococcus xylosox*, *Staphylococcus epidermidis*, *Staphylococcus schleiferi*, *Staphylococcus simulans*, *Staphylococcus warneri*.

According to Balicka A, Pilarczyk,<sup>2</sup> the most common diseases pigeons include coccidiosis, trichomoniasis and respiratory infections, which are also confirmed in our study (Figure 1). Mixed infections with intestinal nematodes and coccidia were found in 42% of domestic pigeons and in 14.3% of the wild. As can be seen from the research, parasitic infection was greater in domestic pigeons than in the wild.<sup>16,17</sup> In Istanbul (Turkey), in feral pigeons nesting in famous mosques, mixed infections of coccidia and nematodes were detected: *Capillaria obsignata*-19.3% and *Ascaridia columbae* -14.6%.<sup>17</sup> Moreover, mixed infections were described in other regions of Turkey: *E. labbeana* and *E. columbarum* were found in wild pigeons, which were infected in 15.1%. The parasites affect the health of pigeons and are among the most common pathogens, which can reduce flight effectiveness.<sup>1,15</sup>



**Figure 1** Comparison of the most common diseases of pigeons before and after race season.

Legend : Endoparasitosis\* - caused by *Ascaridia* spp, *Capillaria* spp, Ectoparasitosis\*- caused by *Columbicola columbae*, *Ceratophylus columbae*, Respiratory syn\* - respiratory syndrome determined according to clinical manifestations.

## Conclusion

Our study showed that the young pigeon microflora is dominated and composed of mainly host specific bacteria by enterococci

and streptococci during the race season. The commensal bacteria especially coagulase negative and positive staphylococci, that are part of the microflora, can also act as an opportune pathogen as a result a number of stress conditions, which leads to substantial exhaustion of birds and increases their susceptibility to various diseases.

## Acknowledgements

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## Conflict of interest

The author declares no conflict of interest.

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