Research Paper

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Infectious Diseases of Carrier Pigeons and Antimicrobial Resistance in Isolated Bacteria

Veterinary Science

KEYWORDS : racing pigeons, diseases, E. coli, E. faecalis, Streptococcus spp., resistance

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ABSTRACT

The aim of this study was to monitor the health status of carrier pigeons (Columba livia) coming from two independent holdings during the race season. The two holdings differ in the way the prevention and treatment was carried out. In the A holding – the treatment and prevention was based on the use of antibiotics, while in the B holding – natural medicine agents in the form of extracts were used. Faecal samples and swabs of the cloaca, oropharynx and crop were collected from 80 pigeons from each holding. After laboratory anlyses of infectious agents, followed by testing with the disc diffusion method for resistance to selected 13 antibiotics. High level of drug-resistance (R ≥50.0%) of bacterial strains E. coli and E. columbae to ampicillin isolated of cloacal, oropharynx and crop swabs were recorded in both holdings. In both, holding A and B, incidence of - coccidiosis was 20 and 32.5 % respectively, trichomoniasis 7.5 and 14.4% respectively, endoparasitosis 4.8 and 8.8% respectively, ectoparasitosis 6.3 and 10 % respectively and the incidence of infectious causing respiratory syndrome was 2.5 and 6.6% respectively.

INTRODUCTION:

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. The accumulation of large numbers of pigeons in one place increases the potential for transmission of infectious agents which may later sign on the increased incidence of diseases (Hand, 2004).

The aim of this study was to characterize the most common diseases pigeons and determine the sensitivity of isolated bacteria of the oropharynx swabs, crop and cloaca to the tested antibiotics.

MATERIAL AND METHODS:

During the race season were monitored by two different holdings of pigeons with different ways of prevention and treatment.

In the A holding - the treatment and prevention was based on the use of broad-range antibiotics based tetracycline, ampicillin, erythromycin and streptomycin, while in the holding B - natural medicine agents in the form of extracts from the garlic, organic acids and ethereal oils were used. Faecal samples and swabs of the cloaca, oropharynx and crop were collected from 80 pigeons from each holding. Clinical examination was performed according to Kimpe *et al.* (2002). The floatation technique was used for detecting coccidiosis and endoparasitosis from faecal samples according to Dranzoa et al. (1999).

Determination of trichomoniasis from swabs of the oropharynx and crop as well as detection of ectoparasitosis was performed according to Letkova *et al.* (1997). Swabs of the cloaca, oropharynx and crop were cultivated onto blood agar (Oxoid LTD, Hampshire, UK), pri 37°C for 24h. Based on the colony morphology, bacteria *Staphylococcus* spp. were selected for the tube coagulase test (Staphylo PK, ImunaPharm, SR). Suspect colonies *Staphylococcus* spp., *Streptococcus* spp. and *Enterobacteriacae* spp. were isolated on blood agar, cultivated at 37°C for 24h and identified biochemical using the STAPHYtest, STREPTOtest, ENTEROtest (Erba-Lachema, CZ) and identification by software TNW Pro 7.0 (Erba-Lachema, CZ).

The diagnostics for salmonella was performed after multiplication in buffered peptone

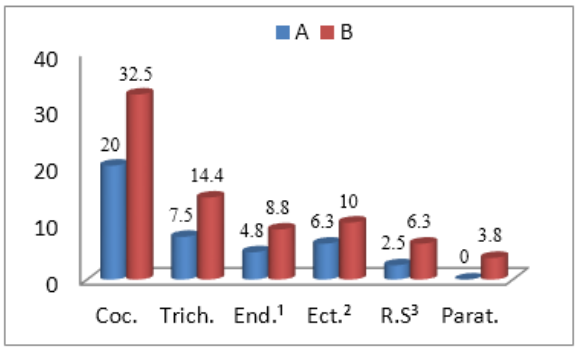
water and culturing on the Mac Conkey medium according to Stenzel *et al.* (2013). For mycoplasma culture, were collected oropharynx and crop swabs. To culture mycoplasmas were used mycoplasma-selective agar plates and broths according to Turcsányi *et al.* (2012).

Identified *Streptococcus* spp. and *Enterobacteriacae* spp. isolated from swabs samples were *in vitro* tested on Mueller-Hinton agar by disc method after 24 h incubation at 37°C, on resistance to 13 types of antibiotics according to the CLSI (Clinical and Laboratory Standards Institute, USA). In the overall assessment of the isolated species of bacteria (n ≥ 10) was judged the overall resistance within a specific species to individual kind of antibiotics. Value of resistance from isolated strains were valuated as sensitive (S) ≤ 10.0 %, moderate sensitivity (M) 10.0 – 50.0 % and resistant (R) ≥ 50.0 %.

RESULS AND DISCUSSION:

According to Bergman (2013), the most common diseases pigeons include coccidiosis, trichomoniasis and respiratory infectious which is also confirmed in the studied holdings A and B (Graph 1).

Graph1: Comparison of the most common diseases of pigeons in the monitored holdings A and B [%]



Legend: Coc. – Coccidiosis, Trich. – Trochominiasis, End. [1] - Endoparasitosis caused by *Ascaridia* spp., *Capillaria* spp., Ect.[2] - Ectoparasitosis caused by *Columbicola columbae, Ceratophylus columbae,* R.S[3] - Respiratory infectious – caused by *Mycoplasma* spp.

In a study conducted Stenzel *et al.* (2013) from 683 pigeons in Poland were isolated from cloacal swabs *E. coli, S. faecalis* and *S. gallolyticus*, which are considered the natural digestive tract commensals. *E. coli* and *S. gallolyticus* are usually commensal but can also act as an opportune pathogens. Several factors are needed for *E. coli* to cause disease in pigeons, such as stress or adenoviral or herpesviral infection (Baele *et al*., 2002; Kimpe *et al*., 2002).

The most frequently bacteria isolated from cloacal swabs in the holding A were *E. coli* (47 strains), *E. columbae* (29 strains), *E. faecalis* (21) *S. gallolyticus* (20 strains) and *S. faecalis* (12 strains). In the same holding swabs from the oropharynx and crop was recorded the occurrence *E. coli* (6 strains), CNS (5 strains), *S. aureus* (3 strains) and *Mycoplasma spp.* (2 strains). In holding B were at a higher rate from cloacal swabs isolated *E. coli* (66 strains), *E. columbae* (26 strains), *S. gallolyticus* (33 strains), *E. faecalis* (37) and *S. faecalis* (23 strains). CNS (11 strains), *S. aureus* (2 strains), *E. coli* (9 strains), *E. columbae* (5 strains), *Mycoplasma spp.* (5 strains) and *S. faecalis* (4 strains) were the most frequently isolated from swabs of the oropharynx and crop.

In table 2 are values expressed resistance isolates from both holdings during the race season.

Table 2: Value of resistance to antibiotics in isolated bacteria in the holdings

	E. coli		E. columbae		E. faecalis		S. gallolyticus		S. faecalis	
	A	B	A	B	A	B	A	B	A	B
n	53	75	29	31	21	37	20	33	12	27
AP	R	R	R	R	M	M	M	M	M	S
AX	M	M	M	M	M	M	M	S	M	S
AC	S	S	S	S	S	S	S	S	S	S
CE	S	S	S	S	S	S	M	S	M	S
ER	S	S	M	S	M	M	M	S	M	S
LI	M	M	M	M	M	M	S	S	M	S
CO	M	S	M	S	M	M	R	M	M	M
NO	S	S	S	S	M	S	R	M	M	M
PE	S	S	M	S	S	S	R	M	M	S
ST	M	S	M	M	M	S	M	S	M	S
DO	M	S	S	S	M	S	S	S	S	S
CP	S	S	S	S	S	S	S	S	S	S
TE	M	M	M	S	R	M	M	M	R	M

Legend: AP - Ampicillin (10 µg); AX - Amoxycilin (25 µg); AC - Amoxicillin-clavulanic acid (2:1) (5 µg); CE - Cefaperazone (30 µg); ER - Erythromycin (10 µg); LI - Linkomycin (15 µg);CO - Colistin (10 µg); NO - Novobiocine (5 µg); PE - Penicillin (10 U); ST - Streptomycin (10 µg); DO – Doxycycline (5 µg), CP - Cephalotin (30 µg); TE - Tetracicline (5 µg)

The presented data in indicate a high level of drug-resistance (R ≥50.0%) of bacterial strains *E. coli* and *E. columbae* to ampicillin isolated of cloacal, oropharynx and crop swabs in both holdings and are consistent with the results reported in other countries (Futagawa-Saito *et a*l. 2007; Stenzel *et a*l. 2013).

In the A holding, in which the prevention and treatment carried out with broad-spectrum antibiotics was recorded resistance in *S. gallolyticus* to colistin, novobiocin and penicillin, *E. faecalis* and in *S. faecalis* and *E. faecalis* to tetracicline.

All isolates from both holdings were most sensitive to amoxicillin-clavulanic acid and cephalotin.

CONCLUSION:

In summary, the drug-resistance of the bacterial strains isolated from pigeons at the holding A is higher than the holding B. Pigeons should be considered a risk species for the spreading into the environment of antimicrobial resistant bacteria, including antibiotic-resistant *E. coli* strains. It may pose a real risk to human health due to the easy transmission of the bacteria from birds to humans which is facilitated by long-term exposure to the microorganisms.

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