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Review Paper

House flies *Musca domestica* as transmitter of red poultry mite *Dermanyssus gallinae* - case report

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Abstracts

At intensive poultry breeding condition red poultry mite *Dermanyssus gallinae*, usually shares our habitat with house fly *Musca domestica.* As both populations were in permanent contact their presence pose a possibility of mechanical transition of *D.gallinae* via *M.domestica*, especially in cases of massive infestation with both arthropods*.* During our examination we established the presence of *D.gallinae* in flies in 1.44% and that the domestic fly *Musca domestica* under intensive poultry farming can mechanically transmit *Dermanyssus gallinae*.

Key words: *Musca domestica, Dermanyssus gallinae*, transmission

Introduction

Among the numerous avian ectoparasites, *Dermanyssus gallinae* occupies the most important place in poultry farming (Nordenfors, 2000; Sparagano *et al.,* 2009). Parasitism of this haemotophagous mite is demonstrated through disturbance of poultry, irritation, anemia, transfer of diseases, reduced laying ability, and sometimes even death (Pavličević *et al.*, 2007b). *D. gallinae* is a cosmopolitan parasite. It has so far been confirmed on 30 bird species and 20 mammal species including human (Pavlović et al., 2004). The global medical and economic impact on poultry farming has shown a constant growth (Pavličević *et al.,* 2007a; Wall and Shearer, 2001).

At intensive poultry breeding condition red poultry mite *Dermanyssus gallinae*, usually share our habitat with house fly *Musca domestica* (Lysyk and Axtell, 1987; Kaufmann, 1996; Nordenfors, 2000). As both populations were in permanent contact their presence pose a possibility of mechanical transmission of *D.gallinae* via *M.domestica*, especially in cases of massive infestation with both arthropods (Hogsette *et al.,* 1993).

From the available data from the research we could not establish a correlation between the presence of flies and red chicken mite but it raises a legitimate question of the possibility of its transmission by flies as mechanical vectors, especially when we know that the most common parasites of flies belonging to the genus *Macrochelidae* (Acari: Mesostigmata) the same genus as *D.gallinae* (Zhang, 2003). How both groups of Mesostigmata have cosmopolitan distribution there is a chance of flies' presence in temperate latitudes. The most abundant is genus *Macrochelidae* with following species *Glyptholaspis confusa, Macrocheles bedarius, M. muscaedomesticae, M. subbadius, M. robustulus, M. glaber* and *M. matrius* (Greene *et al.*, 1989). The occurrence of the first five species was reported mainly in the USA, while in Europe like dominant species occurred *Macrocheles muscaedomestice* (Pavlović *et al.,* 1997; Wall and Shearer, 2001). Same species of these arthropods were found in the objects of poultry breeding and at poultry as well as the accidental ectoparasites (Dobrivojević and Petanović, 1982, Pavlović, 2004).

Considering the way the method way of fixation in the Mesostigmata parasitic genus Macrochelida, it raises the question of the possibility of transferring other Mesostigmate - *D.galinae* by house fly especially in conditions of high infestations in poultry breed object.

Materials and methods

Experiment is performed in facilities in high infestation poultry farm with *D. gallinae.* Samplings were performed at one poultry object with battery systems for the

exploitation of laying hens with capacity of 25,000 layers. At object, we established a massive infestation with fly and poultry red mites using method for early detection of poultry red mite described by Pavličević et al. (2007b). In the selection of farms to see what was done, we followed the usual level of infection that occurs in this region and which is normally very high. The level of infestation can be estimated feathers blowing in the animal and counting mites are at the moment. The severity of infection is determined on the basis of their index numbers estimate the levels of infestation (Pavlović, 2014). At same in object we established permanent high level of infestation of *Musca domestica.* Temperature range in object of 26^{o}C is optimal for the full activity and the daily dynamics characteristic of both type of arthropods – *D.gallinae* (especially when the high level of infection) and *M. domestica*.

From 10.45h to 12.45 h in object we suspend 10 traps prepared of open new nylon bags, which we have the upper inner surface width of 20 cm greased with adulticide for fly. Traps were hanging in metal setting at 70 cm in diameter above the lamp between the battery cages, along the central line of the entire poultry facility. Sampling time was subordinate to daily activities of domestic flies, because we wanted to observe their possible impact on the distribution of *D.gallinae.*

After exposure tentacles of 2 hours, the bottom third of the bag was cut off and sealed with tape. The contents of each nylon sacks were unloaded on a white background paper and looked at under artificial light with a magnifying glass. While examining the proper sampling of flies, transport and process the samples, we subsequently prevent contamination of samples *M.domestica* with mites. We sampled a total of 3332 domestic flies.

First, we performed the identification of captured flies based on morphological characteristics of domestic fly *M. domestica* (Emberson, 1980; Di Palma *et al.,* 2012). After that each individual fly (*M.domestica*), examined for presence of parasites. After those positive samples were sorted and placed 48 hours in 70% alcohol, then washed and collected sediment was examined under the microscope. Featured mite samples were identified by light microscopy based on morphological characteristics. For the identification of *D.gallinae* were used keys given by Di Palma *et al.* (2012) and by *Macrochelidae* species were used keys given by Emberson (1980) and Halliday (1990).

Results and Discussion

During the examination of sampled *M. domestica* at 4.14%, we found the presence of mites. The 2.70% of occurred mites was parasites of domestic flies from the genus *Macrochelidae* (Acari: Mesostigmata) - *Macrocheles muscaedomesticae* and 1.44% was *Dermanyssus gallinae* (Table 1).

Table 1: Presence of *Dermanyssus gallinae* and *Macrocheles muscaedomesticae* at collected *Musca domestica*

No. of trap	No. of *Musca domestica*	species of mites infected fly			
		D. gallinae		*M. muscaedomesticae*	
		No	%	No	%
1.	93	1	1.07	13	13.97
2.	23	/	0.00	4	17.39
3.	262	2	0.76	34	12.97
4.	96	/	0.00	12	12.50
5.	420	5	1.19	8	1.90
6.	21	/	0.00	1	4.76
7.	227	1	0.44	3	1.32
8.	313	12	3.83	3	0.95
9.	1320	22	1.66	2	0.15
10.	557	5	0.89	10	1.79
Total	3332	48	1.44	90	2.70

During our examination we established infection of *M.domestica* with *Macrocheles muscaedomesticae* and *Dermanyssus gallinae.* Both species of arthropod belonging to the same genus - Mesostigmata and it is expected that the possible infection of flies with the both species of arthropod. The essential difference is in the fact that *Macrocheles muscaedomesticae* is a real ectoparasite flies while *Dermanyssus gallinae* is accidental parasite.

D.galinae is the parasite who in low infection manifests a clear night-time activity, but with increasing numbers of parasites his presence was evident throughout the day in the house and poultry. It often happens that when there are a severe infection and workers these parasites so that in some countries this is considered to be the professional disease of workers in poultry production. Their presence during the day is not strange at a time when the old buildings, hygiene and inadequate when the infection is large and it is observed during the numerous studies around the world (Kaufmann, 1996, Nordenfos, 2000, Kilpinen 2009, Mul and Koenraadt 2009, Sparagano *et al*., 2009). Under normal conditions they are the primary

parasite of birds and accidentally attack humans and other mammals whe the rate of infestation large (Pavlović, 2004, 2014).

Poor hygienic conditions in the breed objects lead to the emergence of large populations of domestic flies. With its mass and distribution, population *D. gallinae* provide a basis from which local populations of flies directly come in contact with them. In addition, it is possible that *M. domestica* additionally makes them attracted to the red chicken mite feeding on poultry blood.

D. gallinae probably has an active climb to domestic fly. As *M. domestica* has a wider agenda of dermanisida movement, there is a possibility that at such a distance they mechanically transmit *D. gallinae*. This way they contribute to the distribution *D. gallinae* in house, farm, or the near vicinity, especially when we know that the area of movement of a fly can cover a distance of 2 km. This could encourage the expansion of the health of important poultry ectoparasites; affect the control of *D. gallinae,* as well as infectious diseases, which are the red chicken mite vectors.

At same time by author's knowledge we established and described for the first time presence of *Macrocheles muscaedomesticae* at domestic fly (*Musca domestica*) in Serbia (because these studies have not yet been conducted).

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