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Original Article

Canine Myiasis and Its Causal Agents in Northeastern Iran

***Ali MOSHAVERINIA [1], Hossein KAZEMI MEHRJERDI [2]**

1. *Dept. of Pathobiology, Faculty of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran*
2. *Dept. of Clinical Sciences, Faculty of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran*

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***Correspondence**
Email:
moshaverinia@um.ac.ir

Abstract

Background: Myiasis is defined as the infestation of live human and vertebrate animals with dipterous larvae for a certain period. There are reports indicating that dogs are the most common species affected by myiasis. This study was conducted to identify myiasis-causing flies in owned and stray dogs in Mashhad (Northeastern Iran).

Methods: A total of 435 owned dogs and 800 stray dogs were examined for myiasis. Myiasis cases were cured and fly larvae were identified by microscopy using the relevant standard identification keys.

Results: Ten out of 435 owned dogs (2.29 %) and 18 out of 800 stray dogs (2.25 %) had myiasis. The causative agents of myiasis in dogs based on their frequencies were as follows: *Wohlfahrtia magnifica* (50%), *Lucilia sericata* (28.57%) and *Chrysomya albiceps* (21.42%).

Conclusion: *W. magnifica* was the most important myiasis-causing fly among the dogs sampled here, sometimes causing very serious damages. However, when treatment was given early enough, the larvae removed and the wound disinfected, the animals usually made a full recovery.

Introduction

The term myiasis was first used in 1840 by Hope (1). "Myiasis" has been taken from Greek word "Myia" that means Fly. Myiasis is defined as the infestation of live human and vertebrate animals with dipterous larvae for a certain time (1). The myiasis-causing flies based on their affinity to viable and non-viable tissues have been categorized into three groups: obligatory, facultative and accidental. Classification of myiasis is based upon the organ or tissue of the body involved (2). It is an important subject of

medical and veterinary operations particularly in tropical and subtropical countries. Health of humans and animals are adversely affected by myiasis and if left untreated, it can cause serious damages and eventually death.

In humans, myiasis often occurs in the very elderly, very young, unable persons and those who have poor hygiene (3). In addition, alcoholism, diabetes, mental retardation, low socioeconomic status, basal cell carcinoma and natural body orifices secretion are other predisposing factors for human myiasis (4). Untreated wounds, matted hairs and accumulation of excrement near the genitalia are the major predisposing factors for myiasis in animals (3).

Identification of myiasis-causing fly species in different regions and countries is an essential issue. Apart from the danger of these insects for humans and animals, certain species of these flies have also been used for removing dead tissues and cleaning the slow-healing wounds (3). Likewise, these flies are predominant insect group found in human and animal corpses and can play an important role in forensic investigations and criminology.

Climatic changes and global warming in recent years along with rise in global trade, international travels and immigration have increased the likelihood of spread of myiasis-causing flies to naïve areas (5). Introduction of new species to a naïve region may cause unexpected serious problems for humans and animals.

Myiasis has previously been reported in Iran from human (6, 7) and animals (8, 9) as case reports, but few researches have been conducted on epidemiology, ecology and biology of myiasis-causing flies in Iran (10, 11). Despite the abundance of owned and stray dogs in Iran, there is no proof of its epidemiology in these animals.

The aim of this study was to identify the wound myiasis-causing fly species infesting these animals in North East of Iran.

Materials and Methods

This study was carried out since April 2012 until April 2014 and had two study groups. All procedures were performed after approval received by the University Research Committee in accordance with the guidelines of its Institutional Animal Experimentation Ethics Committee.

In the first phase of the study, all owned dogs with myiasis referred to surgery ward of veterinary teaching hospital of Ferdowsi University of Mashhad, Iran, were clinically examined. Hairs in affected area were clipped and larvae were removed under general anesthesia. Mechanical removals were done using diluted chemical compounds (Cypermethrin 1/1000 v/v) and sterile medical forceps. All collected larvae were washed with normal saline and transferred into tubes containing 70% ethanol. These larvae were sent to Parasitology Laboratory of Faculty of Veterinary Medicine, Ferdowsi University of Mashhad, for subsequent microscopical identifications using the relevant standard identification keys.

Treatment of these animals after removal of larvae were followed by cleansing the area with 10% Povidon Iodine solution, diluted 1:10 in normal saline (0.09%). Moreover, the animals received ivermectin (0.4 mg/kg BW, SC, single dose, Ivectin®, Razak Laboratories Co, Tehran, Iran) and cefazoline (22 mg/kg BW, bid for 5-7 successive days, Cefazex®, Loghman pharmaceutical Co., Tehran, Iran). Finally, the animals were bandaged before hospital discharge. They were brought every 5 days by their owners for changing the bandage and following improvement process.

The second phase of this study was done in a municipality shelter for stray dogs in Mashhad, Iran, where monthly visits were performed and dogs with clinical signs of myiasis were examined and treated with the same protocol as the first phase of the study.

Additional data (i.e. age, sex, history, affected organ and time presented) were collected from the samples.

Results

During the study, a total of 435 owned dogs and 800 stray dogs were examined. Ten out of 435 owned dogs (2.29 %) and 18 out of 800 stray dogs (2.25 %) had myiasis. Parasitological studies revealed that *Wohlfahrtia magnifica*, *Lucilia sericata* and *Chrysomya albiceps* were causative agents of myiasis in studied dogs.

Identification of these species was carried out by examination of morphological features of cephalopharyngeal skeleton, anterior and posterior spiracles of third-stage larvae (Fig. 1-3).

The frequencies of species found in this study were as follows: *W. magnifica* (50%), *L. sericata* (28.57%) and *C. albiceps* (21.42%). *W. magnifica* was the predominant species infesting owned and stray dogs. The cases of myiasis were seen from May to November. The detailed information about myiasis cases are shown in Table 1 and 2.

Fig. 1: Morphological structures of anterior spiracle (A), cephalopharyngeal skeleton (B) and posterior spiracle (C) of third instar larva of *W. magnifica*

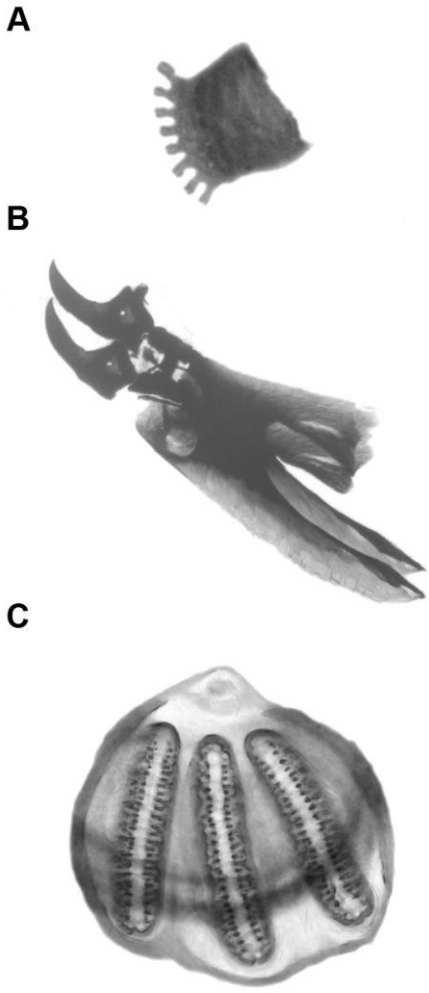

Fig. 2: Morphological structures of anterior spiracle (A), cephalopharyngeal skeleton (B) and posterior spiracle (C) of third instar larva of *L. sericata*

Table 1: Recoded data about owned dogs affected by myiasis in Northeastern Iran during the study (n=10)

Date	Sex	Age (yr)	Breed	Location of lesion	History	Fly species
Aug	M	1.5	Mixed	Mouth	None	*W. magnifica*
Aug	M	1.5	German Shepherd	Paw	None	*W. magnifica*
Oct	M	2	Mixed	Nose	Cauterization	*L. sericata*
July	M	1.3	Husky	Neck	None	*C. albiceps*
June	M	1.5	Terrier	Nose	Open wound	*L. sericata*
Sep	M	4	German Shepherd	Skin	Demodicosis	*W. magnifica*
Oct	M	2	Mixed	Scrotum	Fight wound	*L. sericata*
Oct	M	3	Mixed	Skin	Rupture by metal	*W. magnifica*
Oct	F	2.5	Rottweiler	Skin	Open wound	*C. albiceps*
Nov	M	1	Great Dane	Prepuce	None	*W. magnifica*

Table 2: Detailed information recorded about each myiasis case of stray dog examined in this study (n=18)

Date	Sex	Location of lesion	Fly species
June	F	Thigh	*W. magnifica*
June	M	External ear canal	*W. magnifica*
Aug.	M	Lower lip	*C. albiceps*
July	M	Neck	*L. sericata*
July	F	Nose	*W. magnifica*
July	M	Anus	*W. magnifica*
Aug	M	Prepuce	*W. magnifica*
Oct	M	Skin of belly	*C. albiceps*
Oct	M	Paw	*C. albiceps*
Sep	M	Shoulder	*L. sericata*
Sep	M	Prepuce	*C. albiceps*
Sep	F	Vulva	*W. magnifica*
May	M	Neck	*W. magnifica*
May	M	Thigh	*L. sericata*
June	F	Vulva	*W. magnifica*
Aug	F	Between the toes	*L. sericata*
Aug	F	Neck	*L. sericata*
Aug	M	Lower lip	*W. magnifica*

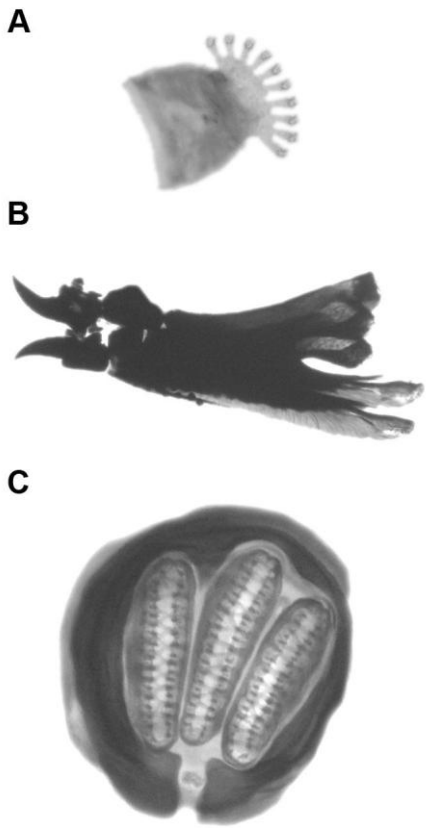

Fig. 3: Morphological structures of anterior spiracle (A), cephalopharyngeal skeleton (B) and posterior spiracle (C) of third instar larva of *C. albiceps*

Discussion

Myiasis is a common disease of animals and rarely humans in Iran and other parts of the world (2, 10, 12). Veterinarians and medical staffs usually treat submitted cases without attention to myiasis-producing fly species. In addition, maggot –therapy and the use of forensic entomology in criminology are unusual in Iran. The mentioned factors, as well as large geographical extent of Iran were the reasons why there were no comprehensive studies done on myiasis-causing flies. In the present study, we focused on dogs because they were more accessible and according to some investigators, dogs are the most common species affected by myiasis (3, 13). Herein, we identified *W. magnifica, L. sericata* and *C. albiceps* as causative species of myiasis in dogs.

W. magnifica is an obligatory myiasis-causing fly and has been reported in canine myiasis from Israel, Greece, Morocco and Hungary (13-15). It seems that this fly is very prevalent in our study area, as we have previously reported it from Goat and camel cases in the same area (8, 9). *W. magnifica* is one of the most important fly species causing myiasis in the Palearctic zone (15). It infests a wide range of mammals (dogs, horses, sheep, goats, donkeys, pigs, cows, camels etc.) and birds (1).

L. sericata maggots, another identified species in this study, have been collected from wound myiasis of dogs in Israel and turkey (13, 16). This species is a facultative myiasis-causing fly and is very important in producing strike myiasis in sheep especially in Europe, but is not important in this view in Iran.

C. albiceps is a facultative myiasis-causing fly that has not been previously reported from Iran. Maggots of this fly have been identified and reported from Israel and Kuwait (13, 17).

Three identified fly species involved in canine myiasis in this study had seasonal activity from May to November. This period is correspondent to results of researchers in Greece (14).

Anatomical locations of myiasis were mostly relevant to location of neglected wounds. In some cases, natural orifices of body were affected, almost all of them by *W. magnifica*. Probably the presences of excrement or emitting chemo attractants from intact orifices attract the female flies and produce myiasis in these sites (15).

Although a relatively large number of dogs were studied, prevalence determination of myiasis especially facultative myiasis is not precise. The reason is that this type of myiasis is dependent to presence of untreated wound on host body. However, our findings about prevalence of myiasis in stray dogs, as well as owned dogs were in agreement with a report from Israel (13).

Although ivermectin was used systemically in most of the cases in this study, it is our impression that its use alone will not be effective enough. Some of the animals were previously treated using systemic ivermectin alone, and their infestations was not resolved until the wounds were treated locally and in most instances until larvae were manually removed and adjunct therapies such as antibiotics were employed.

All of fly species found in this study can attack humans and produce myiasis. *W. magnifica* frequently attacks humans and often deposits its first-stage larvae in ears and eyes (1). The nasal cavities and any kind of wound on the body may also attract this fly for larviposition. More than 10 cases of wohlfahrtiosis in humans have been reported from Iran, Turkey, Europe, Asia, Morocco and Egypt (4, 7, 18). Human myiasis caused by *L. sericata* have been reported from Iran and some other countries and its larvae have been retrieved from ear, eye, skin tumors, urethra and tracheostomy wound (7). Therefore, with regard to zoonotic importance of these fly species especially *W. magnifica* that is an obligatory parasite and more prevalent in the study area, effective population control measures is needed. In our view, one of the most practical methods to control the population of these flies is avoidance of leaving wounds without treatment and urgent curing of myiasis cases. Untreated and neglected wounds cause flies attract to the wound and produce myiasis. Treatment of myiasis can interrupt the life cycle of these flies and consequently reduce their population.

Conclusion

We noted that *W. magnifica* is the most important myiasis-causing fly among the dogs sampled here, sometimes causing very serious damages. However, when treatment was given early enough, the larvae were removed and the wound was disinfected, the animals usually made a full recovery. Prevention is always better than cure. It appears that there are compounds available that may be effective prophylactics against myiasis in dogs but the ideal formulation and route of administration have not been worked out yet.

Since the myiasis is a zoonotic disease and threats the human health, more study is needed on causative agents of myiasis all over the country. Undoubtedly, faunistic and ecological studies on these flies will help us to have better understanding about them and design better control programs.

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