Prevalence of hypodermosis in cattle slaughtered in industrial slaughtered-house of Ardebil, Iran

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Abstract Hypodermosis is one of the important veterinary problems because of its worldwide prevalence and significant economic losses. Economic losses is due to decreasing of productivity potential and leather quality. The disease is caused by two parasitic fly species in cattle, *Hypoderma bovis* and *lineatus*. Diagnosis of the parasites has crucial importance because of treatment and eradication plannings. Basically diagnosis is based on parasitological methods but recently serological methods were used in some countries. In the present study, a total of 3716 cattle were investigated in Industrial Slaughter house of Ardebil, Northwest of Iran. In this study, the prevalence of *H. lineatus* and *H. bovis* was 0.32 % (12 larva) and 1.07 % (40 larva), respectively. Low prevalence of hypodermosis could be caused by cold climate of studied region also shows efficacy of controlling programs. Unlike low prevalence of *Hypoderma* spp. in the studied regions, antiparasitic agents such as organophosphates and avermectins should be used to reduce the prevalence.

Keywords Hypodermosis · Prevalence · Cattle · Ardebil

Introduction

Hypodermosis is a kind of myiasis that is caused by larvae of *Hypoderma* spp. (Diptera, Oestridae) including *H. lineatus*, *H. bovis*, *H. diana*, *H. actaeon*, and *H. tarandi*. Herbivores including cattle, sheep, goat, deer, buffalo, and reindeer are definitive hosts for parasitic stage of *Hypoderma* spp. Cattles are mainly affected by *H. lineatus* and *H. bovis* and these species are distributed in Asia, Europe, and America continents. The parasite has economic importance in the Northern Hemisphere because of decreasing nutritive value and productivity potential of affected animals and also reduction in leather quality (Soulsby 1982). Also adult female flies cause decrease of productivity in the infested animal by making disturbance while grazing (Zumt 1965; Piekarski 1989; Catts and Mullen 2002; Mullen and Durden 2002).

According to the climatic differences, life cycle of the *Hypoderma* has some differences in different regions. A lot of studies have conducted on biology of *Hypoderma*, the first work was carried out in 1700 in Italy (Zumt 1965). The fly has high adaptation ability and stimulate disease by larval migration. Occasionally, the larvae can complete life cycle by passing through internal parts of the host body. In the host body, *Hypoderma* could be characterized by the presence of warble in subcutaneous tissues (Zumt 1965). The larval (parasitic) stage of fly lasts about 1 year whereas adult flies life time lasts only a few days.

Diagnosis play an important role in treatment and eradication of the disease, so it helps to prevent economic losses (Otranto et al. 2001). Generally, diagnosis is based on finding warbles on the back region of the infested animals during clinical examination. Also serological tests such as ELISA has been developed for early diagnosis in most of the countries (Sinclair 1995; Argente et al. 1998).

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Fig. 1 Larva of *H. lineatus* (left with wide internal canal of spiracle) and *H. bovis* (right with narrow internal canal of spiracle) in carcasses

Main purpose of diagnosis and studying of the prevalence of hypodermosis is using the obtained data for controlling and eradication of the parasite. For the first time Rak and Anwari reported hypoderma in Iran (Rak and Anwari 1974), after that researchers conducted numerous studies to evaluate hypodermosis condition in the country. The fly has low reproduction rate and there is no reservoir host for the parasite, therefore the treatment is effective and the parasite could be eradicated easily. Controlling programs could be a little different depending on environmental conditions. By now, chemicals agents such as derris (rotenone), organophosphates and avermectins are employed against the parasite and the best results are obtained by avermectins (Beesley 1974; Ogg 1977; Preston 1984).

Materials and methods

Sampling

The study was conducted in Ardebil, Northwest of Iran between August 2011 and July. A total of 3716 cattle of different sexes and ages were examined thoroughly. Every other week inspection of slaughtered cattle was carried out and the samples were collected. Most of the slaughtered cattle in industrial slaughter-house of Ardebil belonged to rural regions that located in vicinity of the city; some of which belonged to neighbor cities and rarely belonged to other provinces. Before slaughtering, the carcasses were examined for larval infestation by carefully palpating the skin. After dissecting the inner surface of the back and the neck skin, subcutaneous tissue, adipose tissue surrounding spinal canal, and oesophagus were examined for presence of larva. Oesophagus samples were cut along the longitudinal axis and their inner surface were inspected. Adipose

tissues surrounding spinal canal were inspected from first vertebrae of neck to last sacral vertebrae.

Laboratory examination

The gathered larvae were stored in containers containing 70 % ethanol and 5 % glycerol after counting and washing in physiological saline solution (NaCl 0.9 %), and larvae of each carcass were stored in special containers. Within a day, samples were transferred to veterinary parasitology lab of Islamic Azad University, Science and Research Branch, Tehran. The collected larvae were identified according to keys of Richard (Mullen and Durden 2002).

Results

Overall, 44 out of 3716 (1.18 %) examined carcasses were found positive for *Hypoderma* and because of multiple infestation 52 larvae were isolated including 12 *H. lineatus* (23 % of isolated larvae) and 40 *H. bovis* (77 % of isolated larvae) (Fig. 1; Table 1). 30 and 14 larvae were isolated from subcutaneous tissue of the back region and adipose tissue surrounding spinal canal, respectively (Table 2). The first larva from adipose tissue surrounding spinal canal was isolated after examination of 186 carcasses and the highest rate of infestation was recorded in February (2.69 %). The first larva from subcutaneous tissue of the back region was isolated after examination of 143 carcasses and the highest

Table 1 Number and ratio of isolated species

Species	No of isolated	Percentage
<i>H. bovis</i>	40	77
<i>H. lineatus</i>	12	23
Total	52	100

Table 2 Infestation rate of different parts of body

Site of examination	Oesophagus	Subcutaneous tissue of the back region	Subcutaneous tissue of the neck region	Adipose tissue surrounding the spinal canal
Positive No.	0	30	0	14
Total No.	3617	3617	3617	3617
Percentage of infestation	00	0.80	00	0.30

Table 3 Month-based prevalence of hypodermosis in cattle slaughtered in industrial slaughterhouse of Ardebil

Number	Month of examination	Total examined carcasses	Positive no.	Percentage of infestation
1	August	187	0	00
2	September	310	0	00
3	October	300	0	00
4	November	352	0	00
5	December	330	1	0.30
6	January	297	2	0.67
7	February	306	4	1.31
8	March	305	3	0.98
9	April	332	9	2.71
10	May	361	17	4.71
11	June	311	6	1.93
12	July	325	2	0.61
	Total	3716	44	1.18

infestation rate was recorded in May (9.3 %) (Table 3). Unfortunately in the present study ages and sexes of infested carcasses were not recorded.

Discussion

Larvae of *H. bovis* were found in adipose tissue surrounding the spinal canal (site of winter resting for larvae) for the first time in December and the larvae were isolated until April also the highest infestation rate recorded in February. The first larva was isolated from subcutaneous tissue of the back region (site of spring resting for larvae) in April and presence of the larva were recorded till July, with the highest infestation in May. Winter break for larvae last 2–3 month and spring break last about 2 month (Need and Butler 1991). So the larvae that located in winter resting site arrive to spring resting site after about 2 month. According to the finding of our study in studied regions larvae leave host body in early May and activity of adult flies start in early July and also the laying of eggs (singly) on the body and above the hocks of host occur in the early summer (Foreyt 2013).

Our study revealed relatively low rate (1.18 %) of prevalence in studied regions. Following are several studies on prevalence of *Hypoderma* in other parts of Iran and

around the world. Bazargani et al. reported infestation of only 2 out of 294 (0.68 %) slaughtered cattle in Isfahan province, Iran, but they reported high infestation (51.36 %) in goats of studied regions (Taghipour Bazargani et al. 2010). In other study that was conducted by Lamei et al., larvae of *Hypoderma* were found in slaughtered cattle in Urmia counties, Iran. The mentioned study reported 5.52 % prevalence including 84.88 % *H. bovis* and 15.12 % *H. lineatus* (Lamei et al. 2012). L1 infestation of *Hypoderma* was reported in 1.27 % and L2 and L3 infestation in 7.23 % slaughtered cattle in Sanandaj city, Iran. In two studies conducted by Mohamdnia and Mahzuni could not find larva of *Hypoderma* in cattle of Mashhad and Kerman cities, Iran, respectively.

In slaughtered cattle in Nigde province of Turkey, *Hypoderma* larvae were found in 68 out of 1336 (5.08 %) examined cattle (Karatepe and Karatepe 2008). The prevalence of Hypodermosis in district Chakwal, Pakistan, was reported 35.5 and 23.5 % in the slaughtered-house and field, respectively (Khan et al. 2008). Serological methods have been used to survey of *Hypoderma* infestation in cattle, for example prevalence of *Hypoderma* reported 51.8 % in China and 38.6–41.3 % in Albania using ELISA (Marquardt et al. 2000; Guan et al. 2005).

Low prevalence of hypodermosis in comparison with some previous studies could be cause by cold climate of

studied regions also shows efficacy of controlling programs. Although the prevalence of hypodermosis is low in studied regions, the economic losses makes it important to use antiparasite chemicals such as organophosphates and avermectin in order to reduce the infestation rate and fully eradicate hypodermosis in studied regions.

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