

Myiasis in humans and animals

Vahedi Nouri N^{1*} and Salehi A²

¹Razi Vaccine and Serum Research Institute, Agricultural Research, Education and Extension Organization (AREEO), Karaj, Iran

²Department of Veterinary Medicine, Babol Islamic Azad University, Iran

Abstract

Myiasis is the contamination of live or dead tissue of vertebrates via the larvae of various flies. Myiasis occurred both in humans and animals. The myiasis contamination has a worldwide distribution. Different genera of three families which include: *Oestridae*, *Calliphoridae* and *Sarcophagidae* have a role in creating myiasis in animals and humans. Myiasis in addition to health problems, can cause a lot of economic problems. Decrease of fly population as a causative of myiasis is one of the important ways to control this contamination. Also, surgical approaches and removing larvae of flies in infected parts, is the other treatment for the contamination.

Introduction

Although Kirby and Spence (1918) for the first time, used the term Scholechiiasis for infected animals with fly larvae [1], Hoop (1840) used the term Myiasis for many years before that [2]. Myiasis is a Greek word (Myia=Fly) meaning fly, which means the contamination of organs, living tissues or dead vertebrates (humans and all kinds of animals) with fly larvae. In this definition, vertebrate animals include mammals, birds, amphibians, reptiles and even fish. For example, infestation with Californian fly larvae has been reported in an aquarium fish species, *Asryanax mexicanus faciatus* [3]. Larvae usually enter through wounds, skin lesions or natural body cavities such as mouth, nostrils, eyes, and the genitourinary tract. Myiasis have a worldwide spread. Myiasis in animals is economically more important than humans [4]. Ranchers mainly report arthropod bite wounds, especially hard ticks, as a causative factor [5,6]. Specifically, the causative agent of myiasis in humans has not been known but some species of flies are specific to animals. Also, in some tropical regions of the world such as India, Myiasis have become typical [7]. The purpose of this article is to identify myogenic agents and ways to control and treat them.

Myiasis classification

There are usually two main ways to classify Myiasis in the world:

1. Depending on the habitat or infection of the fly larvae, the Myiasis is divided into cutaneous (skin), subcutaneous, nasal-pharyngeal, intestinal-internal and urinary-genital types.
2. In terms of the host-parasite relationship, accordingly we have three main groups of myiasis:

Obligatory myiasis

The flies need living tissues to complete their evolutionary phase.

Facultative myiasis

The flies can continue to evolve in living tissues or in spoilage and decaying organic matter. Facultative myiasis is divided into two categories: primary and secondary facultative myiasis. In first form, the external parasite has adapted to the life as an external parasite and is capable of producing Myiasis but sometimes resides in spoilage of

decaying organic matter and carcasses of animals. The external parasite producing secondary myiasis lives naturally in the form of a detritivore and usually cannot produce Myiasis but may attack previous living organism secondary [8].

Accidental myiasis

In this type, the larvae of the fly create a random Myiasis and may attack the inappropriate host or caused by accidentally swallowed of fly's egg by the host. Random or miscellaneous Myiasis is very rare. As examples of accidental human Myiasis, urinary Myiasis or respiratory Myiasis could be named [9-11].

Although the first method is a more appropriate method for laboratory diagnosis of the parasite, the second method provides more important information on the biology of the parasite and teach us how to fight it [12].

Myiasis factors

Three family of flies are involved in the development of myiasis in vertebrates. These three families include:

Oestridae family

The flies of this family are called Warble or Bot.

Calliphoridae family

There are four genera in this family consist of *Calliphora*, *Lucilia*, *Chrysomya* and *Cochliomyia* as agents of myiasis.

Sarcophagidae family

Most laid in rubbish, carcasses and decaying organic matter and include two genera, *Sarcophaga* and *Wohlfahrtia*. *Wohlfahrtia* genus

*Correspondence to: Vahedi Nouri N, Razi Vaccine and Serum Research Institute, Agricultural Research, Education and Extension Organization (AREEO), Karaj, Iran, E-mail: nsvahedi@yahoo.com

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is important in veterinary science and is a causative agent of myiasis in meat [13].

The most important species of myiasis-related flies in humans and animals

Oestrus ovis

These flies cause myiasis in many domestic animals and sometimes in humans. It is widespread in different parts of Iran and causes considerable economic losses to livestock. This fly is also called the sheep bot fly. Female flies release large number of eggs, up to 500 eggs into the nostrils at one time. Most cases of human myiasis, occur in the eyes and throat, which cause inflammation and conjunctivitis in the eye. Blindness caused by this species has also been reported. In cases with throat myiasis, inflammation of the pharynx and vocal cords observed and difficulty in breathing and speaking was documented.

Hypoderma bovis

The primary host is cow. These flies rarely attach their eggs to the human foot and the larvae infiltrate under the skin and create spiral tunnels which can sometimes cause local paralysis by excretion or abscesses.

Lucilia sericata

This fly often has a green Sparkle and has a worldwide distribution. Female flies usually lay their eggs on meat, fish, carcasses and decaying corpses. They also lay their eggs near or on the wounds and stinky scars of human or animal and on decaying feces and plant-related material. These insects are most commonly found in unsanitary areas and in places where meat and carcasses are rotting and they almost always founded near butchereries and slaughterhouses. There are reports of these larvae beneath the bandages and clothes of patients, especially when infected with blood and secretions. These infections usually do not cause significant harm because the larvae consume mainly from dead tissue and pus.

Chrysomya bezziana

This fly existed throughout Africa and most parts of Asia, including Iran, and caused extensive damage to livestock in the south, southwest and west of the country in recent years. The larvae of this fly can infect all warm-blooded animals and humans. Adult insects are 8 to 12 mm long, metallic green, bluish-green to purple. Fertile female insects lay their eggs in batches of 150 to 200 and sometimes more in upper surface of wounds or mucus of infected organs such as eyes or the genitalia. Occasionally, it can occur in the eyes or ears, causing blindness or deafness and destroy the structure of the eyes and ears.

Economic damages caused by myiasis

Different species of myiasis-related flies, both during their maturation and larval stages, can cause significant economic losses such as: serious skin damages, weight loss, growth rate postponement, reduction in milk and meat production, carcass price drop, damage to the central nervous system and esophagus and sometimes death due to anaphylactic or toxic shock to the livestock industry [14]. In a study by Greek researchers, the average weight loss of infected goats compared to non-infected goats was 2.6 ± 1.3 kg over 133 days. However, the particular importance of this contamination is in the damage to the leather. Adult flies are also annoying and can reduce milk production and weight gaining. Due to the severe economic damage caused by these flies and their larvae (for example, \$192 million in the United

States annually), rules are being taken to prevent, control and eradicate them in most countries worldwide [15].

Control and prevention methods against myiasis

Myiasis's control and prevention methods include actions that do not attract the flies to the animals and secondly, fight the flies themselves. The following steps used for this purpose.

1. Breeding: The thinner buttock and skin folds of the buttock are, especially in the sheep, the more they become vulnerable against predisposing agents versus fly's attack. Therefore, it is attempted to eliminate or reduce these predisposing factors in sheep.
2. Remove capillary folds of buttock by using surgery
3. Remove tail and dumba
4. Shearing, which shortens the wool around the tail and buttock and keep these areas dried. Shearing with machine surely is more effective than doing it manually because machines leave shorter wool behind.
5. Genetic manipulation method for control: In a strain of myiasis-related flies in sheep whose females are blind and cannot survive in the environment, male flies transmit blindness genes to female offspring. It is possible to control this class of the flies.
6. Carcass Destruction: It is essential to remove and destroy carcasses during the season when livestock flies mainly reproduce on the land and they have no competition with other species. For example, during the winter in South Africa, carcasses must be burned or first covered with insecticides and then buried.
7. Treatment of myiasis: The purpose of treatment is to eliminate the Larvae, accelerating regeneration and healing process of the wound, and ultimately prevent upcoming infections. While using chemicals against this disease, monitoring intoxicating in sheep is necessary. However, during the event of a myiasis in the wound or skin, the first action is to cover the site with a layer of oil such as paraffin. This action blocks the dorsal respiratory holes of larvae and forcing them to get out of the wound to obtain oxygen, then the larvae must be removed immediately. The use of disinfectants and insecticides, especially larvicides, is also important in the process of treatment the disease. Insecticides such as Coumaphos, Clorophene, Diazinon, Malathion and Dichlorvos are useful as a treat. Highly infected animals require general antibiotic therapy and supportive treatments such as fluid therapy. The larvae should be removed and if it is necessary, this should be done by performing surgery on the skin or the involved organ, especially the eye or ear. In myiasis of pharynx and throat, drinking warm oil, annoys the larvae and pushing them out from the throat's mucosa [8]. Bath containing insecticides, especially phosphorous-based insecticides, are very common and have a good result. During the bath, the sheep should be immersed for at least 30 seconds. Spraying insecticide solutions with sufficient pressure is also another useful method where taking a bath is not possible.

Since access to appropriate treatment was not possible for some ranchers, they have traditionally treated myiasis in some societies [16]. Usage of these methods are still common today and lower medical costs [17]. By the same purpose, a study conducted by Soyliu *et al.* in South Africa which identified different shepherds use different plant species including: Aloe vera, Acacia, Pokeweed and Cherry plum, which showed that Could be used to treat myiasis or the wounds caused

by them [18]. The benefits of using the traditional methods of treating myiasis is huge, including that there is no contraindication of Sheep's meat because of the treatments [19].

Recommendation

Since any ulcers, even a slight scratch on the surface of the body can attract Myiasis-related flies and stimulate them to lay eggs, it is recommended to avoid any ulcers on the surface of the body and in cases such as ulcers from sheep's shearing, physical damages, tail removing and castrations, bathing with organophosphorus compounds (Clorophene, Coumaphos and Diazinon) and Pyrethroids (Permethrin and Cypermethrin) are advised which are effective against preventing myiasis. Since hard wools that are contaminated with faeces are very suitable places for flies to lay eggs, it is recommended that these wools should be cut regularly and sequentially.

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