

Case Report

Dermatitis Caused by *Simulium* (Blackflies) Bite

* MR Youssefi^{1,2}, A Aminpour², F Arabkhazaeli²

¹Dept. of Veterinary Parasitology, Islamic Azad University Babol-Branch, Iran

²Dept. of Veterinary Parasitology, Faculty of Veterinary Medicine, Tehran University of Medical Sciences, Iran

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Abstract.

A 32-year-old man was attacked by flies while camping around Khorram Abad, Lorestan Province, western Iran. Pruritic dermatitis with marked edema and considerable discomfort appeared mainly on the lower legs. The flies were identified as *Simulium*. Simuliids are tiny bloodsucking flies, popularly known as blackflies or buffalo flies, belonging to the dipterous, family Simuliidae. They are occurred worldwide, breed in fast-flowing streams, and are a major animal pest.

Keywords: *Simulium*, *Dermatitis*, Iran

Introduction

Simuliidae consist of more than 1700 species in 19 genera of which more than 40 are of medical and veterinary importance (1). Some of the most important genera of this family are *Simulium*, *Prosimulium*, *Parasimulium*, *Australosimulium*, *Cnephia* and *Gigantodax*. Adults are 1-5 mm in length, most frequently black but occasionally yellow or yellowish-brown. These flies have prominent eyes, short mouthparts and 11 segmented antennae (1). Humped thorax, broad colorless wings with distinct venation that at rest are held as the closed blades of a pair of scissors are other morphological characteristics of these flies. Eggs are laid in sticky masses in fast flowing water and hatching take a few days in warm condition on river floor. The mature larvae are poorly segmented, lightly colored, and distinguishable by a blackish head with a prominent pair of feeding brushes. Pupation takes place in a slipper-shaped brownish cocoon (2). The pupa has respiratory gills projecting from the cocoon

(3). After the 2-6 day pupal period, there is a mass emergence of adult flies. Adult flies feed on plant nectar, but in most species, females require a blood meal to obtain the protein necessary to mature their eggs (1). They are particularly active during the morning and evening. In temperate regions, they may be regarded seasonal since adults die in autumn with new generations in spring and summer. Adults are strong fliers and are highly responsive to carbon dioxide and other host odors (2). They may fly in high densities as many as 6.5-12.8 km in search of a host (1). Geographically, these flies have worldwide distribution except some areas of the tropics like New Zealand, Hawaii and some minor island groups that are rendered uninhabitable by *Simulium* (2). The saliva secreted by fly as they feed may cause allergic responses in the host (1). *Simulium* spp. may transmit different microorganisms to human and animal hosts; e.g. the virus causing vesicular stomatitis and the avian protozoan *Leucocytozoon*. They also act as vectors for filaroid helminthes *Dirofilaria*,

Onchocerca, *Mansonella*, and *Splendidofilaria* in humans, bears, cattle, ducks and goose (2, 3).

Case report

In summer 2007, a 32-year-old man from Khorram Abad City in Lorestan Province, western Iran, while camping in Gahar (around the mentioned city) was attacked by a mass of blackflies (Fig. 1). Few hours later, very sensitive pruritic red wheals appeared in the biting sites (Fig. 2). The lesions were present mainly on the lower legs and randomly distributed. The flies were collected from the body surface by the patient and brought for identification to

the Department of Veterinary Parasitology, Faculty of Veterinary Medicine, University of Tehran. The lesions were pruritic for 2 weeks and healed without any treatment after 20-25 days. Dermatitis, which is defined as superficial inflammation of the skin, characterized by redness, edema, and usually itching (4), was diagnosed. The patient had no predisposing disease and his blood group was A. Lorestan is a province of western Iran with a generally sub-humid climate. Gahar situated in east of Lorestan is full of rills and springs from highlands and the adult black flies are known to live and oviposit in swarms near free running and well aerated streams.



Fig. 1: Adult Simulium fly (×40)



Fig. 2: The lesions on the lower leg. Note the erythema around the biting sites.

Discussion

According to Crosskey (5) and as confirmed by Dr. S. Rahbari (Veterinary Faculty, University of Tehran) the flies were identified as *Simulium*. As stated by one of the few studies on blackfly distribution in Middle East by Crosskey, 17 species belonging to three genera and seven subgenera were identified from Iran and Iraq in 1970-1980 (5). The flies were captured from Alborz Mountain, Kordestan and few regions near Caspian Sea. The captured species were as follows:

Simulium pseudoequinum, *S. paraequinum*, *S. lineatum*, *S. variegatum*, *S. kiritshenkoi*, *S. fontanum*, *S. bezzii*, *S. transcaspicum*, *S. brevitrace*, *S. assadovi*, *S. paucicuspis*, *S. branchyantherum*.

Two other species *Metacnephia persica* and *Sulcicnephia znoikoi* were isolated only from Iran. Three species isolated from Iraq which were not found in Iran included *S. dahestanicum*, *S. ruficorne* and *S. buxtoni*. Regarding the

long common border between these two countries, these and some other species could be expected in Iran as well as Iraq (5). In Lebanon five species of *Simulium* flies were reported (6). There was a report of mass mortality with skin lesions in cattle and buffalos in Arasbaran, where the cause was assumed high densities of blackfly (*Simulim maegaitae*, Rubtsov 1958) (7).

Fortunately, there is no report of river blindness in Iran and the reported species of Simulid flies are not included in those capable of transmitting *Onchocerca volvulus*.

Large blackfly populations and strong bite reactions can be life threatening and have been reported to kill domestic animals as well as humans and the injection of venom into the skin causes intense itching, local swelling and soreness. Severe complications (swelling) from black fly bites are possible in allergic individuals and rare cases of death from toxemia or anaphylactic shock have been reported (8). The flies' bites are seriously painful and due to the

release of pharmacologically active substances such as histamine, leukotrienes, prostaglandins, platelet activating factor and eosinophilic chemotactic factor (ECF) from IgE-sensitized basophils and mast cells after contact with antigens in the flies' saliva acute urticaria, which is one of the disorders due to hypersensitivity may occur. The condition is characterized by local wheals and erythema in the dermis. In urticaria, pruritis is the first symptom followed by the appearance of wheals. Acute urticaria is a self-limited condition and treatment is palliative. In hypersensitive persons, bites can be fatal (4).

Simulium flies are of medical and veterinary importance. Haematophagous female blackflies (Diptera: Simuliidae) are serious biting pests and obligate vectors of vertebrate pathogens, namely filarial *Dirofilaria*, *Mansonella*, *Onchocerca* and avian protozoa *Leucocytozoon* (9). Only the adult females are blood-feeders and different species have different preferred feeding sites. Most species are particularly active during morning and evening in cloudy, warm weather. From a medical perspective Simuliidae are particularly important as vector of filaroid nematode *O. volvulus*, which causes "river blindness" in humans in Africa, Central, and South America. *Mansonella urzadi* may be transmitted via these flies to humans. Blackflies of the genus *Simulium* that are vectors of *O. volvulus* are:

- The *Simulium damnosum* complex (Africa and South Arabia)
- The *S. naevi* group (East Africa)
- *S. ochraceum*. This is the principal vector in southern Mexico and Guatemala (10).

Blackfly control is extremely difficult because of their small size and since the immature larvae are found in running water. The most practical control method is the application of insecticides to breeding sites in example application of organophosphate insecticides to watercourses, which is then carried downstream and kills larvae (1, 2).

Onchocerciasis, which is transmitted by black flies that breed in rapidly flowing rivers and streams, is endemic in 37 countries (30 in Africa, six in the Americas, and one in Yemen), where it infects at least 17.7 million people and causes visual impairment in 500000, and blindness (river blindness) in another 270000 (11). The adult forms of the parasite (*O. volvulus*) are long-lived (8–15 years), but it is the pre-larval stages (called microfilaria), released by female worms, that cause most of the disease (11). Two onchocerciasis-control programs have been implicated in Africa (12). The strategy of West African Onchocerciasis Control Program (OCP) is vector control to completely interrupt the transmission cycle of the parasite by applying larvicide (principally aerially) to riverine breeding sites (12). The development of black fly control in Africa during the 1960s blackflies in the Vaal River was primarily with DDT; during the 1970s and into the 1980s blackflies were controlled using water-flow manipulation; when used at strategic times, water-flow manipulation could be used to enhance the effect of natural predator populations; and during the 1990s the organophosphate temephos and toxins produced by the bacterium *Bacillus thuringiensis* var. *israelensis* were tested for their efficacy against blackflies. The larvicides temephos and *B. thuringiensis* are proved effective and are still used in several control programs (13). By contrast, the African Programme for Onchocerciasis Control (APOC) targets 19 endemic African countries in which mass drug administration covers villages where the prevalence of infection is 20% or above. This strategy will not stop transmission of onchocerciasis, and only newly infected people (and young adult worms) will continue to enter into the parasite's ecosystem (12). The discovery of the remarkable efficacy of ivermectin revolutionized onchocerciasis control strategies, which were previously based on the elimination of the vector blackflies (11). No drugs exist to kill the adult worm, but a single, annual dose of ivermectin

kills the larval worms, which cause the manifestation of the disease. To sustain the beneficial effects of ivermectin (i.e., alleviation of suffering, prevention of blindness and reduced transmission of the parasite), it must be taken annually over an extended period (11). A third strategy, being implemented in the Americas, is to use ivermectin more than once a year (12). Some authorities have expressed concern about the potential emergence of ivermectin resistance following broad use of a single drug, particularly in the setting of ongoing parasite transmission (14).

Specifying *Simulium* dispersal and identifying the regions affected by these flies would be helpful in recognition of the disease agents carried by them in our country (15, 16). Because of the important role of blackflies in the mechanical and biological transmission of human, cattle, horses, turkeys and other animals pathogenic organisms, defining its distribution in Iran is a of great significance.

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