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Horse Flies: Overview and Health Implications

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Abstract

Tabanid flies commonly known as, horse flies, are part of the suborder Brachycera, range from 10 to 25 mm in size, with clear or smoky wings, while deer flies are smaller (around 8 mm) and often have yellow or black bodies with patterned wings, are significant biting pests for both livestock and humans. The adult females are hematophagous, feeding on the blood of domestic and wild animals, and occasionally humans. This feeding behavior can facilitate the transmission of various pathogens, including protozoa, bacteria, and viruses.

Introduction

Tabanidae is one of the most extensively documented families of blood-feeding Dipteran family, comprising around 4,500 species and subspecies across 145 genera globally. Among these, *Tabanus* stands out as one of the largest genera, with over 1,350 species. These flies are relatively large, measuring between 7 to 30 mm in length. Their wings are well-formed, featuring evenly distributed veins. In females, the eyes are large and widely spaced (dichoptic), while in males, they are close together (holoptic). The antennae are short and consist of three segments, the third segment bearing 4-8 annulations. The most prevalent species being *Tabanus striatus*, *T. megalops*, *T. rubidus*, *T. tamthaiorum*, *T. oxybeles*, *T. atratus* and *T. equalis*.

The species under Tabanidae family are *Tabanus*, *Chrysops*, and *Haematopota*, collectively referred to as "horse flies," inflict particularly painful bites, causing significant annoyance and often leading to behavioral issues and considerable irritation. Clinically, their bites are among the most severe of fly-related injuries, resulting in itchy papules, wheals, ulceration, and bleeding at the site of the bite. These bites are most frequently found on the legs, ventral body, neck, and withers. Their feeding can significantly impact livestock, such as reducing milk production in dairy cows. Tabanids can also transmit diseases to humans,

including tularemia and anthrax.

Lifecycle

The members of the genus *Tabanus*, are classified as hemihydrobionts and typically inhabit soils near the edges of streams and ponds. They typically lay their eggs on vegetation near water or in saturated soils, in masses on leaves, rocks, or debris above water, with each mass containing between 200 -1000 eggs. The larvae go through a variable number of instars, ranging from 6-10. While some tabanid larvae are predatory, targeting other invertebrates and annelids, others feed on detritus. The larvae are adapted to aquatic and semi-aquatic environments, where most of them are predators. The pupal stage lasts about 1 to 2 weeks, and mating usually occurs shortly after the adults emerge. Adult horse flies are strong fliers, with some species capable of reaching speeds over 150 km/hour. The complete life cycle of a horse fly usually takes about a year; though larger species may take up to three years to mature.

Habits

Female horse flies are blood-feeding insects known for their painful bites. Female horse flies need blood meals for egg development, while males feed on nectar and do not bite. Unlike mosquitoes, which suck blood, horse flies create lacerations in the host's skin and lap up the blood that pools. Female horse flies rely on visual cues and carbon dioxide emissions from potential hosts to locate them. These flies are adept at dispersing over several kilometers in search of hosts, with their movement likely influenced by the availability of potential feeding targets. They tend to prefer dark-colored hosts, including areas of dark coloration on animals like Holstein cows.

These flies primarily feed during the day and cause significant discomfort to many large animals. While they are not host-specific and will feed on various animals and humans, they have a preference for darker-colored horses due to the light-polarizing properties of their coats. Their breeding grounds are typically found in aquatic and semiaquatic habitats, including mud and wet vegetation near water bodies, with some terrestrial species laying eggs on vegetation or in forest litter. Many horse flies, belonging to the genus *Tabanus*, exhibit selective behaviors when attacking specific areas of their hosts, regardless of colour. Different species tend to prefer various feeding sites; for example, many horse flies target the legs of livestock. Increased competition can lead to heightened defensive behaviours in hosts, such as kicking, which may influence patterns of movement and herd dynamics. Research has shown that the persistent feeding habits of horse flies are significant for the mechanical transmission of disease agents. Horse flies are large and painful biters, often interrupted during feeding. If disturbed, they quickly return to the same host or to a nearby one. Factors like biting rates and interrupted feeding significantly affect the transmission of diseases. Horse flies are attracted to various



chemical cues, with carbon dioxide being the most effective. Other compounds, such as 1-octen-3-ol, ammonia, and phenolic substances found in animal urine, also attract certain tabanid species, often working in conjunction with carbon dioxide.

Visual cues, including the shape, colour, and movement of potential hosts, are crucial for attracting tabanids. They are particularly drawn to colours like blue, black, and red, with contrast and reflectance influencing their approach. Various trapping methods, such as box traps and Nzi traps using bright blue colors, are effective at capturing host-seeking females. Canopy traps can be enhanced by adding movement, such as a suspended black sphere that reacts to air currents.

As telmophages (pool feeders), *Tabanus* spp. employ their sharp mandibles to penetrate skin, creating a pool of blood that they lap up with their tongues. Larger species can draw up to 200 mg of blood in just a few minutes, resulting in painful bites that can cause open wounds. These bites typically occur on the upper body and may lead to local and systemic allergic reactions, including hemorrhagic blisters that can mimic other medical conditions. The saliva of horse flies contains a variety of active compounds, including antihemostatic and immunosuppressive agents that can affect the host. Their powerful flight capabilities contribute to their reputation as persistent biters. Due to their feeding habits, horse flies can transmit multiple pathogens mechanically or biologically.

Transmission

Horse flies, including *Tabanus*, *Chrysops*, and *Hybomitra* species, act as mechanical vectors for several livestock diseases, such as *Microsporium gypseum*, Equine infectious anemia, and *Trypanosoma evansi* (the cause of surra). They can also transmit *Besnoitia besnoiti*, as well as bacteria like *Anaplasma marginale*, *Francisella tularensis*, and *Bacillus anthracis*, along with retroviruses such as equine infectious anemia virus and bovine leucosis virus. Furthermore, they serve as biological vectors for *Trypanosoma theileri* in cattle, while *Elaeophora schneideri*, *Dirofilaria repens* and *Dirofilaria. roemeri* are transmitted biologically in humans.

The bite from a horse fly primarily exposes hosts to venom allergens.

Control and Prevention

Managing tabanid populations can be challenging, as frequent applications of insecticides and repellents offer only temporary relief. Creating barriers of vegetation over two meters high can deter flies from accessing pastures. Additionally, avoiding forested pastures and stabling animals during the day can help limit tabanid exposure. Even excessive night time lighting can prolong their feeding activity into the night. In summary, horse flies are not only a nuisance but also a serious health risk, impacting both animal and human populations through



their role as disease vectors.

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