**Sand fly**

Sand fly adults are small flies – only about 3 mm long – and are golden, brownish or Gray coloured. They have long, piercing mouthparts that are well adapted for sucking blood from their selected host. Sand flies hold their hairy-looking wings in a vertical V-shape when at rest, a characteristic that distinguishes them from some other small flies. Also, the six legs on the adults are extremely long, being longer than the insect’s body.

**Behaviour, Diet & Habit**

Female sand flies are blood feeders, but the males do not feed on blood. Females must consume a blood meal before they are able to develop eggs. However, both males and females also consume sugar-related nutrients that come from plant nectar or honeydew. Sand fly hosts vary a great deal. Some species feed on both mammals and reptiles, while Lutzomyia shannani, a common sand fly species in Florida and other coastal states feed on white-tailed deer, horses, donkeys, mules, cattle, swine, raccoons, rodents, birds and humans.

In general, sand fly bites are very painful. Most flies that bite humans feed during the evening and throughout the night. In some cases, flies will attack in the daytime, if they are disturbed while resting. Daytime resting sites include cavities close to the ground such as dry tree holes, hollow logs, palm tree crowns and the canopy of tropical and sub-tropical rain forest jungles. Another commonly found place for daytime resting is inside the home.

Sand flies develop by complete metamorphosis, which means they go through four developmental stages: egg, larvae (grub), pupae (cocoon) and adult. Sand flies complete their life cycle within 1-3 months, depending on the sand fly species and their environmental conditions. Sand fly adult females lay from about 30-70 eggs that are laid singularly in small batches on moist surfaces like soil in protected areas with high humidity and high organic matter. Eggs typically hatch about two weeks after being deposited. The larval stage may take no longer than three weeks to mature, but may also be longer if the larvae is in an area where it must survive cold weather. Before entering the pupal stage, the larvae stop feeding on the organic matter in their habitat and seek out a pupation site that is drier than its larval habitat. The pupal stage usually lasts only 1-2 weeks. After emerging from the pupal case, the adults disperse at night with the males dispersing before the females.

**Reproduction**

In general, sand fly females must consume a blood meal to develop eggs.

**Signs Of A Sand Fly Infestation**

The appearance of sand flies and their painful bites that can cause secondary infection are the most frequently observed sign of an infestation. Also, evidence of sand fly problems include the incidence of human and animal diseases that are transmitted by sand fly bites.

**Distribution**

Sand flies are worldwide in distribution. However, based on their genus, distribution is categorized as either old world or new world sand flies. The genera Lutzomyia, Brumptomia and Warileya occur in the new world countries, while the genera Phlebotomus and Sergentiomyia occur in the old world countries. Lutzomyia occupy the largest distribution range in the U.S. and are found as far north as New Jersey and as far south as Florida.

**More Information**

Sand fly diseases are transmitted by the bite of infected female sand flies in many parts of the world. Some of the more important sand fly transmitted diseases include:

* Cutaneous leishmaniasis
* Visceral leishmaniasis
* Sand fly fever
* Carrions disease
* Pappataci fever
* Vesicular stomatitis virus

Large area control of sand flies is very difficult for homeowners and small neighbourhood communities due to the hidden, cryptic nature of where sand flies develop. When sand flies become a problem, the best thing for a homeowner to do is to contact their local mosquito abatement district or other local or state agency that can accomplish area-wide sand fly control. If this is not an option, be sure to contact your pest management professional who can perform an inspection and then develop a plan to conduct small scale sand fly control around your home or business.

Preventing sand fly bites can be accomplished by using permethrin-treated clothing. Keeping exposed skin covered by clothing is helpful when venturing into sand fly habitats.

**Mosquitoes**

Mosquitoes are true flies, have one pair of wings, with distinct scales on the surface. Their wings are long and narrow with three pairs of long hair-like legs, and elongated mouthparts. They have slender segmented bodies of length typically 3–6 mm, with dark grey to black coloring. Some species harbor specific morphological patterns. In many species the mouthparts of the adult females are adapted for piercing the skin of animal hosts and sucking their blood as ectoparasites.

Distribution:

Mosquitoes are cosmopolitan (world-wide): they are in every land region except Antarctica and a few islands with polar or subpolar climates. In warm and humid tropical regions, some mosquito species are active for the entire year, but in temperate and cold regions they hibernate or enter diapause.

Behaviour, diet and habit:

An adult mosquito may take up to 300 ml of blood per day from each animal. Apart from bloodsucking, the females generally also drink assorted fluids rich in dissolved sugar, such as nectar and honeydew, to obtain the energy they need. For this, their blood-sucking mouthparts are perfectly adequate. In contrast, male mosquitoes are not bloodsuckers; they only drink sugary fluids.

Adult females lay their eggs in stagnant water: some lay near the water's edge while others attach their eggs to aquatic plants. Each species selects the situation of the water into which it lays its eggs and does so according to its own ecological adaptations. Some breed in lakes, some in temporary puddles. Some breed in marshes, some in salt-marshes. Some are equally at home in fresh and salt water up to about one-third the concentration of seawater, whereas others must acclimatize themselves to the salinity. Such differences are important because certain ecological preferences keep mosquitoes away from most humans, whereas other preferences bring them right into houses at night.

Life Cycle:

Mosquitoes go through four stages in their life cycles: egg, larva, pupa, and adult or imago. The first three stages—egg, larva, and pupa—are largely aquatic. Each of the stages typically lasts 5 to 14 days, depending on the species and the ambient temperature. Eggs hatch to become larvae, which grow until they are able to change into pupae. The adult mosquito emerges from the mature pupa as it floats at the water surface.

1. Egg: Anopheles female lays eggs singly in fresh water, size of eggs is about 1mm, boat shaped, lateral float are present. About 100-250 eggs are laid. Eggs are not visible by naked eye.

Culex female lays eggs in stagnant & polluted water in raft, they are oval in shape and lateral float are absent.

2. Larva: After 2-3 days larva emerge from egg, actively swimming on water surface and feed on algae, fungi & bacteria. Larva is about 1-6 mm long. Body is divided into three parts (head, thorax & abdomen). Spiracles (respiratory organs) are present on abdomen. Palmate hairs are present on abdomen which help larvae to float in water.

3. Pupa: after 5-7 days larva becomes pupa. Pupa is comma shaped and moves actively on water surface. The body is divided in cephalothorax and abdomen. Two small respiratory trumpets are present on thorax. It does not feed. The pupal stage lasts for 1-2 days.

4. Adults: when the adult emerges from pupa, it rest for a while on the pupal skin then flies away. Under favorable environmental conditions the life cycle is completed in 7-10 days. Normally the adult mosquito lives for about 2-3 weeks.

Reproduction:

The female needs to obtain nutrients from a blood meal before it can produce eggs, whereas in many other species, obtaining nutrients from a blood meal enables the mosquito to lay more eggs.

Infestation:

Mosquito bites lead to a variety of mild, serious, and, rarely, life-threatening allergic reactions.

**More Information**:

Mosquitoes can act as vectors for many disease-causing viruses and parasites. Infected mosquitoes carry these organisms from person to person without exhibiting symptoms themselves.[99] Mosquito-borne diseases include:

Viral diseases, such as **yellow fever, dengue fever,** and **chikungunya**, transmitted mostly by Aedes aegypti. Dengue fever is the most common cause of fever in travelers returning from the Caribbean, Central America, South America, and South Central Asia. This disease is spread through the bites of infected mosquitoes and cannot be spread person to person. Severe dengue can be fatal, but with good treatment, fewer than 1% of patients die from dengue.

**Medical importance**

Genus: Anopheles: Malaria

Genus: Culex: Filarial & viral encephalitis

**Control Measures**

1. Biological control: Use of parasites, predator (fish & frog) and pathogens. The best known fish are Gambusia affinis and lobister reteculatus.

2. Genetic control: Release of sterile male mosquitoes in the field. Which will compete with the natural fertile male mosquito in mating & the population will be automatically reduced.

3. Environmental control: To eliminate their breeding places. This is also known is source reduction. Filling, leveling and drainage of breeding places.

4. Chemical control:

Anti larval chemicals like Paris green, mineral oil.

Anti adult chemicals like Melathian, Fenthian and abate.

**Housefly**

**General Characteristics of Housefly**

The housefly is a medium size common insect, from light to dark gray in color. The body is divided into three parts:

Head: The head bear a pair of compound eyes, a pair of antenna and a retractile proboscis, which is adapted for sucking liquid food. Male eyes are closer together, while female eyes are set apart widely.

Thorax: Thorax has 2-4 well developed dark longitudinal stripes. Thorax bears a pair of wings and three pair of legs. The legs and the body are covered with short and stiff hairs, called tenent hairs which secretes a sticky substance.

Abdomen: The abdomen is 4 segmented and shows light and dark marking. In female a tube like structure is extended from the abdomen when the fly lays her eggs.

**Habits of House fly**

The habits of housefly make it suitable for the spread of disease

Distribution: The housefly occurs all over the world.

Breeding: Housefly breeds in fresh horse manure, human excreta, garbage, decaying fruit and vegetables.

Feeding: Housefly does not bite. It is attracted to food by its sense of smell. It can not eat solid food. It vomits on solid food to make a solution of it and then suck it in a liquid state.

Defecation: The housefly has the habit of defecation constantly all the day. Thus it deposits countless bacteria on exposed food.

Dispersal: Housefly can disperse 3-4 miles from their breeding places.

**Life cycle of Housefly**

The housefly undergoes a complete metamorphosis.

Egg: The female lays about 120-150 eggs in one siting. Eggs are laid in horse manure and other decaying materials. They are creamy white in color and are about 1-2 mm in length. The fly lays from 600-900 eggs during her life time. The eggs hatch in 8-24 hours.

Larva: The larva is 12 segmented, white in color and about 1-2 mm in length at birth. At the anterior and posterior end of the body a pair of spiracles are present. The larva feed on decaying organic matters. The larval period lasts from 2-7 days.

Pupa: The pupa is dark brown in color. The pupa stage lasts from 3-6 days but in winter it may be prolonged.

Adult: The complete life cycle from egg to adult may take 5-6 days during summer. Flies do not live longer than 15 days in summer and 25 days in winter.

**Transmission of diseases**

1. Mechanical transmission: Flies are potential vectors and efficient mechanical spreaders of many diseases and most of them can be spread by mechanical transmission. Houseflies transport microorganisms on their feet and hairy body. Pathogenic organisms, ova and cyst have been recovered from the bodies of the common housefly. Pathogens remains alive for 36 hours on their feet.

2. Vomit drops: The vomit drop is a rich bacterial culture. By its habit of repeatedly vomiting, the housefly infects foods and there by transmits disease. Infection remains alive for 8 days in vomit.

3. Defecation: The excrement of housefly has been found to contains microorganism, cyst and ova of intestinal parasites. By its habits of constant defecation, the houseflies spreads these diseases. Infection remains alive for 18 days in the feces.

**Control measures**

1. Protection against flies: Screening of houses, hospitals, food market, restaurant and other similar establishments will give considerable relief from houseflies. The doorways and windows should be screened. Screen should be made of non-corrosive material, such as copper or aluminum gauze.

2. Environmental control: The best way to control the housefly is to eliminate their breeding places and improvement in environmental sanitation on a community basis. All domestic refuses should be placed in strong plastic bags and the opening should be tightly closed. Regular refuse collection twice a week to prevent any egg laying among the refuses developing to adult. The refuses should be burned or buried properly. A clean house with clean surrounding is the best answer to the fly problem.

3. Insecticidal control: Commercially available aerosol dispensers are commonly used in home as a spray to kill flies. They contains knock down insecticides such as 0.5% dichlovos or 0.2% pyrethrins. Spraying of residual insecticides such as 3% malathion or 1% dimethoate are remain effective for 1-2 months. Special care should be taken to prevent contamination of food or water during spraying operation. Poisoned baits containing 1 or 2 % diazinon and malathion have been tried with success. Liquid baits containing 0.1 to 0.2% of the same insecticides and 10% sugar water have given good results.

4. Health education: It is difficult to control the flies without the co-operation of the people. Fly control campaigns require organized individuals and community efforts which is the basis of successful public health programmed. It is only through health education that people can be motivated with a desire to get rid of flies permanently.