Plant protection
Elective - Forensic insects
Stage- 4th
Lecture 5
27/10/2022

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Insects that feed on but do not breed in carrion:

1-Adult male insects collected on or near a body, many need a good protein-rich meal after they emerge from their puparium for proper seminal fluid production as blood and other bodily fluids, for females that often require a protein meal for egg development after copulation and fertilization.

2- Many species of Sarcophagidae and Tachinidae that live as parasitoids of other insects and arthropods, and which do not develop on mammalian carrion, may show up to get a protein meal. .

3- Other species may be using the body or uses weeds or bushes growing downwind from a body as a congregation site for mating purposes.

Insects that breed in carrion:

1-They uses decaying corpse as a larval food resource.
2- Adults can come and go, their immature stages are tightly associated with the body, do not fly or run away when disturbed.
3-Their growth and development occurs in a predictable pattern that can be used to establish the minimum period of time that they have been present at the body.

The two groups of insects of highest importance to a forensic investigation are species in the orders of true flies (Diptera) and the beetles (Coleoptera).

Diptera are distinguished from all other groups of insects by
1- Single pair of membranous wings on the adults.
2-The hind wings are reduced to two small halteres, one on each side of the posterior thoracic segment (or metathorax)
3- All flies undergo complete metamorphosis, larvae known as maggots. Maggots are generally legless, wormlike, and the head is not sclerotized (except for the mouthparts).
4-The pupal stage is passed inside the last larval skin, which is called a puparium. The two families of flies used most often for determination of PMI, Calliphoridae and Sarcophagidae.

Insects as Evidence

Early Stage Decompostion:

1-Family:Calliphoridae

Order:Diptera

The blow flies are a metallic blue or green color. The antennae are aristate, and the calypters are large and prominent. These scavenger insects lay their eggs on dead animals. The larvae feed on decaying tissue of animals. The Calliphoridae includes many species that are well known to the general public.

1-Green Bottle Fly or Sheep Blow Fly *Lucilia sericata* (Meigen)

Order:Diptera

Family:Calliphoridae

Distribution: Habitat Cosmopolitan; blow flies can be found everywhere in association with human habitation as well as in the wild.

Forensic Importance:

The immature flies are used to estimate the minimum portion of the post-mortem interval, known as PMI. *L. sericata* is one of the first insects to arrive at a corps, go further and state that calliphorids have appeared on carcasses in experiments within minutes of death. The most common way of estimating PMI using dipteran larvae, such as *L. sericata* is to determine the developmental stage the immature is in when collected.

Description and Life cycle:

There can be multiple generations per year .

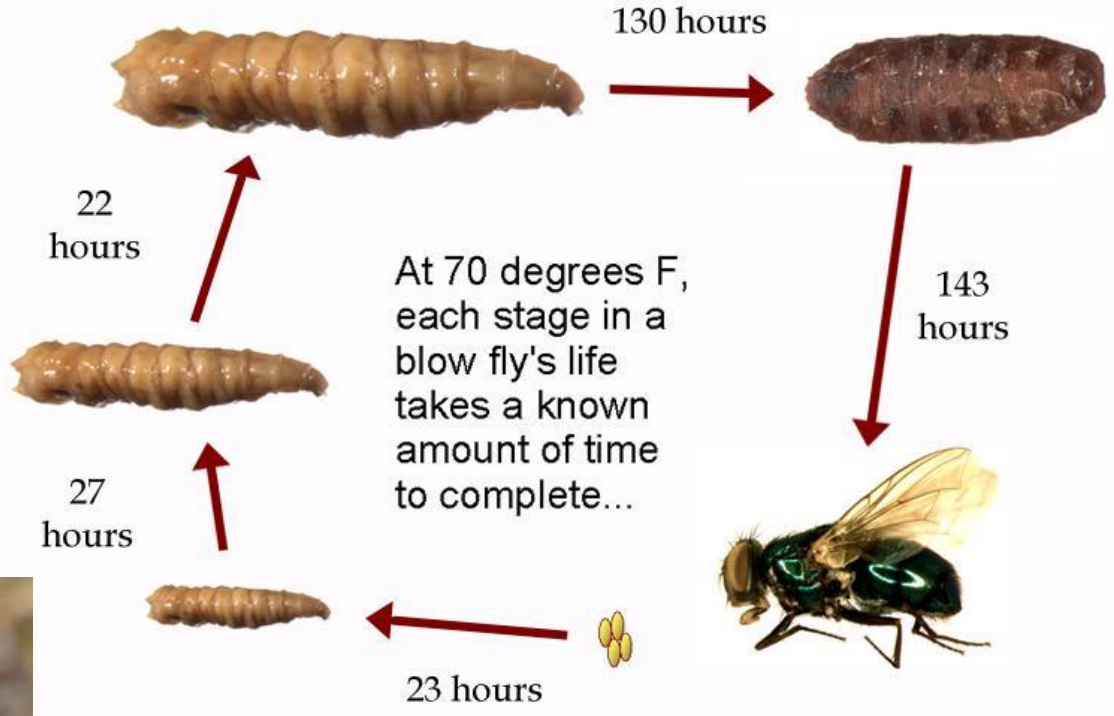
Adults: usually a metallic green and can also have a copper green color. The mouthparts are usually yellow . The back is hairy and the overall diameter is about 8–10 mm.

Eggs: Adult females may lay 100–200 eggs in a cluster on a food source. usually white-pale yellow, deposited in batches or masses, elongated with one end tapered slightly, approximately 1.5 mm long . Eggs take about 21 hours to hatch, and at 27°C it takes about 18 hours to hatch.

Larvae: Larval development requires approximately four days. There are three instars All stages of the larvae are smooth, conical-shaped and have a complete peritreme (area surrounding the spiracles) on their posterior spiracles . The larvae are white or yellowish through all three instars of development and reach a maximum of 12–18 mm before pupation.

Pupae: enclosed in a hardened shell -reddish brown, light brown or black in color, 9–10 mm long. Pupal development takes approximately 10 days after which the adult fly emerges.

The blow fly life cycle has six parts: the egg, three larval stages, the pupa, and adult.



2-Family: (Sarcophagidae)
Order:Diptera

Specimens gray with three black longitudinal stripes on mesonotum and checkered or spotted abdomen, by a row of setae on meron. Most species have a medium to large size (8–25 mm), but there are few smaller species (5–8 mm). Females are ovoviviparous multilarviparous (they lay larvae and have a non-telescopic -terminalia .

Flesh Fly:*Sarcophaga crassipalpis* Macquart

Order:Diptera

Family: (Sarcophagidae)

Distribution: As a group, flesh flies occur throughout most areas of the world. Flesh flies are found in urban and rural communities but, fortunately, are relatively uncommon in houses or restaurants. They breed in excrement, decaying vegetable matter and animal flesh or meat.

Description and Life Cycle

Adult: Flesh flies are ovoviviparous ‘larviposition.

The adult ranges in size from 9 - 13 mm, light grayish color with three black stripes on the thorax . Unlike females, males are more hairy, with robust front legs, abdominal end is red for both males and females. Adults also have a distinctive black strip with golden or yellowish margins between their eyes.

Larva: Female flesh flies deposit their 1st instar larvae directly on the host, and the larvae commence feeding immediately. Approximately five days after larviposition, the larvae are already in their 3rd instar and are almost ready to pupate. When the larvae are ready to pupate, they leave the host and wander until they find a suitable location
In the final instar, the larval body ranges from 9 -13 mm in length. Spiracles are located on plates set inside a cavity or pit on the posterior end.
Pupa: Pupation starts approximately one week after larviposition at 25°C. Adult flies will emerge about 10 days after pupation has occurred .They are able to enter, if necessary, a “hibernation”, diapause occurs during the pupal stage.
The pupa ranges in size from 5 -10 mm, and color tends to be relative to the age of the pupa. In general the darker the color the more advanced the fly is in pupal development

Host: Adult flies do not bite but feed on a wide range of liquid substance.Some flesh fly species are parasitoids, Most larvae infest wounds, carrion or excrement. The larvae of some species of flesh flies are beneficial in that they prey on eggs, nymphs, or larvae of more harmful insects. Lesser house fly larvae, blow fly larvae, and grasshopper nymphs are common hosts of flesh flies,they have been reported to cause myiasis in humans. Myiasis is a parasitic condition in which the maggots infest a living host, in this case a human being, and feed on the living or dead tissue present.

Importance:

Flesh flies commonly colonize human remains early in the decay process. Different species prefer bodies in different states of decomposition, and the specific preferences and predictable life cycle timings allows forensic entomologists to understand the progress of decomposition and enables the calculation of the time of death by back extrapolation. This is done by determining the oldest larva of each species present, measuring the ambient temperature and from these values, calculating the earliest possible date and time for deposition of larvae. This yields an approximate time and date of death This evidence can be used in forensic entomology investigations and may assist in identification of a corpse by matching the calculated time of death with reports of missing persons. Such evidence has also been used to help identify murderers

Adult

Eggs

Larva

Pupa

2-Flesh Fly:*Sarcophaga crassipalpis* Macquart