

FORENSIC ENTOMOLOGY



CLOWN BEETLE



SCREWORM FLY



CLERID BEETLE



BLACK BLOW FLY



DERMETES BEETLE



GREEN BOTTLE FLY



AMERICAN CARRION



FLESH FLY



SEXTON BEETLE



BLUE BOTTLE FLY

IF YOU QUIT BREATHING... WE'LL FIND YOU



Entomology
is the **Study**
of **Insects**



Insect Biology

- Insects are the most diverse and abundant forms of life on earth.
- There are over a million described species- more than 2/3 of all known organisms
- There is more total biomass of insects than of humans.
- Insects undergo either incomplete or complete metamorphosis (Egg to larva to pupa to insect)
- The larva have a soft tubular body and look like worms. Fly species larvae are “maggots”

WHAT IS FORENSIC ENTOMOLOGY?



- Forensic Entomology is the use of insects and other arthropods that feed on decaying remains to aid legal investigations.

MOST IMPORTANT ENVIRONMENTAL FACTORS IN CORPSE DECAY

- **Temperature**
- **Access by insects**
- **Depth of Burial**

“The Body Farm”



POSTMORTEM INTERVAL (PMI)

Forensic Entomology is used to determine time since death (the time between death and corpse discovery)

This is called postmortem interval or PMI.

Other uses include

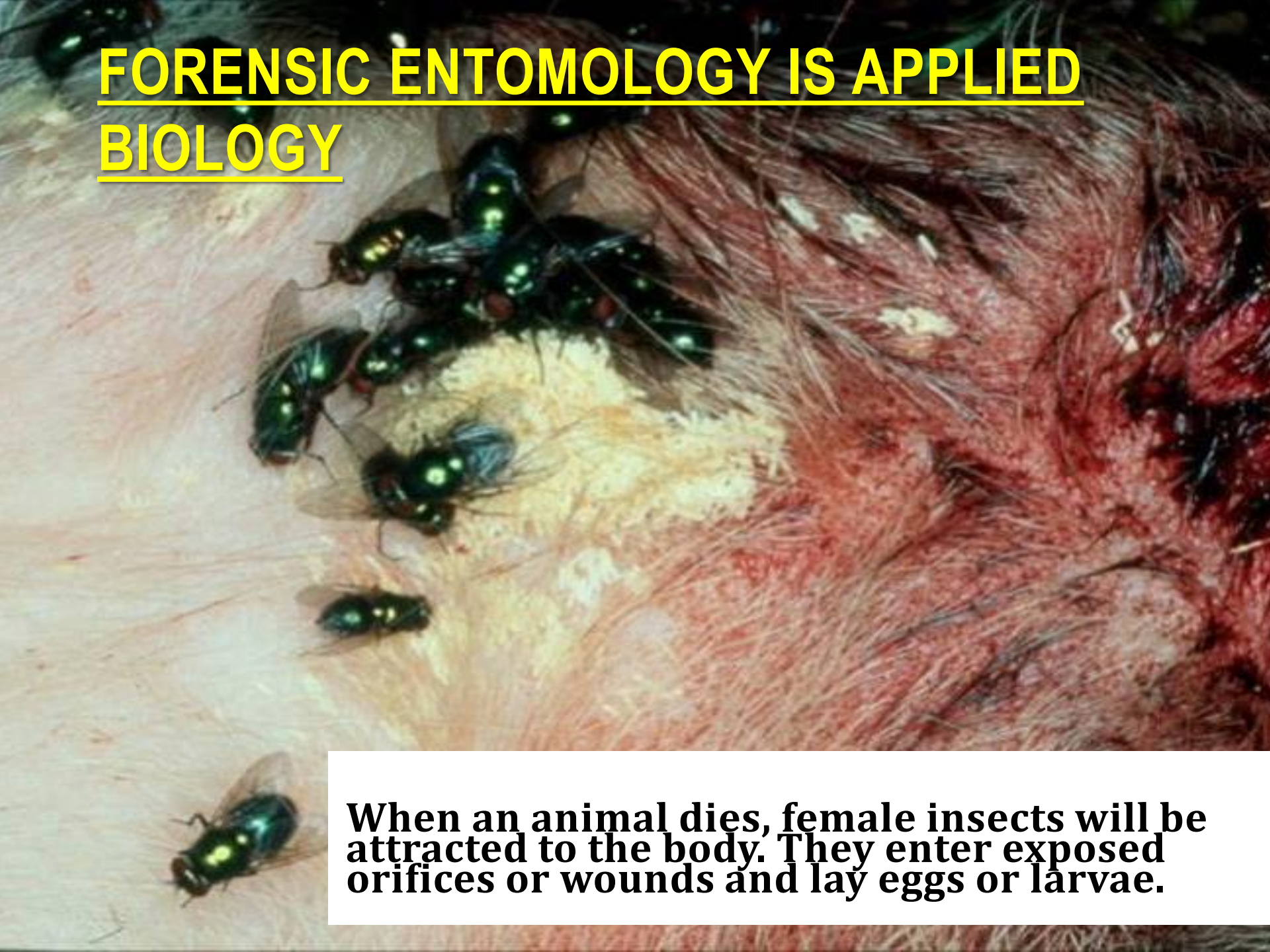
- movement of the corpse

- manner and cause of death

- association of suspects with the death scene

- detection of toxins, drugs, or even the DNA of the victim through analysis of insect larvae.

FORENSIC ENTOMOLOGY IS APPLIED BIOLOGY



When an animal dies, female insects will be attracted to the body. They enter exposed orifices or wounds and lay eggs or larvae.



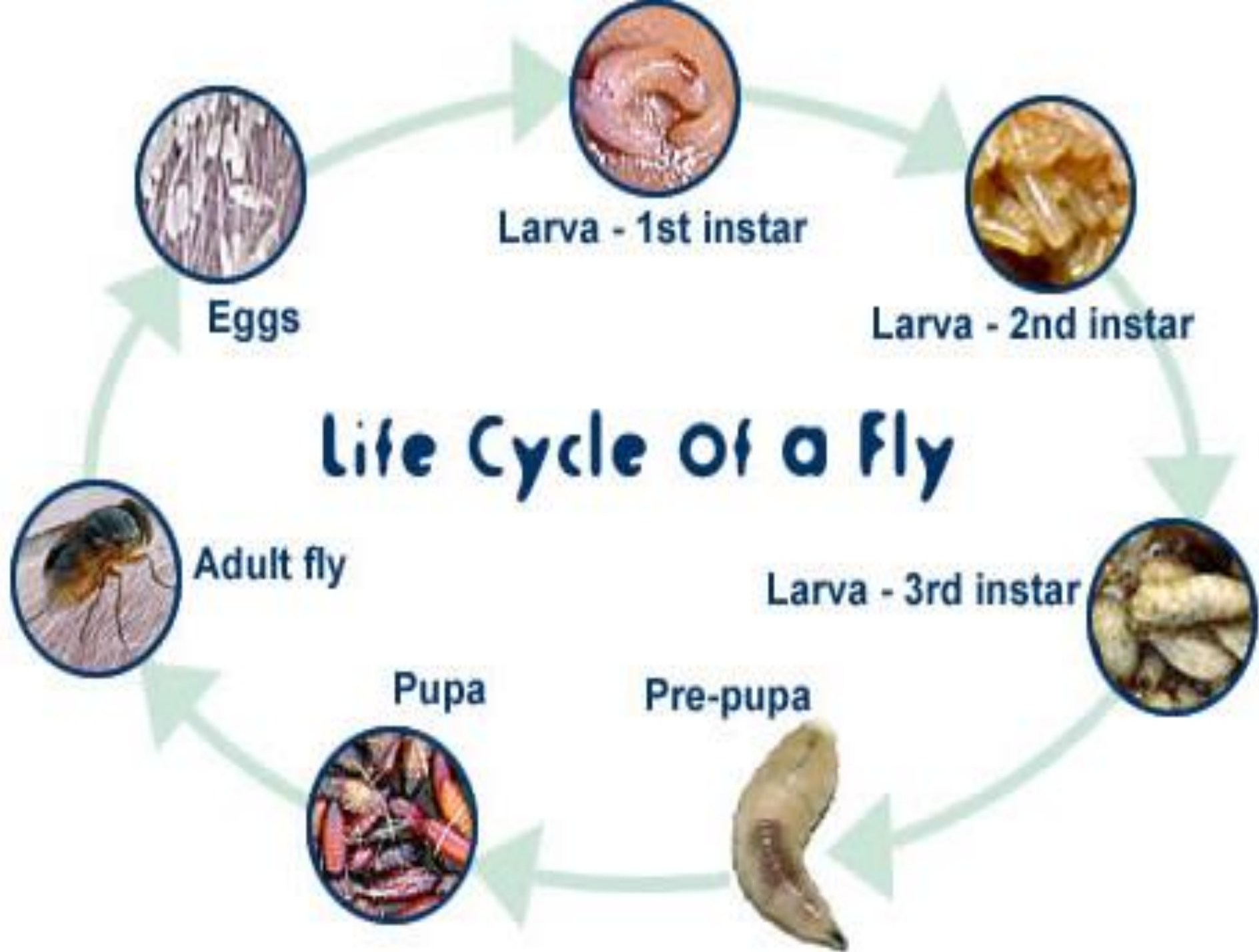
ECOLOGY OF DECOMPOSITION

Necrophages - the first species feeding on corpse tissue. Includes rue flies and beetles.

Omnivores - species such as ants, wasps, and some beetles that feed on both the corpse and associated maggots. Large populations of ominvores may slow the rate of corpse's decomposition by reducing populations of necrophagous species.

Parasites and Predators - beetles, true flies and wasps that parasitize immature flies.

Incidentals – pill bugs, spiders, mites, centipedes that use the corpse as an extension of their normal habitat





FORENSIC ENTOMOLOGY: FLIES



Sarcophagidae - flesh flies

- Adults lay larvae on decaying flesh
- Some of the first insect to reach a corpse



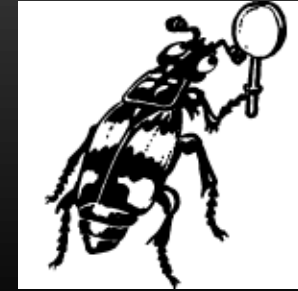
Calliphoridae – blowflies

- Different species have different habits – light vs. dark, urban vs. rural
- All have larvae that feed on corpses
- Also one of the first to arrive

BLOWFLY LARVAE



FORENSIC ENTOMOLOGY: FLIES



Strateomyidae – soldier flies

- Larvae feed on human excrement and remains
- Are found late in decomposition process

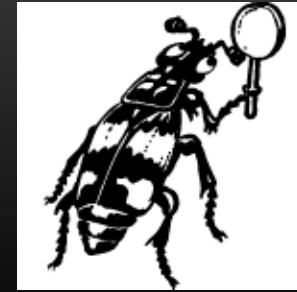


Phoridae – humpbacked flies

- Larvae feed on decaying bodies
- Some species can burrow to a depth of 50cm over 4 days
- Important in buried bodies

FORENSIC ENTOMOLOGY

CARRION BEETLES



Silphidae – Carrion beetles

- **Buries small carcasses**
- **Adults feed on maggots and carrion**

A close-up photograph of a female carrion beetle, characterized by its black body with prominent orange-red spots on the elytra and thorax, positioned on the white, fur-covered body of a dead kangaroo rat. The scene is set in a natural, dry environment with straw and grass visible in the background.

Female Carrion Beetle and Kangaroo Rat

**Rat will be completely buried and eggs laid
upon it.**



FORENSIC ENTOMOLOGY: BEETLES

Staphylinidae – rove beetles



- Arrive a few hours after a death
- Are active throughout decomposition process

Dermestids – Carpet beetle

- Larvae and adults feed on dry skin and hairs



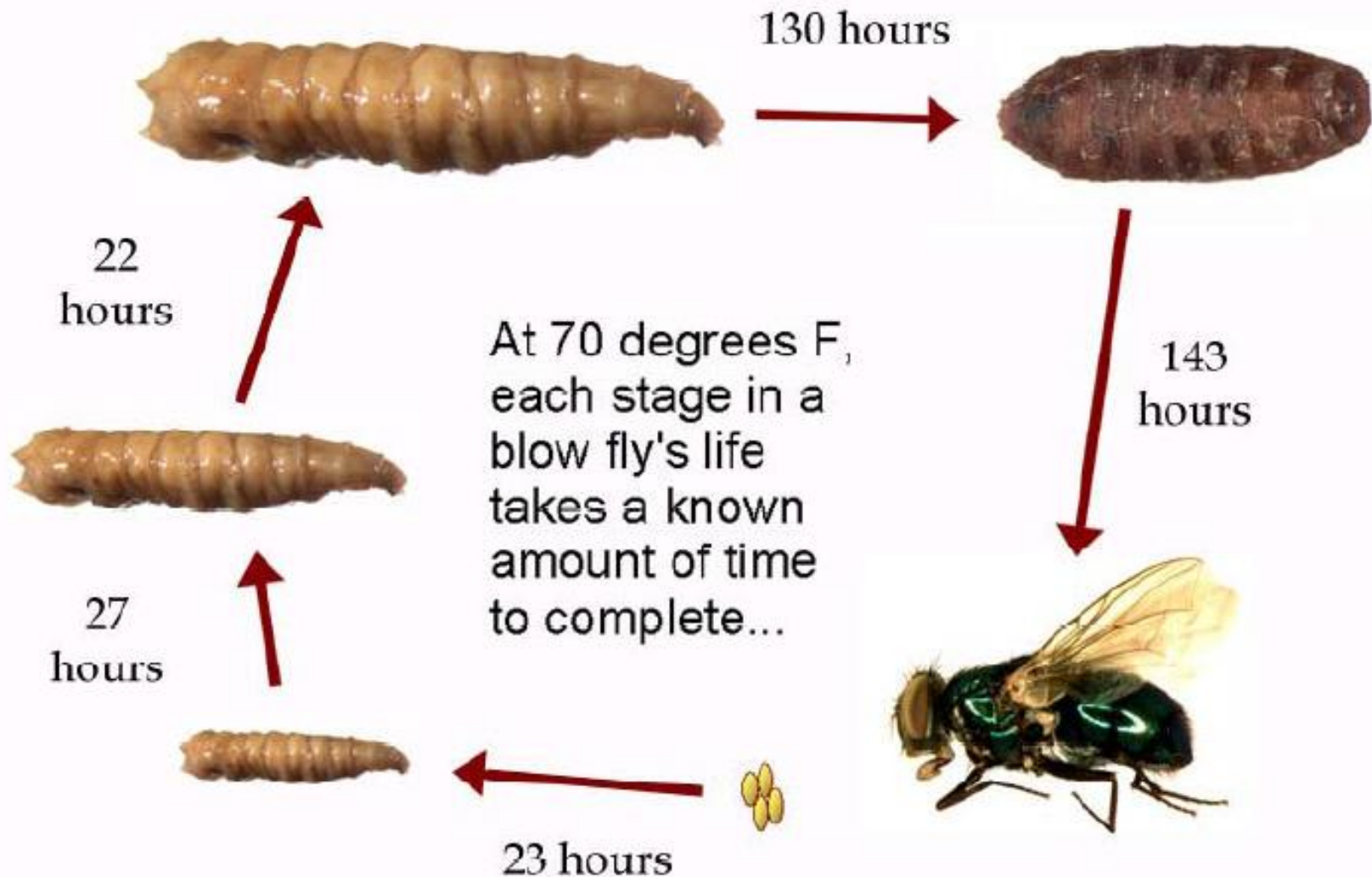
Histeridae – Hister beetles

- Found in bloated, decay, and early drying stages
- Both larvae and adults feed on maggots and puparia

A close-up photograph showing a small, dark, metallic hister beetle positioned on top of a large, pale, translucent blowfly larva. The scene is set on a coarse, granular substrate like sand or gravel. The beetle is dark with a greenish-blue sheen, while the larva is a pale, milky white color. The text 'HISTER BEETLES PREY ON BLOWFLY LARVAE' is overlaid in a black box on the right side of the image.

**HISTER
BEETLES
PREY
ON
BLOWFLY
LARVAE**

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



FIVE STAGES OF DECOMPOSITION FUELED BY INSECT ACTIVITY.

1. Fresh
 2. Bloat
 3. Decay
 4. Post-decay
 5. Dry (skeletal)
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1. FRESH



- Begins at death
- Flies begin to arrive
- Temperature falls to that of the ambient temperature.
- Autolysis, the degradation of complex protein and carbohydrate molecules, occurs.

2. BLOAT



- Swells due to gases produced by bacteria
- Temperature rise of the corpse
- Flies still present

3. DECAY

- Gases subside, decomposition fluids seep from body.
- Bacteria and maggots break through the skin.
- Large maggot masses and extreme amounts of fluid.

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- A photograph of a decomposing animal carcass, likely a pig, lying on its side on a dirt and gravel surface. The body is pale and bloated, with visible signs of decay. The legs are splayed out, and the head is turned away. The ground is uneven and covered with small stones and some sparse vegetation.
- Unpleasant odor
 - Larvae beginning to pupate.
 - Corpse reduced to about 20% of it's original mass.

4. POST-DECAY

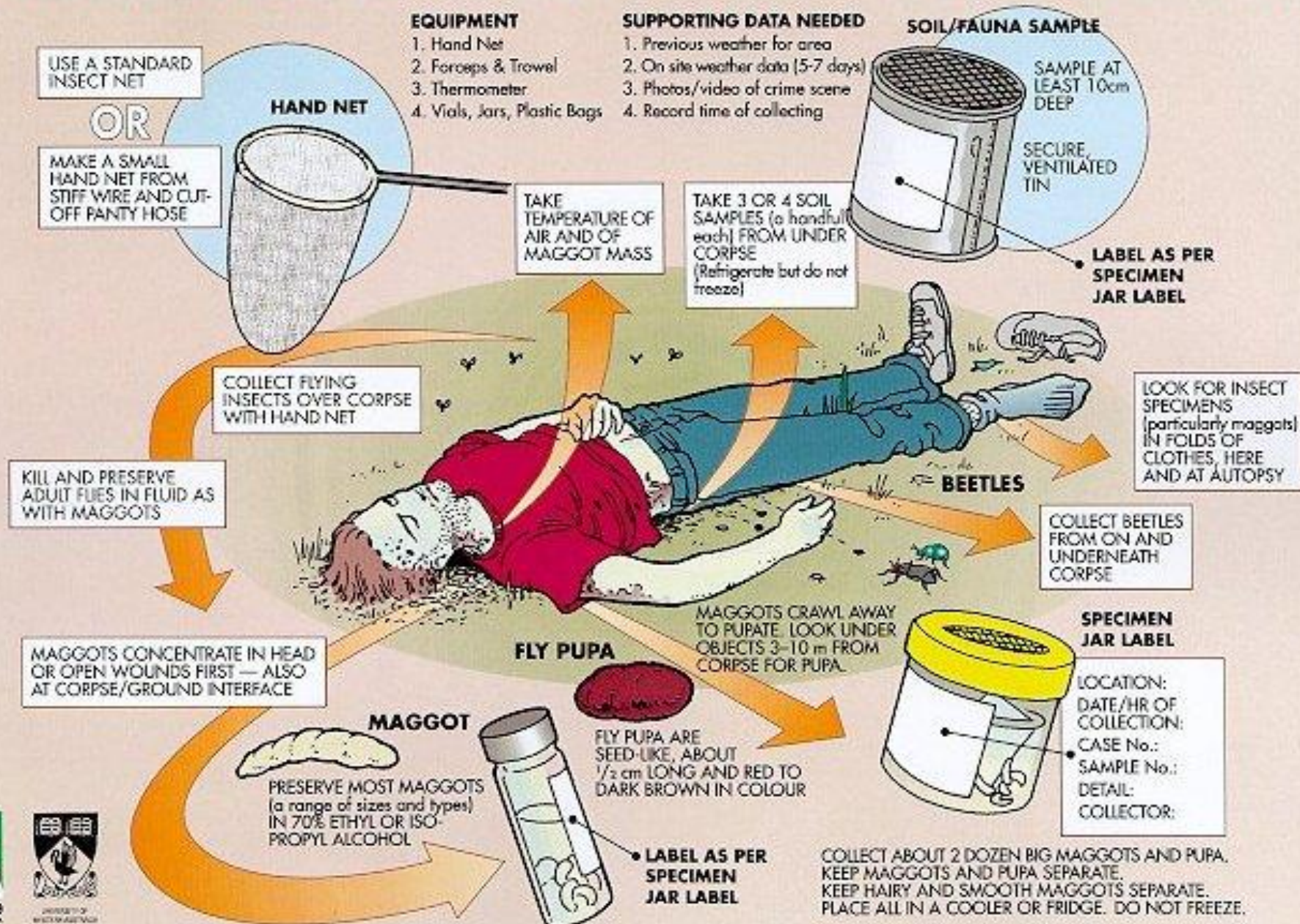
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- Carcass reduced to hair, skin, and bones.
 - Fly population reduced and replaced by other arthropods.
 - Hide beetles are dominant in dry environments.
 - Mite and predatory beetle populations increase.

5. DRY (SKELETAL)

- Does not always occur especially if corpse is in a wet region. Maggots will stay longer and hide beetles will not appear.
- In wet environments the hide beetles are replaced with nabid and reduviid insects.
- The corpse is reduced to at least ten percent of the original mass.
- In the last stage (Skeletal Stage), only bone and hair remain.



COLLECTING INSECTS FOR FORENSIC INVESTIGATIONS



INTERESTING AND TRUE ...



- ❑ Maggot therapy is much more commonly used in Great Britain and Europe than in the U.S.
- ❑ There have been about 25,000 treatments in Great Britain since 1995.
- ❑ Ronald Sherman, M.D. is the pioneer of maggot therapy in the U.S. He is located at U. of Calif., Irvine.



Maggots Cleaning Up a Wound Associated with an Amputation





The End