
TECHNICAL INFORMATION

Forensic Entomology Kit

Catalog No. ENT1000

Background

The concept of forensic entomology dates back to the 1300s, however, only in the last several decades has it been systematically explored as a feasible resource in criminal investigations. It is the application and study of insects as they relate to certain criminal acts. Forensic entomology is primarily associated with death investigations, but it may also be used to detect drugs and poisons, determine the location of an incident, and find the presence and time of inflicted wounds.

The insects found on a corpse will give a forensic entomologist an estimate of how long the body has been dead. This estimate will always be a range of time. This range may vary from a few hours to a day or two, to perhaps several months, to bodies that have been dead for several years.



Application	Collection, containment and transportation of insects and larvae found in a death investigation that may contain valuable information for toxicological analysis, DNA of the victim, and possible time of death.
Hazards/Safety Info	<p>Caution! This kit contains reagents that are toxic and require special handling. It is recommended that only personnel experienced in handling such reagents be permitted to use this kit.</p> <p>Warnings</p> <ul style="list-style-type: none"> • The reagents in this kit are highly flammable. Do not use in the presence of open flames, sparks and/or smoking materials. • Prior to using any kit components, consult the appropriate Material Safety Data Sheet (MSDS) found on our website. <i>Go to www.sirchie.com/support.</i>

Information

The idea behind using insects to estimate a minimum Post Mortem Interval (PMI) is based on how the insects develop and mature. Some insects--those with a complete metamorphosis--have immature stages (maggots) whose movement is extremely limited, but have adult stages that are among the most mobile animals on earth. Some of these insects are specialized to develop on dead animals including human bodies.

The insects recovered from human remains can be a valuable tool for toxicological analysis. The voracious appetite of certain insects can quickly skeletonize the remains. Over a short period, the fluids (blood, urine, etc.) and soft tissues needed for toxicological analysis will disappear. However, it is possible to recover the insect larvae and run standard toxicological analyses on them just as one would human tissue. Toxicological analysis can be successful on insect larvae because their tissues assimilate drugs and toxins that accumulated in human tissue prior to death.

Another important consideration is that it is now possible to use DNA technology not only to help determine

insect species, but to recover and identify the blood consumed by blood-feeding insects. The DNA of human blood recovered from the digestive tract of an insect that has fed on an individual can be extracted. The presence of their DNA within the insect can place suspects at a known location within a definable period and recovery of the victim's blood can create a link between perpetrator and suspect.

Kit Components	<ul style="list-style-type: none"> 1-KCP323 Butterfly Net, collapsible 15- CEB100 Specimen Bags, plastic, 4" x 10" 1-SM100PIC Evidence labels, 100 ea. 1-ENTPL50 Plain labels (no adhesive), 50 ea. 1-ENTKJ4 Kill Jar, 4 oz. 8-ECJ21 Plastic Jar, 2 oz. 4-ECJ41 Plastic Jar, 4 oz. 1-KCP324 Plastic Trowel 1-TWS65 Forceps—fine, straight (stainless) 1-KCP325 Forceps, featherweight 1-KCP326 Thermometer, Bimetal with Probe 1-KCP329 Model Paint Brush 1-KCP327 Spoonula (stainless steel) 5-KCP330 Plastic Spoons 	<ul style="list-style-type: none"> 1-KCP138 Disposable Scalpel 5-ENTMAG5 Plastic Maggot Container, 24 oz. 1-KCP328 Aluminum Foil, 75' 1-ENTV16 Vermiculite, 16 oz. 1-ENTEA1 100% Ethyl Acetate, 8 oz. 1-ENTEAS1 80% Ethyl Alcohol Solution, 8 oz. 1-ENYKAA1 KAA Solution, 8 oz. 2-KCP152 Blue Poly Cases 1-KCP134 Mechanical Pencil 1-KCP183 Sharpie Pen 1-PPS403 6" Photographic Scale (English/metric) black, 10 ea. 1-PPS400 6" Photographic Scale (English/metric) white, 10 ea. 1-ENT1000C Plastic Toolbox Case w/custom foam
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Collection of Evidence

Special Note! Extreme care must be taken during insect collection so that the remains are disturbed as little as possible. Once crime scene photography has been completed, but before collections are made, notes should be taken as to the general habitat, ambient weather conditions, and location of the body. See *SIRCHIE Form No. ENTf-1*.

Evidence Recovery Tools	
Component	Usage
KCP323 Butterfly Net	Capture flying insects over and around the cadaver(s).
KCP326 Thermometer	Record temperatures of the maggot mass, various areas on and under the cadaver and nearby environment including the soil.
Misc. Tools (<i>forceps, spoons, scalpel, spoonula, paint brushes, aluminum foil, and photo evidence scales</i>)	Safely collect insects and larvae in numerous circumstances for placement in evidence collection containers.
Reagents	
ENTEAS1 80% Ethyl Alcohol Solution	Preserve and store carcasses of dead larvae and mature insects.
ENTKAA1 KAA	Preserve carcasses of dead larvae and mature insects.
ENTEA1 100% Ethyl Acetate	Fumigant to kill mature insects prior to preservation.
Evidence Containers	
ECJ2 Plastic Jar, 2 oz.	Collection/preservation of specimens.
ECJ4 Plastic Jar, 4 oz.	Collection/preservation of specimens.
ENTMAG5 Plastic Maggot Container, 24 oz.	Transportation of live specimens.
ENTV16 Vermiculite, 16 oz.	Absorption of moisture occurring inside ENTMAG5 Maggot Container.
ENTKJ4 Kill Jar, 14 oz.	Kill collected live specimens in conjunction with ENTEA1 Ethyl Acetate.

Entomological Investigation of A Death Scene:

1. Observations should note the general habitat and location of the body in reference to vegetation, sun or shade conditions, and its proximity to any open doors or windows if recovered inside a structure. Locations of insect infestations on the body should be documented as well as noting what stages of insects are observed (such as eggs, larvae, pupae, or adults). It is also useful to document evidence of scavenging from vertebrate animals and predation of eggs and larvae by other insects such as ants and beetles. *Note these observations on the Death Scene Form No. ENTDSFI.*
2. Collection of meteorological data at the scene. Such data should include:
 - 2.1. Ambient air temperature at the scene taken approximately at chest height with the thermometer in the shade.
Special Note! Do not expose thermometer to direct sunlight.
 - 2.2. Maggot mass temperature (obtained by placing the thermometer directly into the larval mass center).
 - 2.3. Ground surface temperature.
 - 2.4. Temperature at the interface of the body and ground (simply place the thermometer between the two surfaces).
 - 2.5. Temperature of the soil directly under the body (taken immediately after body removal).

Collection of Insects from Cadaver

Prepare the Killing Jar before proceeding to capture flies and beetles. This jar contains an absorbent plaster disk. Pour a small amount of Ethyl Acetate (No. ENTEA1) onto the plaster disk (approximately one to two teaspoons full). Any excess reagent not absorbed by the plaster may be returned to storage bottle. Recap the jar.

The first insects that should be collected are the most mobile ones: adult flies and beetles. These insects are fast moving and can leave the crime scene rapidly once disturbed. Assemble the collapsible insect net

and make several figure eight passes above and around the body. Once the adult flies have been netted, the closed end of the net containing the insects can be placed in the mouth of the "killing jar." The jar is then capped and the insects will be immobilized within a few minutes. Once they are immobile they can be easily transferred to one of the two or four ounce plastic preservation jars. Add enough 80% Ethyl Alcohol (No. ENTEASI) to cover the insects. Beetles can be apprehended with forceps or gloved fingers and placed directly into 80% Ethyl Alcohol. Do not mix flies in with beetles. They must be preserved in separate jars.

It is extremely important that the collected specimens are properly labeled. Non-adhesive labels should be marked with a graphite pencil, NO INK. The label should be placed in the alcohol along with the specimens. This inner collection label should contain the following information:

1. Geographical Location
2. Date and Hour of Collection
3. Case Number
4. Location on the body from where evidence was removed
5. Name of Collector

An adhesive-backed label should be filled out in ink with the case and specimen number and the identification of the collector. This label is affixed to the exterior of the preservation jars or evidence bags.

The next step is to examine the remains for the presence of eggs. Fly eggs have the general appearance of saw dust and are often found in the folds of clothing or open body orifices. Eggs should be preserved in ethyl alcohol as described above. Living samples may also be useful to the forensic entomologist. Use the Maggot Motel method of transporting live specimens listed below.

Once the adults and eggs have been collected, the collection of larval specimens from the body can begin. The larvae (maggots) should be readily apparent on the body. The largest larvae should be actively searched for and collected. Additionally, a representative sample of 50-60 larvae should be collected from the maggot mass. These insects can be placed directly into the killing jar or ethyl alcohol preservative. In any case, document the exact preservation techniques and forward to the forensic entomologist. If the body has more than one area of colonization (more than one maggot mass) each site should be collected, labeled and logged separately.

Once preserved collections have been made, duplicate samples should be made for live shipment. Living specimens are to be placed in the Maggot Motels (No. ENTMAG5). To prepare these containers proceed as follows:

1. Add enough of the Vermiculite (No. ENTVI6) to just cover the bottom of a maggot motel
2. Tear off a five to six inch width piece of aluminum foil from the roll. Tear this piece in half.
3. Form one piece of the foil in the shape of a cup. Poke several pinholes into the bottom of the foil to permit drainage of any fluids that may accumulate.
4. **Special Note!** If the interval from the time of collection to delivery to an entomologist will exceed 24 hours, it will be necessary to provide food for the larvae. Some recommend removing small pieces of flesh that remain on the carcass for this purpose.
5. Add the maggots to the foil, and then place the foil into the container and put the lid in place.
6. Poke several holes in the lid to permit air circulation.
7. Label each container as described previously.

Collection of Insects from the Scene after Body Removal

Many of the insects that inhabit the cadaver will remain on, or buried, in the ground after the body has been removed. The steps listed above should be followed when collecting insects from the soil (i.e. both a preserved and a living sample should be taken). Soil and litter samples should also be taken both immediately under where the body was positioned, and from the immediate surroundings. It is not necessary to dig deeply. A good technique is to collect the leaf litter and debris down to the exposed upper surface of the soil, and then make a separate collection from about the first two or three inches of topsoil. Each soil collection area should be about four to six inches square, and be taken from underneath the head, torso and extremities. All soil samples should be placed in containers such as the plastic evidence bags included in the Identification Kit for immediate shipment. These collections should be labeled and forwarded to the forensic entomologist along with the insects collected from the body.

Shipping Insects to a Forensic Entomologist

While personal delivery is highly recommended, properly collected and preserved insects (see above) may be shipped using overnight express either via the United States Postal Service (US Mail), or the United Parcel Service (UPS). Federal Express may not ship insects living or dead.

Maintenance

Remove all contents from the carrying case and wipe it down with a mild soap solution. Wipe and dry all tools and collection devices.

References

1. Byrd, J.H., PhD, Forensic Entomology, <<http://www.forensicentomology.com/info.htm>> August 5, 2009
2. Bullington, Stephen W., PhD, Forensic Entomology, <<http://www.forensic-ent.com>> August 5, 2009
3. Kenneth G.V. Smith. 1986. A Manual of Forensic Entomology. Comstock Publishing Associates, Cornell Univ. Press, Ithaca, NY, 205 pp.