INSECTS AND DEATH: AN OVERVIEW ON FORENSIC ENTOMOLOGY / ACAROLOGY

إعداد

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Abstract:
Small arthropods particularly blowflies and their larvae, can provide important evidence in the investigation of a crime, i.e. time, place and cause of death. In this presentation, an overview on the ways in which insects and acarines can provide vital clues about a murder is highlighted. Additionally, some criminal events show the successful uses of entomological evidence in murder investigations are elucidated.

Key words: Forensic entomology, Forensic acarology, Post-mortem interval, insects, mites.

Introduction
Insects and acarines provide clear evidences in the investigation of crimes. The most common applications of entomological evidences are in estimation of the post-mortem interval (PMI), the time that has elapsed since death (Goff, 1998). Blowflies may arrive on a corpse and lay their eggs within a few hours of death, followed by the arrival of other insect groups, mites and spiders. The phoretic mite species attached to these flies and other insects start a succession of acarines (Perotti, 2006). It is worth noting that the term “Forensic Acarology” is firstly initiated by the author (2007) to provide clues for forensic investigation.
However, definition of insects associated with corpses and their succession patterns combined with the age of feeding maggots are valuable evidences in criminal investigation, e.g. homicides, suicides, submersion and other unattended death. Moreover, toxic substances in a dead body and/or drugs such cocaine and heroin affect the rate of development of larvae, thereby, affecting the accuracy of post-mortem interval estimates if not considered (Beyer, et al., 1980 and Kintz et al., 1990).

**Main Areas Where Arthropods are Useful for Forensic Investigation**

1- Estimation of post-mortem interval as the development of arthropods which arrive at a dead body soon after death play a distinct role as a biological clock to estimate PMI.

2- Insects and mites are often geographically distributed and this has been used to locate scenes of murder crimes.

3- Insects can serve as reliable specimens for toxicological analyses in the absence of human tissues and fluids normally taken for such purposes.

**Applications of Entomological Evidences in Estimation of the Post-mortem Interval**

Arthropod succession and insect development have been successfully used to determine the PMI in criminal investigation.

During the earlier stages of decomposition, the interval could be determined by the period of time needed for the larvae to develop to the oldest growth stage collected from the corpse, i.e. an estimate of the oldest larvae found on the corpse. Their greatest ages indicate the time when flies first laid their eggs (Donovan et al., 2006).

After the first stages of decomposition have passed and the flies have departed, estimates are generally based on interpretations of arthropods succession patterns into the decomposing body
and correlate these patterns with different stages of decay. Early and Goff (1986) established five stages of decomposition, i.e. Fresh, Bloat, Decay, Post-decay and Remains. Each stage is characterized by physical stages and associated arthropod communities.

**Applications of Entomological Evidences in Case of Murder or Death**

The first entomological evidences applied to a criminal investigation were recorded in China in 12th century. The weapon, a sickle, used by a murder attracted many flies due to the presence of blood and tissue traces.

Later on in the 17th century, the wrong belief that the larvae directly originated from the carcasses, theory of “Spontaneous generation”, was dismissed. It was proved that larvae associated with dead bodies come from eggs laid by flies.

In Europe, the first application of entomological evidence in forensic investigation was that of Bergeret (1850) in France. A couple was cleared of the death of a child whose mummified remains were discovered in a fireplace of their house. Based on the succession of insect necrophagous species, it was proved that the child had dead two years before the couple had resided there.

Another event reported by Haskell *et al.* (1996) shows the valuable use of entomological evidence during murder investigation was recorded in the United States, where a corpse of a man was found beside his resident. The last time the victim had been seen, he and his wife were engaged in a bitter argument. The wife claimed that she had last seen her husband two days ago, while the forensic entomologist refused the wife’s alibi as the maggots noted on the corpse when located were oldest than two days. The wife was charged with first-degree murder.
On the other hand, blowfly larvae featured in the first successful use of entomological evidence in UK, when they were discovered on decaying human remains, of wife and maid, dumped in a small ravine in Scotland in 1935. The maggots provided a vital clue as to when the murder took place. The husband was subsequently found guilty and hanged.

**Conclusion**

However, additional investigation concerning the effect of decomposing remains of succession patterns on biology of small arthropods associated with corpses might be useful to forensic science. As research in these areas are completed, we can anticipate that estimates of post-mortem intervals based on entomological and acarological data will become more accurate and widely accepted (Rasmy, 2005). Such knowledge narrows the area of possible suspects in the crimes and reveals that these small arthropods can provide vital clues as to when the murders took place and also causes of death.

In addition to the gathering and processing of entomological data, it is necessary to develop more cooperation between the forensic entomologists and law enforcement agencies.
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