International Multilingual Journal of Science and Technology (IMJST)
ISSN: 2528-9810
Vol. 4 Issue 6, June - 2019

Forensic Insects And Discovered Crimes

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***Abstract*—Forensic medicine is considered as one of the important medical specializes. Nowadays, the detectives depend on to get information about crime, victim and sometimes criminals, but the most important thing that forensic give us is the minimum post-mortem interval (PMImin) which is the first and the main evidence that the detectives depend on to arrest the suspects and then to determine the criminal. Therefore, in this article, we are going to talk about the (PMImin), mention the decomposing stages of the dead body, then we will focus on forensic insects, what the important insects that the detectives use, how it helps to determine the (PMI), and the factors that may affect at the (PMI)**

Keywords—forensic medicine, pathologist, dead body, forensic insect, minimum post-mortem interval (PMImin), entomology, flesh fly, (Diptera:Calliphoridea) , blowflies, (: sacophagidae), Carrion beetle, (Coleoptera: Silphidae),

Introduction

The forensic able to get evidence like (DNA, fingerprints,

Dust, perfume, blood or seminal fluid like they found in rape cases), it is also can determine the (PMImin) recording to the condition of the dead body and circumstances in which found.

However, the first 72 hours consider as the rush hours to the pathologist which help him to determine the (PMImin) minutely and maybe the reason of death. In addition, they can determine the (PMImin) even though the dead body disintegrate which may be in one of these three stages:

1-Autolysis; is an operation when the body gets in a natural crumble and the body enzymes decompose the cells in somehow the body starts eating itself and gets microbes a suitable milieu to grow up.

2- Putrefaction and skeletal bone; it starts when the microbes start eating the tissue and bone.

3- Anaerobic fermentation; which happened as a result caused by the releasing of some gases, often after this stage the insects attracted to the dead body.

But these stages depend on some of the factors. Such as, (tempter of the body and the crime scene), so the forensic sciences devise the methods and manner to determine the (PMImin), one of that methods is a forensic insect or forensic entomology.

Forensic entomology is a field concerned about how the insects affecting the dead body and what the insect they found it, that because every different insect has special circumstances to grow up and has a different life cycle which considers the main thing that helps the pathologist to determine the (PMImin).

There are many insects that the forensic entomology uses to determine the (PMImin) but in this article, we are going to mention just three of them which are:

- Blowflies (Diptera:Calliphoridea)
- Fleshfly (dipetra: sacophagidae)
-Carrion beetle (Coleoptera: Silphidae)

1-Blowflies (Dipetra:Calliphoridae)

This insect is the first insect that settles the dead body no matter if it was outdoors or indoors. The decomposing remains and the gasses that release attracting the blowflies easily. So, because of that, it considers as one of the insects that the pathologist depends on to determine the (PMImin) accurately by using its larvae which live in human remains then determine the age for it and finally defined the (PMImin)

The life cycle of Blowflies

Because the adult Blowflies can't sharp the body and the natural opening at the body have a wet environment that makes Blowflies attract to put its eggs inside and then to start its life cycle. There are Four recognizable stages to complete the life cycle for Blowflies which are:

- First stage (L1): the egg which must get in two transformations ((1st instar,2nd instar), it almost takes (1-3) days to hatch and its size is about (2-3 mm) ,it's the shorter stage and often the pathologist don't see it at the crime scene except when they have unusual condition.

-Second stage (L2): the larvae; this stage the blowflies start to get out of the dead body, it has a transformation (3rd instar).

-Third stage (L3): the pupal, it's able to live in a semiliquid medium, it's the longest stage and the stage that the pathologist focuses on to determine the (PMImin).

- Fourth stage (L4): the adult; which able to leave the dead body and then start the cycle again.

2-Fleshfly (dipetra: sacophagidae)

This insect considers as facultative ectoparasites which feed on human feces and remains, the wounds

and blood attracting the Fleshfly which also considers an easy access point to the dead body. Also, its egg hatching on the same day, so the pathologist considers its larvae as important evidence because it helps them to get an accurate (PMImin).

The Life cycle of Fleshfly

The Fleshfly has a long-life cycle but it takes a short period, its cycle has 5 stages which are:

-The first stage (L1): is the egg; which hatching at the same day, the fly pushes the eggs directly to the carrion to ensure there is enough food to get the (1st instar) larvae.

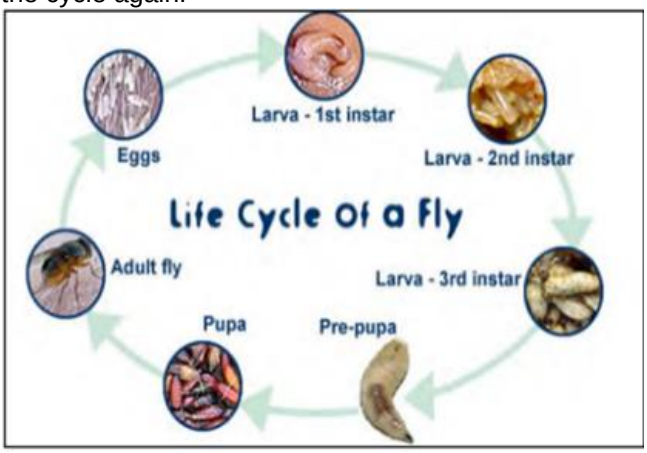
-The second stage (L2): the larvae; which has three transformations (1st instar, 2nd instar, 3rd instar (which is the longest one))

-Third stage (L3): is the pre-pupal; which consider as a post- feeding pupal, also which must prepare for pupation stage (get out the body)

, this stage is the longest stage of the life cycle, it takes about one-third of the pre-adult development time.

-Fourth stage (L4): is the pupal(imago); which consider the stage before being an adult fly, the (L3, L4) consider the essential stages which the pathologist depends on to determine the (PMI).

-Fifth stage (L5): is the adult fly; it is the last stage which the Fleshfly leaves the body and able to start the cycle again.



3-Carrion beetle (Coleoptera: Silphidae)

This insect depends on animals remains to live, it also buries the bodies of small dead animals to feed their young. This insect has a long life cycle and it takes a long time to complete, so the pathologist use it to determine the (PMI) when the dead body have an advance decomposing and its succession patterns consider as a strong available evidence that they have, Beetles that collected from the crime scenes can determine the (PMI) in summer season and at dry environmental conditions which may increase according to the climate changes.

The life cycle of the Carrion beetle

After the beetle attracts to the dead body, it starts to put its eggs in a deep opening into the dead body and then it is beginning its life cycle which has 4 stages:

-The first stage (L1): is the egg, which hatching and getting larvae.

-The second stage (L2): is the larvae, which is so young to feed itself so the mother feeds them until they get the ability to produce digestive juice that decomposing the body.

-Third stage (L3): is pupal, which often take two weeks to be an adult.

-Fourth stage (L4): is the adult, which can leave the body and start the cycle again.

The factors that effecting on determine the (PMI) by insect

1- Temperature: every insect has a suitable temperature to grow up and any changes including digressing or increasing it will effect negatively on life cycle for example: the suitable temperature to Blowflies growth is (20 degrees) after hatching it grows up about (2mm) the increase of temperature make its growth more faster for example : (every (14 degree) more than (20) its pupal size increase about (6mm)), but on the other hand the high temperature makes the Blowflies relatively inactive and its hatching be more slowly at the coldest temperature .

2-The light: it is affecting at the way that attracts the insect to the dead body and lay its eggs inside it. For example, the Blowflies can't reach the dead body at darkness and it is hard to even at the laboratory condition.

3-The human tissue: it is important to the pathologist to know the place that the larvae were taken from because it considers as food for it and affecting on the size and development rate to the larvae. So, it absolutely affecting on (PMI).

4-The dead body fats it is beneficial for the larvae at the (1st instar, 2nd instar), but at (3rd instar) it may be having a negative effecting. For example, the fat may stop the development of the Blowflies larvae if it is getting more than its needs.

5- Defending the kinds: the adult flies in somehow have the same appearance and every fly has a different life cycle so any mistake may get inaccurate (PMI). So, the pathologist uses the length of wings and the molecular methods to defend the kind then get an accurate (PMI).

6- The condition of the dead body; because it has some differences to determine the (PMI) when the dead body is buried or not, the buried one has a constant temperature and less insect that may attract, so it will get longer time to decompose than the unburied one, which the climate conditions effecting on weather as making the life cycle faster or slower.

7- The min and max time: which mean that every insect has a rush period to consider it as evidence or to get it the priority to determine the (PMImin). For example, the rush period to Fleshfly are almost (70-100) hours after the death then the pathologist may depend on other insects to determine (PMImin) like Carrion beetle which often gets the longer life cycle.

Notice: sometimes the pathologist must get some samples around the body because often the pupal or the adults laves the body.

The methods to preserve the egg sample

It is important to the pathologist to kill the egg before collecting it from the crime scene to stop its development that is placing the living eggs directly into 80% ethanol. This method is more affected than killing with the hot water because 80% ethanol caused a marked decomposition of samples, but without a discernible change in morphological landmarks.

Methods

Endnote to organize the reference, Pubmed, Google Schooler, Web of Science (ISI) to get the articles.

Acknowledgement

We would like to express our gratitude to our doctor Miss Rania Sadek, who helped us to end this paper and gave us the motivation for more advances, we also want to thank doctor Neven Gaber, who helped us with our searching, and we want to thank King Abdulaziz for Science and Technology (KACST) to provide us with articles that support our searching. At the end, we want to thank Miss Rema'a Al Hakam and Miss Montaha Saeed Bahwerth, who helped us to edit this paper.

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