SYNONYMOUS USE OF MAGGOTS AND DIATOMS IN DECOMPOSED BODIES

Dr. Maneesha Singh, Medical Officer, Dr. Pankaj Kulshrestha, Junior Forensic Specialist & Asst. Chemical Examiner, Dr. D.K. Satpathy, Director, Medicolegal Institute, Bhopal

ABSTRACT
The use of maggots and diatoms conjointly has proved to be an important factor in the medicolegal cases referred with advance decomposition. In practice it is quite much difficult to determine Post Mortem Interval (PMI) and as well as to ascertain ante-mortem drowning factor in the bodies, which are being recovered with advance putrefaction. However the analysis of co-existing evidences associated with corpses viz: Maggots and diatoms may reveal to draw fairly sound inferences, relating to PMI and drowning mode of death as well, especially in the decomposed bodies. Otherwise, it would not be possible to solve the cases of this nature.

The present paper enumerates the two case studies recently reported in year 2003 emphasizing about the medicolegal application of both the evidences simultaneously in the cases with advance decomposition.

KEY WORDS: Entomology, Maggots, Diatoms, Time Since Death, Post mortem Interval.

INTRODUCTION

In Medicolegal practice during the examination of decomposed bodies it is often difficult to ascertain Post Mortem Interval (PMI) as well as ante-mortem drowning factor in the cases which are being recovered with advance putrefaction. No doubt this exercise becomes more difficult when the deceased person is reported to be unknown and no last alive history is available.

Nevertheless the analysis of both co-existing evidences viz: maggots and diatoms which are being associated together with putrefied corpses may reveal to draw fairly sound conclusions relate to PMI and drowning mode of death.

MAGGOTS EVIDENCE

Over the last two decades there has been a resurgence of interest in using forensic entomology in medicolegal field. We have already established that during earlier stages of decomposition (i.e. within first two weeks). Flies of family Calliphoridae, Muscidae, and Sarcophagidae are important postmortem invaders [1-3]. However we have also reported about the use of coleopteran or Beetles the main entomologic evidence. (D. maculatus Deeger, Necrobia) encountered on the corpses in the later stage of decomposition [4]

Among Calliphoridae the use of Chrysomya flies has emerged as important evidence in forensic entomology in recent years. C. rufifacies and C. megacephala is the most common among Chrysomya flies, which can be used as a prominent entomological evidence in medicolegal field for estimating PMI [5]

More recently two elaborated text on forensic entomology has been published which can be used by professionals to update their knowledge on the subject. [6, 7]

DIATOMS

Diatoms are microscopic unicellular water algae with a rigid case composed of silica which belong to class Bacillariophyceae and said to enter the pulmonary circulation during drowning. There are numerous forms of diatoms found in different shape and size both in fresh water and sea (Salt) water. [8, 9]

When the body (dead or alive) falls in water the drowning fluid and particles like diatoms and planktons passes down the air passages to the lungs. If the life is still present the heart will be beating and will transport diatom which penetrate the lungs living to distant parts of the body (Brain, bone marrow, liver other viscera and skeletal muscles). This phenomenon could be happened only a live body but in a corpse (Dead body), this
can not occur, thus presence of diatom in bone marrow is the surest sign of ante-mortem drowning [8 & 9].

In our practice we received usually about 500 cases per year in which bone marrow of long bones such as femur, tibia, humerus or sternum are being examined for diatoms. However in cases of drowning death to differentiate the ante-mortem and postmortem death particularly when the bodies are being recovered in state of advance decomposition or when only bony skeletons are found, the presence of diatoms in bone marrow is quite significant as the sign of drowning will not be found, may be minimal or absent, if there is delay since death.

Thus diatom examination is a reliable and practical method that is used to identify whether deceased drowned before his/her death or was thrown into water after his/her death specifically when corpse is putrefied [10].

**METHODS TO USE MAGGOTS FOR PMI ESTIMATION**

Collection and preservation of entomological evidence present on corpses have been discussed in detail by Kulshrestha & Chandra [1].

Among two methods pertinent in using the entomological evidence first is measurement of larvae, which provides very useful findings for forensic estimations. The development of body length (In millimeters) of fly larvae over corresponding days has been recorded at different temperatures and humidity. On the basis of variation in the length of larvae, a scale relating to their maturation in prevailing environment can be drawn, which shall certainly be used as an aid in estimating the age of larval growth by studying the specimens.

The second method adopted for study was the rearing of fly larvae in to adults, to calculate the ‘Time Since Death’ of infested body on the basis of total developmental time.

This method enable the examiner the confirm the identification of species and to calculate egg deposition day which will indicate the PMI assuming that eggs of flies concerned are laid soon after death. [1]

**METHOD FOR DIATOM TEST**

About 5g of material (Bone marrow sample or water sample from the site of drowning) are taken in a test tube, to digest the material. It is essential that surface contamination should be eliminated completely. Analytical grade concentrated hydrochloric acid and concentrated nitric acid in 1:3 ratio is to be added. All care should be taken with corrosive liquids. In ordinary course where there is no urgency the material is allowed for digestion over night at room temperature. However in urgent cases the acid may be heated in a water bath in a fume cupboard. The digestion being carried out in Kjeldal flasks [11].

A Can instrument for destruction of organic material is use for the diatom examination has also been discussed by Yange et al. [10] they have successfully developed the said can for the destruction of organic material, which is ideal for forensic diatom examination.

When digestion is complete a dark liquid will remain after partly changed due to the action of the acid on organic material. The material is boiled and transferred to a centrifuge tube. The material is centrifuged for 3 minutes at the rate of 3000 rpm. The supernatant is removed and deposit is retained which is further washed thrice with distilled water. After the final supernatant is thrown out and remaining deposit has obtained for final examination.

About 5 drops of the deposit is taken over a slide with the help of a clean pipette. The material is then allowed to dry by gentle heating over a hot plate. It is then mounted with DPX and examined for diatom under microscope: dark background or phase contrast is the most effective for the demonstration of diatoms.

**CASE STUDY – I**

On 20th June 2003 the body of male boy aged 10 years was referred for postmortem examination from near by district of Bhopal. The deceased reported to be seen last alive since 10th June 2003 evening and his body was recovered from a well on 17th June 2003 morning.

The body was in advance stage of decomposition, hence the autopsy surgeon could not ascertain any cause of death, and however, no bony injuries were evident.
ENTOMOLOGICAL EVIDENCE AND PMI ESTIMATION

Number of 15-16 millimeters post feeding *C. megacephala* maggots were collected from the corpse and further put for rearing. During successful rearing the pupae observed next day on 21st June 2003, the adults found emerged on 24th June 2003 in the environment of average temperature 28.4 ºC and average humidity 50%.

On the basis of control rearing experiment determined for *C. megacephala* (reference range average temperature 27.4 ºC and average humidity 72%) which is nearest to the present case prevailing environment, the development period from egg to adult observed as 10 days.

In this case the successful rearing results indicate that adult found emerged on 24th June 2003. This finding gives the conclusion that body was likely to be available to flies for oviposition on 14th June 2003. The simple calculation by subtracting 10 days from adult emergence date (i.e. 24th June 2003). As these flies takes 1-2 days (Maximum) to deposit eggs after death. Thus the likely dates come out as 12th or 13th June 2003 on which incidence might have taken place. The autopsy surgeon has given PMI one to three weeks, whereas entomological findings confirms 7-8 days PMI, which further narrow, the PMI estimation range and suggest that his lower limit one week estimation about PMI is more accurate.

DIATOM EVIDENCE AND RESULT

As body recovered from well, the autopsy surgeon has preserved tibia bone and water sample from the site of drowning, were referred to the diatom lab for examination. Diatom test found positive in both bone and water, which indicate about ante-mortem drowning.

CASE STUDY – II

A male corpse aged about 30 years referred from near by district of Bhopal for postmortem examination on 7th August 2003. The deceased reported to be seen last alive on 3rd August 2003 and the body was recovered from a well in advance stage of decomposition. Hence autopsy surgeon was unable to draw any inference relating to the cause of death. Nevertheless no evident injuries were observed in available parts.

ENTOMOLOGICAL EVIDENCE AND PMI ESTIMATION

*Sarcophagidae* (Flesh flies) maggots measuring 5-7 millimeters collected from the corpse. The collected maggots have further put for rearing; the feeding substrate was the liver tissue of same infested body. The pupation observed on 15th August 2003 and adults found emerged on 26th August 2003 in the environment of average temperature 26.4 ºC and humidity 28%.

The control rearing experiment determined for *Sarcophagidae* flies (reference range average temperature 26 ºC and humidity 86%) which is closest to the present case prevailing environment revealed that total egg (Larviparous) to adult development period is 21 days.

In this case, adult found emerged on 26th August 2003 during the successful rearing of collected maggots in pupae and adult. This indicates that flies deposited eggs (larviparous) on the body likely on 5th August. Therefore incidence might have taken place either on 2nd or 3rd August 2003 which has been further corroborated with fact that deceased person was seen last alive on 3rd August 2003. The autopsy surgeon has given PMI 5-7 days whereas entomological finding confirms 4-5 days, which has corroborated with known facts of case too. Thus five days PMI estimation of autopsy surgeon was more accurate.

DIATOM EVIDENCE AND RESULT

Autopsy surgeon has preserved tibia bone and subsequently police has sent water sample of well from which body was recovered. Diatom test found positive in both bone and water, which indicate about ante-mortem drowning.

CONCLUSION

The present case studies successfully demonstrated that both maggots and diatoms conjointly have proved to be important evidence particularly in the cases where body is recovered in advance stage of putrefaction.

The present findings emphasize that in both two cases, due to decomposition the cause of death and as PMI estimation could be a difficult task to be ascertained. However, simultaneous analysis of both maggots and diatoms may reveal fairly sound conclusions relating to PMI and drowning mode of death specifically in decomposed cases.

REFERENCES


