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RESEARCH ARTICLE

DETECTION OF DIATOMS IN DROWNING DEATH CASES OF BIHAR REGION

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ABSTRACT

Diatoms are microscopic algae which are present in all aquatic environments. The primary application of the study of diatoms in forensic investigations is in the diagnosis of drowning as the cause of death. Extraction and identification of diatoms present in the tissue samples can be used as supportive evidence in drowning and also for site specific diatoms. Whenever there is drowning the diatoms along with the water enter the blood circulation and reach the distant organs like bone marrow. In this present work few selected drowning death examination cases were mentioned .The biological sample as well as the water sample from the place from where the dead body was recovered examine in the laboratory by acid digestion method, centrifugation and presence or absence of diatoms were studied under trinocular microscope. 13 cases were selected in which 5 cases showed positive result for diatom test and the rest 8 that showed negative results are mentioned here. Finding also revealed the occurrence of various varieties of diatoms in Bihar region. Thus the study concluded that diatoms test is a valid tool to support the diagnosis of drowning which have a great forensic significance. Further research on molecular level and new methods are required for diatom testing and recognition.

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INTRODUCTION

Diatoms are a major component of phytoplankton community. They are autotrophic and found in both marine and fresh waters. A sub-field of forensic botany is called Forensic limnology in which we study about the presence of diatoms in crime scene samples and victims. A significant number of water-related deaths are due to accidental drowning while a smaller but still significant number represent suicidal or homicidal drowning. Diatom testing is currently an important supporting technique to determine whether a dead body in the water resulted from drowning or from disposal after death. Diatom analysis can also be use to establish the actual site of drowning if samples are available for comparison.

MATERIALS AND METHODS

Soft tissues , femur bone, sternum bone and water sample referred to Forensic Science Laboratory, Bihar, Patna from different district of Bihar . Exhibits were examined in Biology Section in Forensic Science Laboratory, Bihar, Patna. Nitric acid digestion and centrifugation were done .Presence or absence of diatoms were studied under trinocular microscope (Peabody, 1978; Hürlimann, 2000; Taylor, 2007). After microscopic observation of diatoms in both samples, a correlation of diatoms present in the water sample in which drowning took place and material extracted from biological specimen was drawn out accordingly.

RESULTS

In this present work, out of different drowning death examined cases only few selected are being reported in the section of results. 13 cases were selected in which 5 cases showed positive result for diatom test and the rest 8 that showed negative results are mentioned here. (Table 1).

DISCUSSION

The study was done to establish whether or not the victim is likely to have drowned in the suspected drowning medium. On the basis of microscopic examination it is concluded that in sample no 1. Synedra, Nitzschia and Fragilaria species of diatom were detected which were the same species as traced from the water sample from which the body was recovered that indicates that death was attributed to drowning. The microscopic studies of sample no 2 showed the absence of any diatom species in biological sample while two diatom species Eunotia and Pinnularia were detected in the water sample from where the body was found which reveals cause of death was other than drowning. Eunotia, Pinnularia and Achnanthes species were detected in the sample no 3 these diatom species were also detected in the water sample from where the body was found, allow a confirmation of death by drowning of a victim. The finding of sample no 4 was inconclusive. In sample no 5 Pinnularia, Nitzschia,

Table. Diatoms detected in exhibits samples

Sl. No.	Biological Sample	Diatoms in Biological Specimen	Diatoms in water	Result
1.	Sternum (Bone marrow)	Synedra Nitzschia Fragilaria	Synedra Nitzschia Fragilaria	Positive
2.	Soft Tissues (Lungs)	Nil	Pinnularia Eunotia	Negative
3.	Soft Tissues (Lungs)	Eunotia Pinnularia Achnanthes	Eunotia Pinnularia Achnanthes	Positive
4.	Femur (Bone marrow)	-	-	Negative
5.	Soft Tissues (Lungs)	Pinnularia Nitzschia Cyclotella Aulacoseira	Pinnularia Nitzschia Cyclotella Aulacoseira	Positive
6.	Sternum (Bone marrow)	Nil	-	Negative
7.	Sternum (Bone marrow)	Asterionella Synedra	Asterionella Synedra	Positive
8.	Soft Tissues (Lungs)	Nil	-	Negative
9.	Femur (Bone marrow)	Pinnularia	Eunotia Nitzschia	Negative
10.	Sternum (Bone marrow)	Nil	-	Negative
11.	Femur (Bone marrow)	Pinnularia Cymbella Fragilaria	Pinnularia Cymbella Fragilaria	Positive
12.	Femur (Bone marrow)	Nil	-	Negative
13.	Sternum (Bone marrow)	Nil	-	Negative

Cyclotella and Aulacoseira were detected that were drowning associated diatoms. In the sample no 7 both in biological and water sample have similar species Asterionella and Synedra were found shown result of drowning death. Sample no 6, 8, 10, 12 and 13 findings were negative so, here drowning is not a cause of death. Cymbella, Pinnularia and Fragilaria species were detected in sample no 11 which indicates victim had not died before being moved to the water. Thus In those sample were same diatoms are found in both the remains and the water, from these finding it may be concluded that the victim is likely to have drowned in that water and the victim was alive when they entered the water . It proved that when the victim had drown, water is inhaled and subsequently the diatoms in that water reach the lungs and circulated around the body to other internal organs and bodily tissues, including the lungs, brain, kidneys and bone marrow. In sample no 9 diatoms prevalent in the water do not match those found in the body which indicates that body found in water may not have actually drowned in that water. Out of 13 selected cases 5 samples shown positive result while those 8 that shown negative results were mentioned here. The presence of diatoms in the internal organs most likely confirms the ante-mortem drowning . Three possibilities are usually considered for this submersion that are accidental, suicidal and homicidal (Sheikhazadi, 2009). The results of the present study revealed the occurrence of various varieties of diatoms in Bihar region .Ten different species of diatoms were observed. The most frequent diatoms observed were Pinnularia, Eunotia and Nitschzia . These findings are also corroborates with the studies of Bharati et al, 2019 (Bharati, 2019) and Mani and Sahu 2020 (Sneha Mani, 2020). The abundance and uniqueness of diatoms allows for their study to be of great use in legal investigations. Diatoms test has significant role in those cases also where bodies shown advanced stage of decomposition and post mortem symptoms of drowning had lost (Pathak, 2009; Mohanty, 1964; Peabody, 1980; Ranga Rao, 2014). Diatom test is important for the concluding analysis of drowning deaths (Sharma, 2017; Hussain, 2014).Several new methods are developed for diatom testing over the decades (Zhou, 2020). These new techniques have been reduced shortcomings associated with diatom analysis.

CONCLUSION

Thus In forensic, diatom test is an effective tool to support the diagnosis of drowning and solve the crime. Further research on molecular level and new methods are required for diatom testing and recognition .

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