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Diatoms an Conclusive Report for Drowning: A Review

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Abstract

Diatom is an important conclusive tool used in the diagnosis of drowning and dumping cases as the features pf postmortem changes disappear fast when the commencement of putrefaction appears hence diatom is reliable and conclusive test for the diagnosis of drowning diatoms have large number of characteristics feature species diversity and they can be preserved therefore this group can be used as geoforensic science for criminal investigation the temperature and ph. variation plays important aspects in distribution of diatoms at different locations the extraction and identification of diatoms present in tissues plays a role of supportive evidence in drowning at specific site a specific diatoms found in water and specific area of tissue give a reliable result for drowning hence proper measures and identification technique can be followed this paper follows an application of diatoms in forensic sciences.

Introduction

Diatom (Bacillariophyceae) are unicellular, photosynthetic, autotrophic organism which have the cell wall composed of silica called as frustules, frustules made up of two halves known as valves. The diatoms are highly diverse toxin consist of more than 200000 species [1] which are in the range of 2-200um the diatoms are divided on the basis of shape in two orders which is centrales and pennales. The centrales are radially symmetric and the pennales are bilateral symmetry [2] the siliceous walls have the pattern of pores, ribs, minutes spines and marginal ridges which is used to delineate genera and species [3]. When drowning death occur there is suspicion of antemortem or postmortem drowning in these aspects diatoms plays important role to counter the cause of death therefor for the investigation of death in drowning we need to establish the diatom extracted from the organ and the water samples collected from the putative sites of drowning for the determination of drowning in forensics laboratory [4-10]. Drowning test done in done in forensic pathology is a tough task and the number of test were developed to confirm the cause of drowning death therefore continuous monitoring of freshwater and species level identification is useful for diatom flora in the medico-legal investigation.

History of Diatom Test

Diatoms were first done by Hofman [11] in the lung fluid whereas incze [12] also detected diatoms in blood and parenchymal organs and stated that diatoms could enter into circulation through lungs. Diatoms found to be detected in bone marrow by Tamasaka [13]. Porawski [14] in his study stated that presence of diatom in organs and bone marrow is an indication of the antemortem drowning inhaled water during drowning in the era of 1960 and 1970 Timperman Hurlimann J [15] presented their paper for the presence of diatoms in the bone marrow, lung , liver ,spleen, brain tissue these part of the organs are used for screening of drowning death the presence of diatoms can be identified qualitative

and quantitively the extraction method used for drowning is acid digestion method by pollanen. In 80-90% diatoms in bone marrow match with the drowning medium [16].

Cameron stated in his research paper diatoms are diverse remains and can be identified with high taxonomic precession these factors also allow diatoms to be used in the range of application in forensic geosciences [17,18].

Horton in his study stated about the diatoms that it acts as valuable and important tool in identification of drowning death

Extraction, Isolation of Diatoms from the Sample

The diatom extraction process starts with the complete destruction of tissues samples for the extraction and detection of diatoms the acid digestion method is used for the diatom identification the bone marrow is removed with the help of spatula and placed in a flask approximately 50 ml of nitric acid is added into the conical flask this bone is suspended and boiled in on hot plate in fuming hood for 48h. these suspension is cooled an then it is centrifuged and washed with double distilled water then the opted out final sediment is placed microscopic slide and examined on phase contrast microscope for the detection of diatom Hurlimann, et al. [19] stated that use of nitric acid for the extraction of diatoms from bone marrow tissue and bortolotti, et al. [16] they used nitric acid for the extraction of diatoms from the lungs and sternum bone whereas Krstic, et al. [5] used sulfuric acid for the extraction of diatoms from kidney, liver ,lungs etc. There are limitations in acid digestion method as structure of the diatoms get destruct due to acid treatment but as he researchers progressing in the conducting research lefort aqua regia (3:1 nitric acid to hcl) by Hatpin Wang, et al. [20] have improved the old acid method for analyzing diatoms as these are time consuming and dangerous. enzymatic digestion method used by kakizaki, et al. [21] stated in his paper about solubilizing lung tissues by using Qiagen proteinase, buffer ATL, and 5N HCL, which accelerate and simplify diatom extraction from suspected drowning cases various molecular technique can be used for the detection of 16s rRNA subunits of ribosomal RNA for the detection of planktonic DNA from human tissues in drowned victims [22]. When a person gets drowned in the water of diatoms due to aspiration of fluid they enter into the lungs portion and microscopical tears get develop due to forceful expiration in alveolar walls they get enter into blood linings many studies have conducted in the world to show that different interval organs can be used for the diatom testing Aghayev stated in his paper that left ventricular blood can be used for the diatom testing whereas pacher and Cameron showed hat liver, brain and kidney can be used for diatom testing. Anand and unmesh have utilized bone marrow and nasal sinus aspirate and lungs bits for the detection of diatoms.

Importance of Diatoms Test and Its Limitations

The diatom test can help in ascertaining whether the cause of death is drowning or not. When the criminals dump the body after committing the crime to simulate the death as drowning so theses microscopical test of autopsy in drowning detection of diatoms, by acid d death are plume of froth on the mouth and nostrils, lung emphysema, oedema aquas Om, paltauf spots, froth in trachea and pleural effusion. diatoms resist putrefaction so diatoms are the, most conclusive in the cases where decomposition or putrefaction appears and postmortem symptoms got diminished studies have conducted on diatoms which states that skeletonized bodies and the bodies with advanced stage of decomposition only diatom confirm antemortem drowning. The criticism lies on the fact that validity of diatom test is protentional of ante-mortem and post- mortem penetration of diatoms and detection of diatoms in non-drowned bodies whereas presence of diatoms is high abundance is required in putative sites of drowning for the positive finding's detection of diatoms, when strong acid heated eliminate harmful gases such as nitrogen oxide can cause health hazards. planktons by acid digestion method are not possible. from the studies we have concluded that rapid death in drowning medium, low abundance of diatoms in drowning water makes inefficient methods of extraction and detection and inappropriate tissue sample can give negative results or lesser number of diatoms in tissue samples.

Conclusion and Summary

Qualitative and quantitative analysis of diatoms can be done by identifying or detecting diatoms in the samples and counting can be done for the number of species results pertaining to these studies should be interpreted.

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