H75 Alibi Verification Using Diatoms

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After attending this presentation, attendees will understand the use of diatoms in a forensic case to verify an alibi.

This presentation will impact the forensic science community by utilizing evidence that was previously disregarded but in actual fact contributed to solving a case.

The corpse of a young girl was found on the shore of Bracciano Lake (Rome, Italy) one early morning in November, 2012. The corpse was identified as a girl who disappeared the day before, after she spent a night out with her boyfriend. The relationship between them was known to be turbulent and the boy, when questioned about the events of the night of the girl's disappearance, admitted to having an argument with her. Furthermore, he told the investigators that because of the argument he let the girl out of the car late that night, not far from the lake and a few kilometers from her house. When questioned about the time between letting her out of the car and the discovery of the corpse, he stated that he was at home and had never been at the lake that night.

The autopsy noted there was no sign of violence associated with the body. She had not been sexually abused and the results of the toxicological analyses were negative. The death was found to be as a consequence of natural causes but the results were still controversial. Due to the circumstances surrounding the death, a further investigation was requested to clarify the events of that night. In particular, an investigation was conducted to verify if the boy had been at the lake that night.

The resulting investigation was an analysis of the boy's clothing to determine the presence of diatoms and to identify if the diatom assemblage of the lake could be matched both to his clothes and to the place where the corpse was found.

Diatoms are unicellular organisms that are present in almost all natural aquatic environments such as seas, lakes, rivers, streams, and even puddles of rain water, but are generally absent in tap water. Many species are habitat specific. Diatoms have a hardened silica structure that is resistant to chemical treatments and have morphological features that can be used for species identification. Diatoms can be found in clothing, proving a possible contact with a particular water type in which a specific diatom community is present.

All the garments belonging to the boy underwent a diatom test and samples of both tap water of the house and the water of the lake were used as reference. The glass bottles used to collect the water were sterile to avoid the presence of extraneous diatoms, while each garment collected was placed in a separate bag to avoid possible diatom transfers between items. Formalin was added to both of the reference waters and after settling for 48 hours, the supernatant was discarded. The pellet was first treated with H2O2 and then with 10% HCl. This was followed by three washing steps: (1) a 2g-sample of each of the boy's clothes were rinsed in 70% ethanol; (2) each sample was placed in a 50ml plastic tube with 50ml ethanol solution (70% in water) and left in a rotator for 48 hours; and, (3) the cloth was removed and after settling for 48 hours, the supernatant was discarded.[1] The pellet underwent the same treatment as the reference waters.

Samples were mounted with a high refractive index medium and were analyzed with an optical microscope. The species composition was determined from both a subsample from the lake, tap water, and clothing pellet and the species of diatoms were compared and recorded. A large number of diatoms were found in the water samples collected from the Bracciano Lake, while only a single diatom cross-matched with the sample of tap water. Furthermore, diatoms extracted from a number of pieces of clothing belonging to the boy were a positive match with the diatoms collected from Bracciano Lake.

An interesting discovery during this investigation was the identification of the outfit that the boy was wearing the night of girl's disappearance, which happened to be the clothing that was matched to the diatom test.

Reference:

1. Uitdehaag S, Dragutinovic A, Kuiper I. Extraction of diatoms from (cotton) clothing for forensic comparisons. *Forensic Sci Int*. 2010:200(1-3):112-6.

Diatoms, Alibi, Clothing