Objective Diagnosis of Drowning by the "Diatom Test" — A Critical Review

REFERENCE: Bortolotti F, Tagliaro F, Manetto G: Objective diagnosis of drowning by the "diatom test" — A critical review; *Forensic Sci Rev*; 16:135–148; 2004.

ABSTRACT: The identification of diatoms in the body tissues to prove a death by drowning (known as the diatom test) dates back to the end of the 19th century. However, in recent decades the reliability of this method was disproved because of an alleged inaccuracy and high false positive rate; nonetheless, the matter is still highly controversial. The purpose of the present work is to offer a critical review of the subject with a specific emphasis on the technical problems. In particular, contamination of samples during autopsy and of tissue extracts during processing was recognized as the main source of false positive results. However, the possibility of diatom passive penetration into the body (particularly into lungs) during submersion cannot be excluded, especially in highly transformed cadavers. Hence, tissues that are highly secluded from the drowning medium, such as bone marrow, are preferred as samples, according to the most recent literature. Additional information on the drowning site and circumstances can be drawn from the qualitative and quantitative comparison between the diatoms found in the body tissues and those present in the drowning water. From the analytical point of view, the majority of authors digest tissues by treatment with strong acids, often after oxidation; alternatively, proteolytic enzymes are widely used. Detection is generally carried out by light microscopy, but scanning electron microscopy (SEM) shows much better resolution, which is important for the identification of the smallest diatoms or diatom fragments.

In the experimental part of the work, a recent evolution of SEM, known as environmental scanning electron microscopy (ESEM) has been tested on drowning victims. The main feature of ESEM is the possibility to work on standard microscopic preparations without the need of sample coating, which allows switching between light and electron microscopy, thus taking advantage of the wide optical field of the former technique and of the high resolution of the latter. On this basis, we propose an integrated approach to the diatom test including a screening with light microscopy (200–400×) and a confirmation with ESEM (5,000–20,000×). The review includes 92 references.

KEY WORDS: Diatom test, drowning, environmental scanning electron microscopy, ESEM.