H2 The Application of Decomposition Scoring Methods to Predict Postmortem Submersion Interval (PMSI) in Human Bodies Recovered From Aquatic Environments: A Comparison Between Freshwater and Salt Water in Italian Areas

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Learning Overview: After attending this presentation, attendees will understand the applicability of aquatic decomposition scoring methods to predict PMSI in human bodies recovered from Italian rivers and the Mediterranean Sea near Italian coasts.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by aiding in the estimation of PMSI in submerged corpses in temperate climatic areas.

Determining PMSI may be problematic, since an aquatic environment can affect the rate of postmortem decay. In several studies, performed in northern Europe, PMSI has been estimated through scores that evaluate visual postmortem modification on the head and neck, trunk, and limbs. Based on the scoring system developed by Megyesi et al., Heaton et al., and van Daalen et al. recently developed two new scores to assess aquatic decomposition.[1-3] Basing on the transformative processes observed on head and neck, trunk, and limbs, a Total Aquatic Decomposition Score (TADS) is calculated and related to PMSI. Moreover, since aquatic decomposition is time and temperature dependent, TADS has also been related to Accumulated Degree Day (ADD), which is the sum of average daily temperatures of the body of water, along with the submersion interval.[2-4]

Different environmental conditions and ecosystems influence the rate of decomposition and the relationship between TADS, PMSI, and ADD. Therefore, there is a growing need for systematic studies on human decomposition in aquatic environments.

The goal of this study is to evaluate whether the scores developed by Heaton et al. and van Daalen et al. are suitable in estimating the PMSI in bodies recovered from aquatic environments in a temperate area, namely Italian rivers and the Mediterranean Sea, near the Italian coasts.[2,3]

Both scores were tested on 285 bodies recovered from freshwater and 45 bodies recovered from the sea, in which PMSI was known. The degree of decomposition within the study samples was heterogeneous, varying from no visible changes to almost complete skeletonization. Postmortem decomposition was assessed using photos taken during death scene investigations. Aquatic temperature to calculate ADD was assessed by referring to official weather databases. The scores obtained through the application of the scales were compared with the real PMSI and the related real ADD values. Regression analysis was conducted to evaluate the accuracy of TADS in predicting the PMSI, according to the following logical frame: (1) TADS according to Heaton et al.'s score vs PMSI; (2) TADS according to Heaton et al.'s score vs ADD; (3) TADS according to van Daalen et al.'s score vs PMSI; and (4) TADS according to van Daalen et al.'s score vs ADD.

The correlation between the TADS and PMSI was calculated and a high correlation was observed, especially for van Daalen et al.'s score. The different regression coefficients obtained in relation to the freshwater cases and the salt water cases confirm the influence of the different aquatic environments on the rate of postmortem decay.

According to this study, both scoring methods can be applied to bodies recovered from fresh and salt aquatic environments within the Mediterranean area, taking into consideration the climatic features with periodical temperature variation, to achieve the best accuracy in predicting PMSI.

Reference(s):

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2. Heaton V., Lagden A., Moffatt C., Simmons T. Predicting the Postmortem Submersion Interval for Human Remains Recovered from U.K. Waterways. *J Forensic Sci.* 55, no. 2 (March 1, 2010): 302-07.
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PMSI, Decomposition, Score