

B119 Clarifying Blood Pool Vocabulary

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Learning Overview: After attending this presentation, attendees will understand the necessity for appropriate definitions of blood pools applicable to crime scenes and court testimony.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by illustrating the need for standardized contextual definitions of blood pools.

The language of science is essential to accurately conduct and report scientific findings. Correct standardized blood pool terminology is imperative to avoid uncertainty in evidence. An overview of relevant literature is provided. Current definitions associated with “blood pools” are vague, focusing on biological and physiological processes. Revision of relevant vocabulary is necessary for standardization and interpretation of each chronological coagulation phase. Chronology is then applied to crime scene reconstruction, relating to time of injury.

The American Standards Board definitions regarding “blood clot,” “serum stain,” and “blood pool” are problematic. Literature generally provides biological information, not visual criteria for characteristics such as coagulation chronology.¹ Without standards for the initiation of each coagulation phase, this information cannot be used to determine time of injury at a scene.

“Blood clots” are described as a gelatinous mass formed through complex biological processes.¹ Some literature’s benchmark for clot formation is “the point at which no flowback occurs.”² Other literature used “no flowback” for determining the initiation of a clot.³ However, “no flowback” as a standard is subjective and ambiguous, leading to potential error. Confusingly, literature records the beginning of clot formation to be between 5 and 20 minutes, and pool spread, implying a lack of clot completion, to continue for 15 to 30 minutes.^{2,4} Clear and concise definitions allow interpretation of initial clot formation.

A “serum stain” is the liquid portion of blood separating from the solid portion as a clot is forming.¹ Literature neglects a standard for the initiation of serum separation. Serum stains do not form in “smaller pools,” an arbitrary description of blood volume.^{4,5} A benchmark is necessary for determining the commencement of a serum stain, otherwise the exact volume of “smaller pools” cannot be ascertained. Serum separation is also an indicator of clot contraction, another important marker in the chronology of coagulation.

“Blood pools” are currently defined as an accumulation of blood on a surface.¹ This definition is similar to a “blood stain”—a deposit of blood on a surface.¹ “Blood pools” and “blood stains,” however, are different. “Blood stain” is generically used for deposited blood at a crime scene. Therefore, contextual markers are indispensable to distinguish a “pool” from a “stain.” These misnomers can be avoided through definitional revision of “blood clot” and “serum stain.” For example, a “blood pool” should be defined to exhibit serum separation, thereby limiting “smaller pools” from the current interpretation. Revised descriptive definitions will provide a clearer interpretation of a crime scene, accurate written reports, and reliable court testimony.

Current definitions of vocabulary regarding blood pools must be revised by a standards board (National Institute of Standards and Technology [NIST], Organization of Scientific Area Committees [OSAC], etc.). Once benchmarks for each phase have been determined, research on the effect of internal and external factors (such as anticoagulants, humidity, volume, etc.) will be applied to crime scene reconstruction. “Blood clots” and “serum stain” terminology require clear standards to determine the initiation of each coagulation phase. With an accurate and reliable interpretation of the chronology of coagulation, a contextual definition of blood pools can be applied to crime scenes. Much like the dissemination of current standardized terminology, a publication should be made available to the relevant disciplines. Seminars and trainings should be conducted to ensure accurate and confident interpretation of corrected standards of the revised definitions.

Standardized scientific terminology creates uniform, non-ambiguous reporting of scientific evidence and testimony. Based on surveyed literature, a revision is needed for the definitions of “blood clot,” “serum stain,” and “blood pool.” While current definitions discuss biological and serological facets of blood pools, they do not address the chronology of coagulation. Appropriate contextual addendums to current definitions should minimize subjective interpretations and confusion concerning time since injury in crime scene reconstruction. These findings will then be accurately and reliably conveyed in written reports and court testimony. Clarification is needed for blood pools in crime scene reconstruction.

Reference(s):

1. American Standards Board. Terms and Definitions in Bloodstain Pattern Analysis. *ASB Technical Report 033*, no. 1 (2017).
2. Anita K. Wonder. What is Blood. *International Association of Bloodstain Pattern Analysis News 2*, no. 2 (May 1985).
3. Celestina Rossi, Misty Holbrook, Stuart H. James, Daniel Mabel. Medical and Forensic Aspects of Blood Clot Formation in the Presence of Saliva – A Preliminary Study. *Journal of Bloodstain Pattern Analysis 28*, no. 3 (2012): 10.
4. Nick Laan, Fiona Smith, Celine Nicloux, David Brutin. Morphology of Drying Blood Pools. *Forensic Science International 267* (2016): 104-109.
5. Frank Ramsthaler, J. Schlote, C. Wagner, J. Fiscina, M. Kettner. The Ring Phenomenon of Diluted Blood Droplets. *International Journal of Legal Medicine 130*, no. 3 (May 2016): 731-736.

Vocabulary, Crime Scene, Blood Pool