A12 A Preliminary Study: Evaluating the Error Rate Associated With Bloodstain Pattern Analysis

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After attending this presentation, attendees will be able to evaluate the error rate associated with basic bloodstain pattern recognition.

This presentation will impact the forensic community by illustrating the first systematic attempt at determining an error rate for bloodstain pattern analysis. This information can be critical in evaluating if bloodstain pattern analysis can be used in court.

Over the past 25 years, the individualization of biological evidence has improved dramatically. Forensic DNA testing has literally transformed forensic science. Since the early days of Gross and Locard, forensic science was an active part of the investigation. Over time the laboratory seemed to drift more into a reactive role primarily being used at trials. The power of DNA databases changed that. Now once again, forensic science could be used to further the investigation and even develop suspects. As useful as forensic DNA testing has become, it is not a panacea. A blood sample collected from a pool under the copiously bleeding victim will most likely be from that victim.

Since all of the bloodstains on a case are not usually tested, understanding the basic mechanisms of bloodstain pattern formation is necessary to adequate sample evidence for DNA testing. Also there can be times when understanding bloodstain patterns can provide more information than the subsequent DNA analysis. When a suspect claims that they received the victim's blood on their clothing after they attempted to help them, this issue cannot be resolved with DNA. The suspect already admitted that it was the victim's blood. In this case the pattern produced by the blood can be more useful than the knowledge of whose blood it is.

The information provided from bloodstain patterns have been used in criminal investigations and court rooms since the late 1800s. As scientific evidence, it has been subject to the different admissibility standards that have evolved in the US criminal justice system. The *Frye* standard (Frye v. United States, 54 App. D.C. 46, 293 F. 1013, 1014 (1923)) essentially evaluated if the expert was qualified, if their testimony will assist the jury, and if the science used was generally accepted by the scientific community. For the most part Bloodstain pattern testimony has not undergone a significant challenge through the Frye standard.

In the early 1990's a civil case reevaluated scientific expert testimony. Daubert v. Merrel Dow Pharmaceuticals, Inc., (509 U.S. 579 (1993) changed the admissibility of scientific evidence to include a more detailed evaluation of the methodology used in the analysis. *Daubert* asserted that the procedure used for the analysis had been tested, subject to peer review, have a defined error rate, and/or was generally accepted.

Not every state uses the *Daubert* standard. Some use Fry or even a combination of Frye and Daubert. For the states that are affected by *Daubert*, techniques such as bloodstain patterns must demonstrate an error rate which can be challenging to quantify. This preliminary study evaluated the error rate associate with the first step of bloodstain pattern analysis, basic pattern recognition.

To accomplish this, known bloodstain patterns were created in a controlled environment using defibrinogenated sheep's blood. The patterns were then photographed with a scale in place using a digital camera. The resultant images were then incorporated into a web-based survey tool. To eliminate issues of stain terminology, participants were asked to describe in a text box how the patterns were produced.

Once all of the patterns were produced, an alpha test was performed with the known patterns and a number of different qualified bloodstain pattern analysts in the same web-based format. These analysts ranged from crime scene personnel to scientists, both with a history of significant publication in the area of bloodstain pattern analysis. In order for a question to remain on the survey, it had to be answered correctly by 100% of the individuals taking the alpha test.

The final version of the test was given to participants that were directly solicited based upon directories to professional organizations and other means. While the survey was performed anonymously, a generic password was used to gain access. Once on the site, some basic information was collected about the participants: education, training, professional affiliations, certifications, and experience. A text box was also provided for participants to add any additional information that they thought was pertinent. Before beginning the study, participants watched a very brief video that described the significance of the study, how the study was created and how the patterns should be evaluated. After the pattern recognition portion of the survey was complete, a brief questionnaire followed about the survey.

***Daubert*, Bloodstain Patterns, Error Rate**

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