



B64 Migration of Seminal Fluid Components and Spermatozoa in Semen Stains Exposed to Moisture

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The goal of this presentation is to provide attendees with a general understanding of the observed migration patterns of seminal fluid components and spermatozoa when semen stains are exposed to varying amounts of water and allowed to dry while positioned at different angles.

This presentation will impact the forensic science community by suggesting modifications for processing sexual assault evidence that has been exposed to moisture in order to maximize the likelihood of detecting semen and spermatozoa.

Typically, semen testing involves presumptive and confirmatory tests to determine the region in which a semen stain has been deposited prior to initiating DNA analysis; however, previous research has shown that the soluble components of seminal fluid, but not spermatozoa, migrated from their original location on cotton cloth upon exposure to porcine decomposition fluids and rainfall/dew.¹ This indicates that preliminary testing and detection techniques may result in areas being sampled that will not yield a successful DNA profile. It is hypothesized that the more moisture a semen stain is exposed to, the greater distance the soluble seminal fluid components will travel, but that minimal spermatozoa migration will occur. It is also reasoned that the extent and direction of semen migration will be dependent on the degree of wetness and the position (angle) of the substrate at the time of moisture deposition.

Neat semen was deposited onto swatches from cotton sheets and allowed to dry before being sprayed with 2mL, 5mL, or 10mL of water. The swatches were allowed to dry while lying flat, at 45°, or at 90°. A total of 13 swatches were created: one at each moisture level at each angle and one control with no water applied. The swatches were viewed with an Alternate Light Source (ALS) at 450nm using orange barrier filter goggles and photographed. Three swatches were sprayed directly with Acid Phosphatase (AP) Spot reagent to determine any potential interference with subsequent P30 and DNA analysis as well as to help determine distances for sampling. Three-millimeter punches were taken from each swatch at 13 locations (one from the center of the stain and four at 1cm, 4cm, and 7cm out from the perimeter of the stain in multiple directions), and were extracted for two hours prior to testing for the presence of P30.

Observation of the swatches under ALS revealed that the fluorescing component(s) of semen traveled up to 3cm from the original stain location. Less migration of fluorescence was observed with the samples exposed to 2mL of water compared to the samples exposed to 5mL and 10mL, regardless of the angle. The samples exposed to moisture while positioned at an angle showed fluorescence migration primarily to the sides and below the stain as expected due to gravity. This effect was more pronounced in the samples at 90° compared to those at 45°.

AP testing showed positive results beyond the original stain region, demonstrating seminal fluid migration for several centimeters in all directions. Positive P30 results were obtained for all swatches at 1cm from the stain in at least one direction. The sample exposed to 10mL of water at 90° also displayed a positive P30 result at 4cm from the stain.

Microscopic examination of slides made from the extracts of each cotton punch revealed minimal spermatozoa migration for all swatches; the majority of the samples outside of the stain deposition area showed no spermatozoa, although a few showed a single sperm cell. These findings demonstrate that the soluble components of semen stains that often aid in detection will migrate when exposed to moisture, while sperm cells containing genetic material largely remain in their original location. Results of DNA testing on select areas from each swatch at varying distances will be presented.

Reference(s):

1. Bemelmans E.A. Effects of decomposition on the recoverability of biological fluid evidence. Proceedings of the American Academy of Forensic Sciences, 67th Annual Meeting, Orlando, FL. 2015.

Semen Detection, Sperm, Moisture