B126 Transfer of Sperm Cells During the Laundering Process

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After attending this presentation, attendees will understand the possible transfer of spermatozoa from one fabric item containing an original semen stain to another previously unstained fabric item during the laundering process.

This presentation will impact the forensic science community by potentially influencing how examiners in a forensics laboratory might treat future casework and what items of evidence criminal investigators might collect if the cases they encounter involve clothing items which have been laundered together.

During a sexual assault investigation, clothing and bed sheets are often collected due to their potential evidentiary value. Sperm cells recovered on such items may provide insight into the allegation but may also produce challenges when interpreting such results. The question then becomes whether the findings were from a direct deposition (potentially establishing sexual contact between suspect/victim) or from an unrelated event (transfer in the washing machine).

There have been several studies which have addressed the persistence of seminal fluid during the laundering process; however, the literature is scarce regarding the transfer of spermatozoa between items during the laundering process. Between the published papers specifically addressing transfer, there are conflicting reports on whether or not transfer occurs.

This project was designed as an initial study to assess the transfer of sperm during the laundering process. Seminal fluid was obtained from a fertility clinic and anonymous donors. A total of 24 cold water (18°C) washes were conducted using the same top-loading Maytag® Performa washer. Each wash cycle was completed using a "mini" water load and set to the "normal" wash cycle. Two types of detergents were tested, Liquid Tide® (phosphate) and Seventh Generation™ Detergent Pods (phosphate-free). Then 2mL of semen was deposited onto three types of "source" (stained) fabrics: 100% cotton panties, 100% cotton towels, and 60% cotton/40% polyester bed sheets. Each of the 24 wash cycles contained one "source" item and three equal size "receiving" (unstained) fabrics. Half of the stained "source" fabrics were air dried for 24 hours prior to washing and half were allowed to air dry for seven days. After washing, all fabrics were air dried.

Each "source" and "receiving" item was examined visually with an Alternate Light Source (ALS). Each item was then tested for acid phosphatase using AP Reagent solution and for the presence of the p30 protein using Seratec® PSA cards. Cuttings from each item were treated and extracted onto a microscope slide, dried, and stained using the Christmas Tree dyes, and examined microscopically.

Twenty-one out of 24 "source" fabrics tested positive for acid phosphatase and 20 out of 24 "source" fabrics tested positive for p30 protein. Fifteen out of 24 "source" items had visual fluorescent stains under an ALS. None of the "receiving" fabric items fluoresced under the ALS and none tested positive for AP or p30 protein. For the "receiving" items air dried for 24 hours prior to washing with a "source" item, 29 were negative for sperm while the remaining 19 had sperm counts ranging from 1 to 50+; with an average of 6.5 sperm/item. For the "receiving" items air dried for seven days prior to washing with a "source" item, 23 were negative for sperm while the remaining 25 had sperm counts ranging from 1 to 31, with an average of 5.6 sperm/item.

Cuttings from each "source" and "receiving" item were tested for DNA using polymerase chain reaction techniques. Twenty-two out of 24 "source" items provided full profiles consistent with the donors. One "receiving" sheet and two "receiving" towels provided full profiles consistent with the donors. Three "receiving" sheets, eight "receiving" panties, and three "receiving" towels provided information at a minimum of six loci, providing partial profiles in which the donors could not be excluded. All samples were extracted using a QIAGEN® EZ1® and quantified using Plexor® HY on an AB 7500®. Following the quantitation results, all of the samples were amplified using Identifiler® on an AB 9700®, and capillary electrophoresis was performed using an AB 3130*xl*.

In this study, sperm heads were visualized on the "receiving" items, demonstrating that transfer of spermatozoa during the laundering process can occur. This is important information to be aware of for investigators and laboratory scientists. Additional work is needed to develop enhanced evidence-collection guidelines. The results of future testing will help define laboratory sampling protocols and data interpretation procedures.

Sperm, Transfer, Washing Machine