A45 Comparison of Two Immuno- chromatographic Test Strips for the Detection of PSA

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After attending this presentation, attendees will have gained further insight into the sensitivity and specificity of two commercially available immunochromatographic tests for the detection of Prostate Specific Antigen (PSA also known as p30). Of particular interest are potential concerns regarding the specificity and sensitivity of immunological-based assays in forensic-type casework. The detection of endogenous p30 from controlled vaginal swabs raised potential concern for the application of these methods in the forensic community. Furthermore, some assays demonstrated the loss of cellular material prior to microscopic analysis and/or downstream analysis.

This presentation will impact the forensic science community by raising awareness of the limitations that exist with current immunochromatographic test strips employed by forensic practitioners.

The brentamine blue spot test for acid phosphatase (AP) is often used as a preliminary screening test for suspected semen stains. Given its limited specificity, suspected semen stains must be analyzed microscopically for the presence of spermatozoa. If spermatozoa are not present, suspected semen samples may be tested for the presence of PSA in conjunction with microscopic examination. PSA is present in high concentrations in seminal fluid but is also found in lower concentrations in amniotic fluid, breast milk, vaginal secretions, and female urine. Current testing methods that exist for the detection of PSA, such as double immunodiffusion, are both time consuming and lack sensitivity. Internal validation of several commercially available immunochromatographic tests for the detection of PSA was conducted. Validation of two independent assays was performed to evaluate the sensitivity, reproducibility, stability, and specificity of each test.

Known semen samples were detected down to a 10^{-4} dilution in both test strips, with reproducibility of positive results from a 10^{-3} dilution. Positive results for the AP test were observed in dilutions down to 10^{-2}. Confirmatory identification of spermatozoa was detected in samples containing dilutions down to 10^{-4} through microscopic analysis. The use of deionized water as an extraction buffer had no adverse effects on test sensitivity or specificity results. Specificity of the tests was demonstrated through negative results in all body fluids tested with the exception of male urine and vaginal secretions. The addition of more vaginal swabs from females with complete sexual and menstrual cycle history was obtained. These samples demonstrated a surprising false positive rate of approximately 30% for PSA for both tests. Chemically treated samples were used to demonstrate the stability of both test strips. One of the immunochromatographic strips indicated significant loss of cellular material, both epithelial cells and spermatozoa, when the test extract was used for microscopic detection of spermatozoa in downstream testing.

Based on these analytical results, both of the immunochromatographic assays under evaluation demonstrated comparable sensitivity and specificity for the detection of PSA from forensic-type samples. The loss of cellular material that was observed microscopically in this study can have serious consequences in DNA investigations and can significantly impact a forensic case. The lack of specificity for PSA as a seminal marker raises concerns regarding the implementation of immunochromatographic-based tests for the detection of PSA in forensic-type casework.

Seminal Fluid, Vaginal Secretions, Rapid Test Strips

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