



### **B25 A Review of Mixture Profiles in the CAP Forensic Identity Proficiency Testing Program**

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The goal of this presentation is to review the reported mixture profiles of human spermatozoa with epithelial cells and white blood cells in proficiency DNA testing results from the Forensic Identity proficiency testing program.

This presentation will impact the forensic community and/or humanity by demonstrating to the forensic DNA community is doing an excellent job in the interpretation of mixed samples.

Learning Objective: to review the reported mixture profiles of human spermatozoa with epithelial cells and white blood cells in proficiency DNA testing results from the Forensic Identity proficiency testing program.

In 1993, the College of American Pathologists first offered the Forensic Identity (FID) proficiency testing program. The FID program distributes two (2) mailings per year. A combination of specimens consisting of reference bloodstains, mock vaginal swabs, crime scene bloodstains and/or semen stains, and other biological material are provided in each survey. Since a significant percentage of submitted cases to the crime laboratories contain mixed specimens such as vaginal swabs, oral swabs, anal swabs, or stains from sexual assault cases where human spermatozoa are present, the College includes such specimens in the surveys. In every mixed sample to date in the FID program, the contributor of the "cell" fraction has been from a female victim.

One major advantage of DNA testing over traditional serological testing is the ability to separate the spermatozoa (hereafter referred to as "sperm") from the epithelial and white blood cells (hereafter referred to as "cells"). The first survey of this program contained a mock vaginal swab sample. The swab was prepared from isolated white blood cells from the same donor of the victim. The leukocytes were isolated in a LeucoPrep tube and the leukocytes were counted on a Coulter counter. Approximately one million white blood cells were spotted onto a sterile SOLON cotton-tipped applicator and allowed to air dry. Semen from the suspect was mixed 1:1 semen:1X PBS. 50µL of this mixture was spotted onto the cotton-tipped applicator. Variations of this original procedure are still used in this program today. Other mixed specimens have included a mixture of whole blood and semen on a swab, an undergarment, and filter paper.

In the earlier surveys, participants reported results mostly for restriction fragment length polymorphism (RFLP) analysis, with some laboratories reporting results for AmpliType™ HLA DQ-alpha, D1S80, and a couple short tandem repeat (STR) loci. Today, approximately 150 laboratories are reporting results with STRs in the CAP Forensic Identity program. The forensic community has standardized the reporting of PCR STR technology over the years; in-so-much, the survey has evolved in the reporting of mixed specimens.

Since STR technology is the current standard in forensic laboratories, an evaluation of the separation of these mock mixed specimens and the reporting of the discrete alleles has been conducted. Not surprising, the "sperm" fraction contained less minor contribution of DNA from the "cells" due to the ability of the DNA analysts to successfully separate the spermatozoa from the cell fraction. This presentation will examine the different combinations of discrete alleles and portray the combinations of mixtures reported. For example, with >10 participants reporting, 96.1% to 100% of the participants reported the profile of the sperm fraction only, representing excellent separation. Of those systems with 100% of the participants not reporting a mixture, the victim shared one or more alleles with the suspect and had no alleles different than the suspect. Further, upon close examination of the "cell" fraction, the different combinations of reported results for this sample demonstrated a greater range of variation depending on the combination of shared and non-shared alleles. This combination of alleles will be closely examined. Pattern interpretation of such mixtures from the most recent surveys using STR results will be presented.

#### **Proficiency Testing, Mixture Interpretation, College of American Pathologists**