A72 Detection of Male DNA in the Vaginal Cavity Following Digital Penetration Using Y-Chromosome Short-Tandem Repeats

Kayla R. Sween, BS, 639 Fox Farm Rd, Asbury, NJ 08802; and Janine Kishbaugh, MS, and Gina Hampson, MS, Cedar Crest College, Forensic Science Program, 100 College Dr, Allentown, PA 18104*

After attending this presentation, attendees will understand the value of collecting sexual assault forensic evidence (SAFE) kits from child sexual assault victims and female victims who have been digitally (finger) penetrated. Attendees will also become aware of how analysis of vaginal swabs has been optimized with application of using Y-chromosome short tandem repeats (Y-STRs) to establish a time interval in which a deoxyribonucleic acid (DNA) haplotype can be obtained from vaginal swabs following digital penetration.

This presentation will impact the forensic science community by displaying the value of collecting evidence from sexually assaulted adolescents as well as females that report digital penetration.

Analysis of sexual assault cases can be challenging if there is no report of vaginal-penile penetration, and the difficulty of analysis increases as the time interval extends between the incident and the report. Sexual assault evidence kits are not commonly collected in the majority of cases if there is only a report of digital penetration; this is due to the belief that there will not be enough DNA from the perpetrator to be detected. The value of Y-STR genotyping has been previously established in sexual assault cases where autosomal short tandem repeats (STRs) are not suitable.[1] This allows for low copy number DNA from the male perpetrator to be detected, eliminates the need for mixture interpretation, and allows for a longer window of detection.

This study has determined that male DNA can be detected from swabs collected from the vaginal cavity following digital penetration. Initial samples analyzed prior to method optimization resulted in detection of 10 of 12 alleles. The purpose of this study is to optimize the methodology used to detect male DNA from the collected vaginal swabs. The second goal is to establish a time interval in which a meaningful Y-STR haplotype can be obtained post digital penetration and determine the likelihood ratio of obtaining Y-STR haplotypes at 1, 6, 12, 24, and 72 hours post-digital penetration.

The optimization of analysis included varying parameters of existing commercial protocols. A modification of a DNA IQ[a] extraction protocol was used to maximize the initial concentration of DNA extracted from the vaginal swabs. Other modifications to the analysis method included the elimination of a quantitation step prior to amplifying the DNA extract using PowerPlex® Y to amplify only male DNA. Additional optimization steps included concentration of some of the DNA from the collected samples prior to amplification. Slight alterations to the capillary electrophoresis protocols were also made to maximize detection of the male DNA.

To obtain the samples that would simulate a sexual assault kit, male-female couples were asked to abstain from sexual activities for a given period of time prior to collection. The couples participated in vaginal-digital penetration for a discrete period of five minutes. Female participants collected four swabs prior to penetration as a control, and four swabs at each of the five time intervals. The vaginal swabs were then processed using the optimized protocol from above to allow for the greatest detection of male DNA. To date, results have shown that full PowerPlex® Y profiles have been obtained from vaginal swabs collected one hour following consensual digital penetration

Reference:

1. Sibille I, Duverneuil C, de la Grandmaison GL, Guerrouache K, Teissiere F, Durigon M, *et. al.* Y-STR DNA amplification as biological evidence in sexually assaulted female victims with no cytological detection of spermatozoa. For Sci Int 2002;125(2): 212-16.

Y-STR, Sexual Assault, Digital Penetration

 ** Presenting Author*