



B11 A Comparative Study of Differential DNA Extraction Methods in United States Laboratories

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Learning Overview: The goal of this presentation is to assess the different methods of differential DNA extraction of mock sexual assault kits employed by labs across the United States by comparing male to female DNA ratios.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by trying to change how individual labs process their rape kits and evidence.

Differential DNA extraction is the process of separating the male fraction (sperm) from the female epithelial fraction. There are numerous methods of separating these two fractions that are employed in labs throughout the country, depending on population, location, funding, and other factors

Although the prevalence of sexual assault cases has decreased in the past decade, there is still a sexual assault that occurs in the United States every 98 seconds.¹ If the victim chooses to go to the hospital after a sexual assault, typically a sexual assault kit (SAK) is collected from the victim (normally a female), which includes swabs from the anus, vagina, and mouth.² These swabs contain both DNA from the male perpetrator and the female victim. However, sometimes the ratio of male:female DNA can be around 1:100, depending on how long the victim takes to come forward. This can make the isolation of the male DNA fraction very difficult. It is important to obtain as much male DNA as possible, so that there is a greater chance of getting a DNA profile to identify the perpetrator.

For this project, labs across the country were asked to participate by filling out a questionnaire, describing the steps used in their extraction, and then by performing differential DNA extraction on five samples with varying male:female DNA ratios. These samples will be created in a laboratory at George Mason University using sperm from a donor and saliva and will have variable ratios such as 1:10 and 1:50. The participating laboratories will be asked to perform DNA extraction, quantification and profiling. Finally, the labs will send back the DNA profiles from each of the samples to be analyzed. This idea was a modification of similar research done in Switzerland.³

The results expected from this research include the questionnaire and the DNA profiles, which will be compared against one another. The ratios resulting quantification will be considered, as well the methods, reagents, and other factors listed on the questionnaire, hoping to determine which ones produce more favorable results. This data could then be used by the scientific community to be better equipped at testing real sexual assault kits. Hopefully, this study will impact how individual labs process their rape kits and evidence, and possibly change the way in which other labs process theirs.

Reference(s):

1. "Statistics," RAINN, accessed July 30, 2018, <https://www.rainn.org/statistics>
2. "Sexual Assault Kits," National Institute of Justice, accessed July 30, 2018, <https://nij.gov/unsubmitted-kits/Pages/default.aspx>
3. Severine Vuichard et al, "Differential DNA extraction of challenging simulated sexual-assault sample: a Swiss collaborative study," *Investigative Genetics* 2:11 (2011), <https://doi.org/10.1186/2041-2223-2-11>

Differential DNA Extraction, Sexual Assault Kits, DNA Profiling