B73 Evaluating the Use of the M-Vac® Wet Vacuum System to Recover DNA From Cotton Fabric

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Learning Overview: With the current state of the field of forensic biology, collecting touch DNA from evidence samples poses some difficulty. Some traditional methods for collection of DNA from biological fluids and touch samples include cuttings, scrapings, and the double swab method. While all of these methods have benefits, they also have their drawbacks. In order to more efficiently collect DNA from an evidence sample, novel approaches need to be explored. The goal of this presentation is to introduce attendees to this novel approach: the Microbial Vacuum (M-Vac®) Wet Vacuum System.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by describing this system that utilizes a sterile collection solution and a vacuum to collect DNA material from evidence samples. While it is similar to the double swab method, it takes collection a step further by collecting DNA material within the pores of samples. It is especially beneficial for cold cases where DNA material from the surface of a piece of evidence was previously collected, but there could still be trace DNA trapped in the pores. This method eliminates issues related to sample size and attempting to determine where to collect samples on a piece of evidence. It also has the benefit of sampling evidence areas directly and in their entirety. This can decrease the number of evidence samples needed to be transported to the laboratory for processing since the M-Vac® can be used at crime scenes. Therefore, this system is beneficial for its use as a serological tool for a crime scene analyst and a DNA analyst.

Some preliminary research has been performed by the Moroose Research Lab comparing the M-Vac® to traditional cuttings for collection of blood, saliva, and semen and swabbing for touch DNA on unworn and 15-minute worn cotton t-shirts. The unworn study showed that the M-Vac® may be beneficial with the collection of touch DNA as compared to swabbing. As for the 15-minute worn study, it was shown that background wearer DNA has the potential to interfere with the interpretation of an evidence sample's electropherogram when collected with the M-Vac® by being preferentially amplified over DNA from an evidence sample. However, with t-shirts only being worn for 15 minutes, not much can be said about wearer interference.

So, to determine the extent interference-wearer DNA can have on an evidence sample's electropherogram when collected with the M-Vac®, a study with t-shirts worn for 12 hours was conducted. This study was the same as the previous worn study conducted with the only difference being that the t-shirts were worn for 12 hours instead of only 15 minutes. T-shirts were worn by individuals for 12 hours consecutively, then a biological fluid or touch DNA was placed onto the worn t-shirt. Fluids were either blood, saliva, or semen. This new study helped to fill the gap of knowledge from the previous worn study by determining the extent wearer DNA collected from the M-Vac® as opposed to a traditional collection method, such as a cutting or a swab, had for the collection of total human DNA and the electropherograms for these evidence samples. For the quantities of human DNA collected for biological fluids, the traditional method of cuttings appeared to collect more than the M-Vac®, whereas the collection for touch DNA was greater for the M-Vac® than the traditional swabbing method. As for the electropherograms, some of the profiles for both traditional methods and the M-Vac® yielded either partial- or full-mixture profiles between the evidence sample and the wearer DNA. In conducting this study, a more realistic scenario encountered in casework was understood, which is an important step in validating new instrumentation into a forensic DNA laboratory setting.

M-Vac®, Sample Collection, Wearer DNA

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