

Validation and Casework Implementation of the Promega PowerPlex® Y23 and Fusion 6C Amplification Systems and Casework Direct at the Columbus Police Forensic Services Center: Troubleshooting, Challenges, and Success Stories

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In 2015, the Columbus Forensic Services Center DNA Unit validated and implemented a male DNA screening method using Promega Plexor® HY quantification system in conjunction with the Promega PowerPlex® Y23 amplification system. Due to the high volume of sexual assault cases being submitted and the overall case load and backlog, the DNA unit needed a more efficient and streamlined process for screening sexual assault cases while maintaining high work quality. Male DNA screening methods reduce screening time and sample consumption, are more accurate and specific, reduce unnecessary processing of samples downstream by providing guidance for sample processing decisions, and are easy to incorporate into a current workflow. In 2016, the Columbus Forensic Services Center DNA Unit replaced the AmpFLSTR™ Identifiler™ PCR Amplification Kit by validating and implementing Promega's PowerPlex® Fusion 6C Amplification Kit into our current workflow. The Male Screening material modification using Plexor® HY in conjunction with PowerPlex® Y23 and Fusion 6C Amplification Systems have shown to be valuable tools in screening and downstream processing of sexual assaults kits. The PowerPlex® Y23 Amplification Kit has proven to be a more sensitive amplification kit than traditional STR amplification kits and has shown to be consistently sensitive down to 31.2pg for interpretable profiles, making it a valuable tool in many sexual assault and homicide cases. The PowerPlex® Fusion 6C Amplification Kit has shown to be consistently sensitive down to 125pg for interpretable profiles and has been robust in amplifying various samples routinely encountered in DNA casework. Amplification decisions are based on the [Auto]/[Y] ratio ranges, as well as the total human and male quant values, and knowing the sensitivities between amplification kits is crucial in determining which amplification kit to proceed with. Recently the Columbus Forensic Services Center has been working on validating Promega's new Casework Direct kit. We have found this protocol to be a time-saving method for male screening and have also begun testing it as a possible replacement for our traditional mainstream evidence extraction protocol. With the addition of the Casework Direct kit to our procedures, we will be able to quickly and accurately process more sexual assault samples and also save time and money with other types of evidence extractions. The past year of implementation into DNA casework, has shown both challenges and successes as we uncovered all of the intricacies of each new kit.