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### **B79 Integration of the QIAcube® Into the Laboratory Workflow for Efficient Processing of Sexual Assault Casework**

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After attending this presentation, attendees will learn how the Qiagen® QIAcube® was implemented into the workflow for processing of sexual assault cases and how they may be able to modify their own laboratory's workflow to gain efficiency.

This presentation will impact the forensic science community by demonstrating how many laboratories struggle with DNA backlogs and showing how to increase throughput without an increase in staffing. The changes detailed in this presentation may assist laboratories in addressing their own DNA backlogs.

The Alaska Scientific Crime Detection Laboratory has historically separated processing of forensic casework into two distinct services of biological screening and DNA analysis. Biological screeners would examine evidence to identify samples/stains that were appropriate for DNA testing based on the results of presumptive chemical tests and microscopic examinations for spermatozoa. A DNA analyst would then resample an item and begin work at the DNA extraction phase, repeating microscopic examinations to assess the efficacy of the differential DNA extraction for sexual assault evidence. This workflow has been inefficient in that two people are independently opening, documenting, sampling, and sometimes performing microscopic exams of the same item.

The laboratory has recently completed validation of the QIAcube® and modified the workflow for sexual assault evidence to eliminate redundancy and maximize the utility of the information provided by the presumptive chemical tests and the DNA quantification. These changes will lead to many samples being extracted and quantified with no prior screening and significantly fewer microscopic examinations being performed. Additionally, the biological screener will be performing the extraction and quantification. A DNA analyst will pick up the case at the amplification stage and carry it through the remainder of the processing.

Several positive outcomes are expected as a result of the new instrumentation and workflow for sexual assault cases. These changes will decrease the turnaround time for DNA cases and increase the throughput of the laboratory. By eliminating the redundancy of tasks between the biological screener and the DNA analyst, the time required to prepare samples for DNA extraction will be cut in half. The DNA extraction process itself, formerly a three-day process that included two overnight soak/digest steps, can now be completed in one day.

Historically, DNA analysts were selecting samples based on the forensic history provided by the alleged victim, the results of presumptive chemical tests, and microscopic examinations; however, these test results are not as predictive of successful typing results as human and male quantification results. Furthermore, it has been observed that even after an aggressive digestion of the cellular material on casework, a significant number of sperm cells remain on the substrate, often greater than what was removed during the extraction protocol. Analysts are now routinely performing a Dithiothreitol (DTT) digest of substrates in addition to the sperm fractions generated on the QIAcube® and quantifying all three samples (epithelial, sperm, and substrate). Armed with quantification results, DNA analysts are able to make better informed choices when selecting samples for amplification and typing, minimizing the need to perform additional testing when the initially processed samples do not yield probative DNA typing results.

Although the laboratory has only recently gone online with the modified differential workflow, the initial results are promising. Compared to the previous (manual) differential method, the QIAcube®-facilitated extractions generally yield more single-source sperm (and/or substrate) fractions and the yield of male DNA in these fractions has been observed to be higher with the QIAcube® than with the manual method. Furthermore, samples processed with the QIAcube® have been observed to yield interpretable sperm fractions even when the microscopic exams did not result in the observation of spermatozoa. It is anticipated that the laboratory will now obtain probative male DNA profiles in cases which may not have proceeded to DNA when the laboratory relied on microscopic exam results for DNA sample selection.

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#### **QIAcube®, Differential Extraction, Workflow**

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