Optimization Strategies for Maximum Performance, Sustainability and Efficiency of BioEM Specimen Prep

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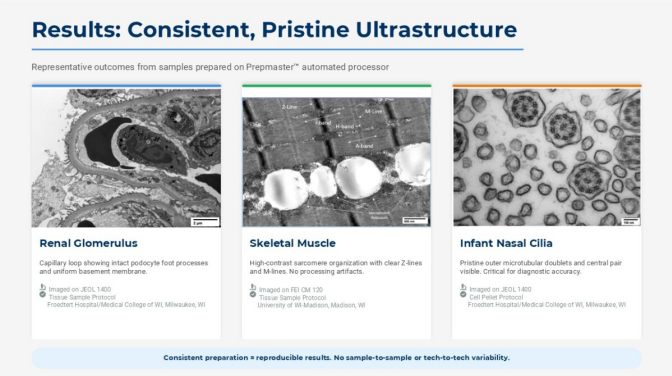
Abstract

Optimization of biological electron microscopy (BioEM) specimen preparation is increasingly critical as laboratories face growing demands for faster turnaround times, improved reproducibility, and enhanced sustainability. Traditional manual workflows remain slow, labor-intensive, variable, and resource-intensive, creating bottlenecks that limit efficiency and compromise data quality. This presentation outlines practical, experience-driven strategies to maximize performance across the entire BioEM specimen preparation workflow.

Key topics include workflow standardization, automation, and cobotics as foundational approaches to reducing variability and improving consistency. By combining human expertise with collaborative robotic systems, laboratories can minimize technician-dependent error, streamline complex multi-step protocols, and scale parallel processing of large sample batches. The discussion will include strategies for optimizing reagent usage to help reduce costs and hazardous waste while maintaining or improving image quality.

The presentation demonstrates how integrated robotic and cobotic systems can transform specimen preparation into a highly reproducible, “load-and-walk-away” process. By eliminating labor-intensive setup steps and improving reagent efficiency, these systems enable a more harmonized, scalable, and cost-effective approach to automated EM specimen preparation. Case-based examples from clinical pathology and academic research laboratories will demonstrate measurable improvements in throughput, turnaround time, and data reliability, particularly in high-demand applications such as kidney biopsy processing and translational research workflows.

Attendees will leave with actionable guidance for modernizing BioEM specimen preparation, improving sustainability metrics, and increasing overall laboratory productivity. The session delivers practical, scalable solutions that can be implemented incrementally, enabling laboratories at any stage of automation adoption to achieve meaningful gains in performance, efficiency, and reproducibility.



Results: Consistent, Pristine Ultrastructure