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### F8 Next-Gen Is Now: Legal Implications and Strategic Preparation for Massively Parallel DNA Sequencing in Forensic Science

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After attending this presentation, attendees will understand the critical importance of multidisciplinary collaboration for the development and implementation of legal authorization and for making strategic preparations for Massively Parallel Sequencing (MPS) technologies.

This presentation will impact the forensic science community by explaining the legal and strategic challenges, opportunities, and potential threats to the forensic application of this cutting-edge technology and how these factors can be most effectively addressed through a coordinated interdisciplinary approach.

The forensic implementation of MPS has the potential to cause a sea of change in the criminal justice system's response to DNA evidence. This is because the technology has the capability to reveal an extraordinary constellation of genetic information about not only identity, but also the phenotypic characteristics, ancestry, lineage, and genetic predispositions of those associated with a criminal offense. It also has the potential to deconvolute currently indiscernible mixtures and detect genetic profiles from samples too degraded for fragment length-based detection methods.

It is precisely *because of* these new and distinctively different capabilities that the potential of MPS for criminal justice applications cannot be fully realized without the counsel and coordination of those both within and outside the forensic community. This includes attorneys, ethicists, policy makers, and industry leaders, among others. Importantly, this coordination must begin *now*, before critical choices are made about the forensic application of MPS that may ultimately prove to be legally indefensible or socially unacceptable.

From a legal perspective, statutory schemes that address constitutional concerns about law enforcement's collection, detection, retention, and comparison of sensitive genetic information must be drafted, debated, and enacted. This legislation must be adequate to withstand the heightened scrutiny that courts will surely apply to the Fourth Amendment "secondary search" analysis applicable to the detection and retention of the genetic data generated by MPS technologies.

State and federal legislation concerning the admissibility and use of DNA evidence in the legal system, which was largely drafted by law makers and interpreted by the courts in response to fragment length detection methods, must be reevaluated and revised to address the unique capabilities and concerns relevant to next generation sequencing technologies.

Existing legislation that prohibits the unauthorized dissemination and use of genetic information in government databases must also be considered and revised, as appropriate, to adequately address heightened ethical and privacy concerns applicable to this sensitive data.

From a strategic perspective, cases that cannot currently be solved with existing DNA technologies may well be cracked in the future by MPS analysis. As such, investigations now facing a forensic DNA impasse may be good candidates for future cold case review projects utilizing MPS. Therefore, America's crime laboratories must *currently* begin to systematically identify and document those forensic samples in their archives that are indiscernibly mixed or too degraded to yield a profile in response to contemporary testing technologies. This work must begin immediately to prevent future time-consuming and tedious retrospective searches for candidate MPS case samples. In other words, laboratories must stop throwing any more "needles" into the "haystack."

Crime laboratories, in consultation with law enforcement and prosecutors, must carefully weigh the risk of currently consuming challenging samples with present-day DNA technologies against the benefit of waiting to test that evidence with MPS-based systems. This dilemma is similar to the decisions labs faced in the past about whether to risk sample consumption with **Restriction Fragment Length Polymorphism** (RFLP) testing or wait for emerging Polymerase Chain Reaction (PCR) technologies.

Finally, evidence, case files, and third-party records from unsolved investigations that involve challenging forensic samples must be identified, properly preserved, and archived by crime labs, police agencies, and prosecutors. This will help ensure that these essential elements of a successful prosecution, a valid defense, or a meaningful post-conviction DNA analysis can be used to credibly support future judicial findings of guilt or innocence based on next generation technologies.

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#### Massively Parallel Sequencing, Legal Implications, Strategic Preparation