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ILLUMINA LAUNCHES MISEQ FGx FOR FORENSIC APPLICATIONS

Jan 21, 2015

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Premium

NEW YORK (GenomeWeb) – Illumina has launched the MiSeq FGx Forensic Genomics System, a next-generation sequencing system validated specifically for forensic applications, the company said today.

The system includes the MiSeq FGx sequencing instrument, the ForenSeq DNA Signature Prep Kit, and ForenSeq Universal Analysis software. It evaluates both short tandem repeats (STRs) and SNPs, and is compatible with existing DNA databases like the Combined DNA Index System (CODIS).

Cydne Holt, senior market manager for forensic genomics, told GenomeWeb that Illumina developed the system with "collaborators in the forensic community, who indicated to us that they wanted a complete solution that can be fully validated and integrated into their workflows."

As such, Holt said that Illumina validated the system through the Scientific Working Group on DNA Analysis Methods (SWGDM), which makes recommendations to the FBI on quality assurance standards for forensic DNA analysis. Individual laboratories that purchase the system will have to do additional internal validation — which Illumina is working with some initial customers to do — before it can be used within the criminal justice system, Holt added.

The system "performed and exceeded the minimum requirements needed to demonstrate SWGDAM validation," Holt said. "We've crossed a major hurdle" toward making the system applicable for use within a criminal investigation setting, she added.

Kenneth Kidd, a genetics researcher at Yale University whose research focuses on developing NGS-based forensics panels and figuring out what markers should be sequenced, told GenomeWeb that having a validated NGS-based platform is a very significant step forward.

"The forensic community, especially when it comes to analyzing data that may enter the court, is very concerned that a methodology, machinery, everything is validated and strongly supported," he said. Kidd added that he anticipates that other companies and organizations will launch NGS-based forensics platforms and protocols.

The MiSeq FGx will be priced comparably to the MiSeq, Holt said, and customers that already have a MiSeq will have an option to purchase an upgrade so that the system can operate in the FGx mode or the standard MiSeq mode, she said.

Traditionally, forensic profiling is based on STR analysis by capillary electrophoresis or analysis of mitochondrial DNA with PCR and Sanger sequencing. However, over the last several years, a number of researchers have been exploring the [use of NGS in forensics](#) applications to do both STR profiling and mitochondrial DNA analysis, as well as to run targeted panels evaluating SNPs that identify a person's ancestry and physical traits. Illumina [first said](#) it was planning to launch MiSeq FGx last year.

The advantages of using NGS for forensic applications include increased resolution as well as the ability to analyze multiple types of markers — like STRs and SNPs — in one assay. Additionally, the single assay will be able to work with degraded samples and samples that contain DNA from multiple individuals.

"There is a lot of great value to moving forward using sequencing as a standard method in forensics. ... The forensic community needs to be thinking very seriously about moving towards sequencing as the standard method," Kidd added. "In my opinion, capillary electrophoresis is an obsolete technology."

The ForenSeq DNA Signature Prep Kit requires just 1 nanogram of input DNA and analyzes around 200 genetic markers, including all autosomal STR markers that are currently used around the world as well as Y- and X-chromosome STR targets, and SNPs that are informative of ancestry and physical traits. Up to 96 libraries can be prepared simultaneously. The FGx reagent kit is based on the MiSeq v3 reagent kit, which can enable 2x300 bp reads, and its components all have RFID tags.

For researchers also looking to evaluate mitochondrial DNA, the company recommends a research-use only workflow on the MiSeq FGx using its Nextera XT DNA sample prep kit, the MiSeq v2 reagent kit, and the ForenSeq Universal Analysis software. The mtDNA workflow has not been validated.

Currently, the major player in the DNA-based forensics space is Thermo Fisher. It sells human identification and STR kits, including its PCR-based GlobalFiler and GlobalFiler Express kits which are both approved by the FBI for forensic laboratories to generate DNA profiles and upload them to the CODIS database.

In addition, Thermo also sells a research-use only Ion AmpliSeq Human Identification SNP panel, and an NGS panel designed for the PGM that evaluates 103 autosomal SNPs and 33 Y-chromosome SNPs. Researchers at Yale University led by Kidd collaborated on the development of the AmpliSeq HID panel, and a group from the University of North Texas Health Science Center [published a comparison](#) of the AmpliSeq HID with a SNP panel run on the Illumina GA.