B88 ABI Prism® 3100 Genetic Analyzer Instrument to Instrument Variation

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After attending this presentation, attendees will learn improved methods to obtain reproducibly high quality STR results.

This presentation will impact the forensic community and/or humanity by demonstrating improving the quality of STR results obtained in the first testing of DNA, and will cut the effort required to obtain DNA profiles, thus increasing ability to identify more criminals.

In a high throughput sample processing environment it is important to eliminate as many variables as possible in order to process samples effi- ciently and achieve the highest possible quality of results with each sample. In pre-amplification stages, it is possible to standardize sample input with DNA extraction, quantification, and normalization of sample DNA con- centration. It is also possible to standardize aspects of the post-amplifi- cation process.

We observed that the same amplified product run on different ABI 3100 Genetic Analyzers produced noticeably different peak heights for the same alleles. Some instruments were reproducibly "stronger" and others reproducibly "weaker". It was decided to perform a variability study with all 11 3100 instruments used for STR genotyping analysis.

It was observed that average peak height intensities for entire samples or across allelic ladder alleles can vary as much as two fold across the 11 genetic analyzers. This compares with an inter-color variation that was as high as six-fold on some instruments, but not others. The relative instrument intensity tended to correlate with instrument age, but not specif- ically with laser age. Two "middle-aged" instruments have had laser replacements. This did not make them stronger with regard to relative RFU intensity.

To counteract this effect, it was determined that injection conditions can be modified to overcome the instrument variability. To a first approx- imation, in the typical ranges used, a combination of injection voltage times injection time (*i.e.*, kV-sec) is directly proportion to RFU strength for an individual instrument. Thus increasing the combined kV-sec used for injection on weaker instruments or decreasing it on stronger instruments allows adjustment so that all instruments provide approximately equivalent performance.

The results of implementation of this approach as well as the corre- sponding effect on ability to improve the quality and reproducibility of first-run samples will be discussed.

STR, 3100, Variation

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