COMPARISON OF TWO PROMEGA EXTENDED CODIS CORE LOCI AMPLIFICATION KITS, POWERPLEX® FUSION AND POWERPLEX FUSION 6C, FOR USE ON CASEWORK SAMPLES

Jennifer Sears, B.S.; Danielle Jardel, B.S.; Megan M. Foley, M.S.F.S.; Kristen L. Smith, M.S.F.S.; Christian G. Westring, Ph.D., NMS Labs

In 2012, the Federal Bureau of Investigation proposed an expansion of the CODIS core loci from 13 loci to 20 loci. Over the last few years, manufacturers have developed and released many new amplification kits to satisfy these requirements. Promega Corporation, a large manufacturer of amplification kits, currently offers two that satisfy these new CODIS requirements. PowerPlex® Fusion is a five dye kit that types 24 total loci. The targeted loci include 23 STR loci (22 autosomal and one Y-STR locus) and Amelogenin, and is supported by current capillary electrophoresis platforms. PowerPlex® Fusion 6C, released in 2015, is a six dye kit that types 27 total loci. This kit targets 23 autosomal STR loci, Amelogenin, and three Y-STR loci. When compared to older kits manufactured by Promega, these two Fusion kits show an increase in sensitivity, a greater ability to overcome inhibitors, and can be used for direct amplification.

In this study, a comparison of the data generated during the internal validations of PowerPlex® Fusion and PowerPlex® Fusion 6C was performed. The PowerPlex® Fusion kit was validated on Applied Biosystems 3130 Genetic Analyzer and PowerPlex® Fusion 6C was validated on Applied Biosystems 3500 Series Genetic Analyzer. Sensitivity studies were performed during both validations where a serial dilution was prepared from 1000 pg to 7.825 pg and included a set of negative controls. Each dilution was also injected at three separate injection times (1, 5, and 10 seconds on the 3130 Genetic Analyzer, and 10, 15, and 20 on the 3500 Series Genetic Analyzer). Analytical and stochastic thresholds were also determined using the data generated from the sensitivity study. Appropriate heterozygote peak height ratios were calculated for each kit at all injection times.

The comparisons from this study determined that the two kits are equivalent. It is important to note that there were two different typing platforms used for this comparison. This did lead to differences in the results which is expected since there are known differences between these two platforms. Both amplification kits generated full DNA profiles down to 250 pg and generated partial profiles down to 7.825 pg. The analytical threshold(s), stochastic thresholds, and peak height ratios generated were comparable. The differences between the values can be attributed to the different platforms that electrophoresis was performed on. Based on the results generated during the internal validations, both amplification kits were found to be suitable for use on forensic casework.