

DEVELOPMENTAL VALIDATION OF THE POWERPLEX® FUSION 6C SYSTEM: A 6 DYE STR KIT WITH 27 LOCI MULTIPLEX

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PowerPlex® Fusion 6c System is a 6 dye assay. It allows co-amplification and fluorescent detection of 27 loci covering both expanded CODIS and ESS core loci as well as three commonly used loci (Penta D, Penta E, SE33) and four gender determination loci (Amelogenin, DYS391, DYS570, DYS576). The improvement of discrimination power will minimize the adventitious matches during data exchange among large size of DNA database.

Development validation experiments followed the Scientific Working Group on DNA Analysis Methods and Chinese National Standard (GA/T815-2009) guidelines. In the species specific study, some non-specific amplification can be detected in primate species including chimpanzee, macaque and baboon as expect. In those non-primate species such as bovine, pig, chicken and duck, non-specific amplification product could be observed at two loci or less. In sensitivity study, the 3130xl Genetic Analyzer was employed. Full profiles were achieved at 200 pg in condition of 3 kV 5 s and at 100 pg in 3 kV 10 s. In the stability study, full and concordant profiles can be obtained at ≤ 200 ng/ μ l humic acid and ≤ 1500 μ M hematin. When it comes to precision and accuracy, the standard deviation of 433 alleles in 48 allelic ladder samples was no more than 0.105 bp; the size deviation between 1730 alleles and the allelic ladder were within ± 0.5 bp. In terms of the casework samples, blood stain, buccal swabs, cigarette butts, differential extracts, hair, muscle, teeth and touch samples have achieved full and concordant profiles. In the concordance study, all the genotypes of 12 components in SRM 2391c and SRM 2395 were concordance with that documented in Certificate of Analysis Standard Reference Material 2391c and 2395. The genotypes of 102 unrelated Chinese Han were also concordance with those of the 24 loci in PowerPlex® Fusion System. Mixture study shows that 91% and 96% (male-male) or 64% and 81% (male-female) minor alleles were detected at 1:9 and 9:1 ratios. PCR-based study showed that the average peak height (APH) increased with the reaction volume reduction from 25 μ l to 5 μ l while the peak height ratio (PHR) decreased. The APH and PHR varied in proportion to the cycle numbers. The n-1 stutter ratios were calculated between 0.0475 (TPOX) and 0.2301 (vWA). In the terms of balance, the PHR was from 79.60% (D22S1045) to 86.16% (D3S1358). As for the intra color balance, the results are more than 50% except for CXR-6C (red, 49.70%). The results demonstrate that the PowerPlex® Fusion 6c System is a robust and reliable STR-typing multiplex for forensic DNA typing and databasing.