



A92 Developmental Validation of a Commercially Available Pentaplex MiniSTR Kit

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After attending this presentation, attendees will understand the benefits and limitations of the PowerPlex® S5 System (Promega Corporation, Madison, Wisconsin), a new mini - short tandem repeat (STR) kit that is intended for use as a screening tool for degraded human samples.

This presentation will impact the forensic community by sharing data from the developmental validation of PowerPlex® S5.

Most commercial STR multiplexes contain 10 to 16 loci with amplicon sizes ranging from 100-450 bp. When used to type degraded DNA, allele dropout or the complete loss of the larger loci due to fragmented DNA template is often observed. To utilize the discriminatory power of STR typing with degraded samples, the forensic community has recently focused on the development of "miniSTR" multiplexes: loci with primer binding sites designed closer to repeat regions to reduce their amplicon size. However, to keep the small miniSTR amplicons from overlapping one another, each dye channel can contain only a few loci.^[1] The result is a miniSTR multiplex with fewer loci than standard STR multiplexes, which in turn leads to a lower power of discrimination. While a relatively low power of discrimination may not be sufficient for identification, small multiplexes can be used as a screening tool for commingled remains. In forensic case work, STR typing with only a small number of alleles recovered has been sufficient to sort the remains of a limited number of known individuals, and STR miniplexes with relatively few loci have also proven successful in resolving large scale circumstances of commingled remains.^[2,3]

The PowerPlex® S5 System contains the sex-determining Amelogenin as well as four loci (D18S51, D8S1179, TH01, and FGA) that are included in both the European Network of Forensic Science Institutes (ENFSI) database and the FBI's Combined DNA Index System (CODIS).^[4] The marker amplicon sizes, ranging from 90 to 260 base pairs, represent a substantial size reduction for three of the loci (D18S51, TH01, and FGA) when compared to other standard commercial STR kits, making the kit appropriate for use on highly degraded samples. The PowerPlex® S5 System purports to consistently generate full profiles from just 50pg of sample input and is less expensive per sample than other commercial STR kits, and is thus suitable for use as a screening tool in forensic case work. However, the relatively low power of discrimination (random match probability of 1 in 190,000 for U.S. Caucasians^[5]) makes the kit less practical for identification and more useful as an exclusionary tool.

Authors will present the results of a concordance study performed with PowerPlex® S5 and three other commercial kits: Powerplex 16®, PowerPlex ES® (Promega Corporation), and AmpF!STR® SGM Plus (Applied Biosystems, Foster City, CA)®. Additionally, results from a population study of nearly 500 samples from 5 major U.S. population groups (Caucasian, African-American, "Hispanic", Asian, and Native American) and results of mixture analysis using the PowerPlex® S5 kit will be presented. Lastly, an examination of stutter, precision, and accuracy will be presented to demonstrate the performance of the kit in these respects.

The opinions and assertions contained herein are solely those of the authors and are not to be construed as official or as views of the United States Department of Defense or the United States Department of the Army.

References:

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