

EVALUATION OF THE INVESTIGATOR® 26PLEX QS STR KIT AND COMPARISON WITH TWO COMMERCIALY AVAILABLE STR KITS

Madeline G. Roman, BS; Ryan Gutierrez, BS; Carrie Mayes, PhD; Bobby LaRue, PhD; and Rachel Houston, PhD

Department of Forensic Science, College of Criminal Justice, Sam Houston State University

Short tandem repeats (STRs) are the gold standard in forensic human identification. Several multiplex STR kits are currently on the market, and in recent years, kits have included an increasing number of loci, resulting in profiles with more discriminatory power. Before new kits are implemented in crime laboratories, they go through extensive validation studies. It is important that the chemistries be sensitive enough to produce profiles from low quantity and low quality samples. In addition, DNA profiling can be complicated by various PCR inhibitors common to forensic sample types, and some kits are better able to handle these inhibitors than others.

In this study, we evaluated the Investigator® 26plex QS kit (QIAGEN) and compared it to two kits commonly used in forensic laboratories: the Investigator® 24plex QS kit (QIAGEN) and the GlobalFiler™ PCR Amplification kit (Thermo Fisher Scientific). The Investigator® 26plex QS kit is a new kit that simultaneously amplifies the CODIS loci and the European standard loci, plus Penta D, Penta E, D6S1043, DYS391, and Amelogenin, along with QS markers to monitor for inhibition. A sensitivity study consisted of varying concentrations of control DNA between 0.03125-2ng. To test the kits' tolerance to common inhibitors, low, medium, and high concentrations of hematin, humic acid, calcium, and collagen were added to control DNA. In addition, a study was carried out to assess the effect of male/female DNA mixtures on profile interpretation. Finally, a variety of casework-type samples were run, including bone, hair, decomposed muscle, formalin-damaged tissue, blood, and "touch" DNA samples.

Preliminary data show that all three kits have similar sensitivity, with only a few alleles dropping out at an input DNA amount of 0.03125 ng. However, Investigator® 26plex QS had a wider dynamic range with relatively clean profiles at a 2 ng input, while Investigator® 24plex QS and GlobalFiler™ experienced pullup between dye channels, making the resulting profiles more difficult to interpret. All three kits were most affected by the inhibitors calcium and collagen and experienced significant dropout in the presence of these inhibitors. The genotypes of the shared loci for the casework samples were concordant between the three kits, and the profile quality and completeness were similar.