DEVELOPMENT AND VALIDATION OF A CANINE MiniSTR PANEL FOR FORENSIC CASEWORK

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In the field of forensic science, animal biological evidence is playing an increasingly important role. Since animals can be the victim, perpetrator, or witness of a crime, animal biological evidence at a crime scene may be forensically important. Dogs (*Canis lupus familiaris*) are kept as pets in 39% of American households, thereby being a domesticated species with significant forensic potential. As with any biological evidence, the condition of that evidence is of utmost importance. Sample degradation can occur from exposure to various elements including bacteria, heat, ultraviolet (UV) light and soil. Obtaining complete nuclear short tandem repeat (STR) profiles is difficult with degraded DNA due to extensive DNA fragmentation. To resolve the problem of generating STR profiles from degraded samples, scientists in the human forensic DNA field developed mini STR primer sets that amplify shorter segments of DNA than the commonly used STR multiplexes. Since canine samples can face the same environmental challenges, we have applied this approach to canine STR analysis. Currently, the UC Davis Veterinary Genetics Laboratory uses a validated sixteen loci multiplex—the VGL Canine Panel—for use on canine forensic samples. This STR panel was redesigned to produce amplicons less than 205 bp and divided into three panels of four to seven primer pairs each. In an effort to increase sensitivity, a smaller reaction volume was implemented, allowing for a smaller amount of input DNA. These new mini STR panels were validated using degraded, inhibited, and casework-type samples to demonstrate the significant improvement that the mini STRs provide over the standard VGL Canine Panel. The optimum input DNA for the standard VGL Canine Panel is 0.5-1.5 ng with full profiles obtained at 160 pg of template DNA. The VGL Canine Mini STRs amplified in the small volume reaction produced full DNA profiles with only 63 pg of input DNA template, resulting in an almost three-fold increase in sensitivity. The data obtained from the validation demonstrates that the VGL Canine Mini STRs increase the likelihood of obtaining complete or near complete DNA profiles from inhibited and degraded samples that have failed to produce full profiles using the standard sixteen-plex STR panel.