B144 The Amelogenin Sex Test: The Missing Y?

Lim Eng Seng Simon, BS, Health Sciences Authority, DNA Database Laboratory, 7 Maxwell Road, MND Building Annex B, #05-04, Singapore, 069111, Singapore; Syn Kiu-Choong Christopher, PhD, Health Sciences Authority, DNA Profiling Laboratory, 11 Outram Road, Singapore, 169078, Singapore; and Tan-Siew Wai Fun, MSME, Health Sciences Authority, DNA Database Laboratory, 7 Maxwell Road, MND Building Annex B, #05-04, Singapore, 069111, Singapore*

The goal of this presentation is to present the forensic community rare and interesting failures in the amelogenin sex test and to recommend alternative Y-locus (i.e., SRY) marker be routinely included in any sex test to avoid mistyping and for gender confirmation. In addition, more p-arm Y-STRs should be included in Y-STRs multiplex design to accommodate potentialy q-arm Y-chromosome deleted males.

The amelogenin sex test is well established as the marker of choice for sex determination in forensic DNA typing work. This sex test is included in commercially available DNA typing kits. This presentation will impact the forensic community and/or humanity by highlighting two interesting cases that demonstrate the failure of the amelogenin sex test. Alternative Y-locus (i.e., SRY) marker should be routinely included in any sex test to avoid mistyping and for gender confirmation. In addition, more p-arm Y-STRs should be included in Y-STRs multiplex design to accommodate potentialy q-arm Y-chromosome deleted males.

The oral presentation will highlight two interesting cases that demonstrate the failure of the amelogenin sex test:

Case I: a male convicted offender was typed as "asexual" by AmpF*l*STR® Identifiler™ DNA typing kit.

Case II: a paternity test involving a family of 4 persons, where one of the 2 brothers showed a female genotype by AmpF*l*STR® Profiler Plus™.

In both cases, the cause of gender mis-identification using the commercial available amelogenin sex test found in the DNA typing kit was resolved using alternative amelogenin primers, sex determining region on the Y chromosome (*SRY)* primers, and Reliagene Y-Plex™ 12.

In the first case, during routine DNA Database typing analysis, an amelogenin null male was encountered. Both amelogenin specific X and Y alleles was missing from his DNA profile, obtained using the AmpF*l*STR® Identifiler™ DNA typing kit. Alternative amelogenin primers, which amplifies the X allele at 212 bp, and Y allele at 218 bp was used to verify the gender. Amplification using the alternative amelogenin primers, showed the presence of only the X allele. This indicates a point mutation at the primer binding position at the amelogenin X allele, which account for the failure in typing for the amelogenin X allele using the Identifiler™ DNA typing kit. However, the amelogenin Y allele still remain missing. The SRY gene amplification gave a positive result, which is the correct sex test result. Using the Reliagene Y-Plex™ 12 DNA typing kit, a complete Y-halpotype DNA profile was obtained. Results therefore, suggest that a deletion of the amelogenin gene must have occurred along the Y chromosome. In addition, a point mutation of the primer-binding site of the X allele used in the Identifiler™ DNA typing kit caused the total failure of the amelognin sex test, resulting in a null allele profile for the amelogenin locus.

In the second case, a family of four, which includes the tested parents and their two sons, were genotyped using the AmpF*l*STR® Profiler Plus™ DNA typing kit and their biological parentage relationship was established. Gender determination using the amelogenin sex test available in the DNA typing kit was correct for all, except for the older son, whose Y allele was missing from his DNA profile. Alternative amelogenin primers fail to amplify the Y specific allele as well. However, with *SRY* typing, the older brother was correct for his gender. Reliagene Y-Plex™ 12 was then used to determine the Y-STRs profiles of the biological father and his two sons. The Y-STRs haplotype of the biological father and his younger son was found to be both complete and consistent with one another. For the older son, only the Y-chromosomal STR marker DYS393 and the X allele of the amelogenin locus were typed. The DYS393 allele was found to be consistent with that of his father and younger brother. The results, therefore indicate that a deletion polymorphism possibly, spanning a major part of the Y-chromosome from Yp11.31 on the short arm up to Yq11.221 on the long arm has occurred. This deletion event, would explain his missing Y allele from the amelogenin maker using the Profiler Plus™ DNA typing kit. In addition, the inclusion of more Y-STRs on the p-arm of the Y chromosome for e.g. DYS453, DYS446 and DYS456 in Y-STRs multiplex design should be considered. In this way, Y chromosome with deleted qarm can still allow discriminating Y-STRs information to be obtained.

Amelogenin, Gender Identification, Y-STRs

 ** Presenting Author*