

AmpF/STR™ Profiler™ Analysis on Severely Compromised Casework Samples

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For identity testing, two multiplex STR systems are currently in use at the Centre of Forensic Sciences in Toronto. The Forensic Science Service Quadruplex (vWA, TH01, F13A01, FES/FPS) system and the Applied Biosystems Division nine locus multiplex, AmpF/STR™ Profiler™ (D3S1358, vWA, FGA, TH01, TPOX, CSF1PO, D5S818, D13S317, D7S820) both with Amelogenin. Based on population databases from the province of Ontario, the most common DNA STR Quadruplex profile in Caucasians is 1 in 1200, while the most common DNA STR Profiler™ profile in Caucasians is 1 in 24 million. Profiler™ analysis provides extremely valuable information to cases in which identification is an issue.

An historical unsolved homicide case illustrates the recent advances in identity testing on severely compromised items. In May 1980, a missing woman's partially clad body was discovered near railway tracks outside the city of Barrie, Ontario. The deceased was last seen in the company of an unknown male. A suspect was apprehended. A trace amount of semen was identified on vaginal swabs from the deceased. ABO analysis yielded insufficient evidence for any charges to be laid. Fourteen years later the unsolved homicide was re-opened to examine the vaginal swabs by PCR methods. DQA1/PM results yielded only the profile of the deceased on the differentially extracted vaginal swabs. STR Quadruplex results indicated a match to the original suspect with a frequency of occurrence of 1 in 23,000 Caucasians. In 1997, the samples were re-analyzed with Profiler™. The Profiler™ results showed a match to the original suspect at five STR loci (D3S 1358, vWA, FGA, TH01, D5S818). The results at TPOX and D13S317 were inconclusive and no results were obtained at CSF1PO or D7S820. Based upon data from the Ontario population, the frequency of occurrence of the seven locus STR profile from the donor of the spermatozoa on the vaginal swabs was 1 in 34 million Caucasians. The suspect pleaded guilty to first-degree murder. Although the samples in this case were aged and the quantity of semen was low, the system of analysis was still highly successful. Profiler™ analysis has also provided results with formalin fixed paraffin embedded tissue samples. In May of 1994, a 3-month-old infant suffered fatal head injuries. The 37-year-old accused grandfather was sentenced for manslaughter but appealed the conviction. The new trial, ordered in 1998, included the exploration of allegations of incest between the teenaged mother of the deceased baby and the accused grandfather. In 1998 the only comparison samples available from the infant were formalin fixed paraffin embedded tissues (liver, brain, testes, pancreas plus mesentery, muscle, lung, heart, spleen, kidney and thymus) taken at autopsy. Initial extraction of the liver failed to yield amplifiable DNA. Subsequently all blocks were treated with xylene to remove the wax from the tissue followed by standard extraction, amplification and electrophoresis. In the STR Quadruplex system complete profiles were generated with brain, testes, pancreas and mesentery and muscle. One allele was lost at the FES locus with lung, heart and spleen while kidney, liver and thymus failed to amplify at FES. Three tissues (brain, liver and testes) were also analysed by Profiler™. A complete nine locus profile was generated only with the testes tissue. The brain sample showed inconclusive results at CSF1PO. Liver produced no result at CSF1PO and was inconclusive at D7S820. The STR Profiler™ results were consistent with parentage of the tissue samples by the teenaged mother and the accused grandfather. Based on data from the Ontario population, the likelihood of obtaining the observed Profiler™ profile was, in the Caucasian population, 1,900 times greater, if the accused was the father than if a random man from the Caucasian population was the father.