Authentication of Forensic DNA Samples

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Over the past twenty years, DNA analysis has revolutionized forensic science, and has become a dominant tool in law enforcement. Today, DNA evidence is key to the conviction or exoneration of suspects of various types of crime, from theft to rape and murder. However, the disturbing possibility that DNA evidence can be faked has been overlooked. It turns out that standard molecular biology techniques such as PCR, molecular cloning, and recently-developed whole genome amplification (WGA), enable anyone with basic equipment and know-how to produce practically unlimited amounts of *in vitro* synthesized (artificial) DNA with any desired genetic profile. This artificial DNA can then be applied to surfaces of objects or incorporated into genuine human tissues and planted in crime scenes. Here we show that the current forensic procedure fails to distinguish between such samples of blood, saliva, and touched surfaces with artificial DNA, and corresponding samples with *in vivo* generated (natural) DNA. Furthermore, genotyping of both artificial and natural samples with Profiler Plus® yielded full profiles with no anomalies. In order to effectively deal with this problem, we developed an authentication assay, which distinguishes between natural and artificial DNA based on methylation analysis of a set of genomic loci: in natural DNA, some loci are methylated and others are unmethylated, while in artificial DNA all loci are unmethylated. The assay was tested on natural and artificial samples of blood, saliva, and touched surfaces, with complete success. Adopting an authentication assay for casework samples as part of the forensic procedure is necessary for maintaining the high credibility of DNA evidence in the judiciary system.