EXTRACTION OF HIGH QUALITY DNA FROM BIOLOGICAL MATERIALS USING A PURPOSE DEFINED SYSTEM

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Forensic analysts encounter a variety of biological samples including deposits of blood, saliva, semen and sweat evidence on a variety of substrates, as well as hair, bones, teeth, finger nail scrapings, and swab evidence - any of which may have been exposed to a range of environmental assaults or contaminants. The genomic DNA contained in these samples is associated with many cellular components and macromolecules that compact and protect the DNA *in vivo*. If not removed during the DNA extraction procedure, these accessory factors can interfere with the downstream processes of DNA analysis, namely, PCR. Therefore, it is important that the procedure used to isolate genomic DNA is efficient and delivers DNA in a highly purified form. It is desirable to have an extraction methodology that enables quantitative recovery of DNA from small quantities of starting material and yields DNA in a highly concentrated form, so that volumes used for PCR can be minimized. The isolation procedure must also remove the vast majority of PCR inhibitors and, moreover, work for the most of specimen types. Lastly, all extraction reagents and steps of the protocol should be amenable to automation.

We describe an innovative method that meets all of these criteria. The developed method enables the isolation of genomic DNA from forensic biological samples that is free of PCR inhibitors and ready for downstream applications like real-time PCR and genotyping. The method employs a proprietary multi-component surface chemistry to isolate genomic DNA from forensic evidence samples. The reagents are packaged for processing individual samples and achieving consistent DNA yields. Walk-away operation increases both the efficiency of trained forensic analysts and the throughput of forensic labs. The protocols are optimized for extraction of DNA from a variety of sample types including; blood stains on denim, cotton cloth, and FTA® paper, samples spiked with PCR inhibitors, saliva on swabs, semen on cotton fabric, bones, tooth, chewing gum, cigarette butts, tape lifts, and touch evidence samples. DNA yields for all samples tested were equal or greater than other commercial kits tested. DNA obtained from these samples was free of detectable PCR inhibitors and resulting short tandem repeat (STR) profiles were complete, conclusive, and devoid of PCR artifacts.