

PERSPECTIVES ON DNA CASEWORK: UNUSUAL EXHIBITS MIXTURE INTERPRETATION AND PROFILES FROM INHIBITED PCR REACTIONS

Norma Szakacs

RCMP Forensic Laboratory Regina, Regina SK., Canada



Inherent to DNA casework is the need to obtain forensic evidence in the absence of obvious biological staining of exhibit material or from biological substances that are nonpristine or of mixed origin. In this presentation, cases will be cited which illustrate successful profiling and yielding probative results for each of these forensic situations.

During the commission of a crime, skin cells transferred through handling of weapons or other objects might be the only biological material left at the crime scene or on other exhibits seized during the criminal investigation. On occasion, partially eaten foodstuffs are discarded and can be used for DNA profiling. In this presentation cases will be cited that focus on the successful profiling of biological material located on obscure and unusual exhibit materials encountered in DNA casework. If the forensic potential of unusual exhibits is recognized, they are less likely to be overlooked during the criminal investigation. One aim of this presentation is to alert those involved in criminal investigations to the potential of unusual exhibits often deemed as unlikely sources for DNA analysis.

Biological materials profiled during criminal investigation often yield DNA profiles of mixed origin. There are many approaches to mixture interpretation. The RCMP Forensic Laboratory Services Biology Section has adopted the acceptable statistical approach of calculating exclusion probabilities for simple mixtures in which major and minor components cannot be distinguished and for complex mixtures of more than three donors. For three donor mixtures in which a major component can be determined, a random match probability can be given for the major component. For two donor mixtures in which a major and minor component can be determined, a random match probability can be given for each component. Cases will be cited illustrating the approach used by the Biology Sections of the RCMP Forensic Laboratory Services to interpret mixed DNA profiles.

Some exhibits submitted for DNA profiling yield a limited quality of DNA that is used in entirety in the amplification process. Due to the nonpristine nature of these exhibits, inhibitors can be present that prevent amplification of the DNA resulting in the absence of a DNA profile. Preliminary tests indicate that profiles can be obtained from such samples by Sepharose or microcon treatment of the post PCR reaction mix followed by PCR of the reclaimed DNA. The validity of this technique for casework is presently being investigated by the RCMP Forensic Laboratory Services Biology Section. Preliminary results using this approach will be presented.