EFFECTIVE LONG-TERM PRESERVATION OF BIOLOGICAL EVIDENCE

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The preservation of biological evidence is necessary in order to maintain the quality and quantity of valuable DNA for forensic casework analysis. Once evidentiary material such as blood, saliva, semen, and/or vaginal fluid is collected on a substrate, it is subject to degradation by nucleases from environmental microbes as well as oxidation from environmental forces. This presents a problem, as some evidence may be stored for months or even years before a crime lab receives it for analysis. Under NIJ award # 2010-DN-BX-K193, optimal methods for the preservation of DNA associated with forensic evidence using inexpensive commercially available off-the shelf (COTS) preservatives that have been used for decades in the food and cosmetics industries were investigated. The preservatives utilized in this study are inexpensive, safe, and are easily applied to samples collected on cotton swabs by the forensic investigator at the crime scene, eliminating the risk of DNA degradation of the sample prior to application of the preservative. The chemical preservatives investigated in this study include: nuclease inhibitors, antimicrobial agents, chelators, fixatives, and antioxidants. The effect of each individual preservative and preservative combinations was tested on blood, saliva, semen and vaginal fluid at room temperature and at an increased temperature in order to simulate aging of the sample. The effectiveness of the preservatives on the resulting DNA profiles for each of the biological fluids will be presented using widely used metrics such as: profile accuracy, percent profile, average peak height (RFUs), and profile balance but will also be analyzed with a statistical model, the forensic DNA profile index (FI), a ranking index that uses Principal Component Analysis for the quality assessment of DNA profiles.