A25 How Does Sampling Strategy and Phone Type Influence the Generation of a DNA Profile Collected From Cell Phones?

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The goal of this presentation is to demonstrate the differences in DNA quantity and quality collected from different areas of cell phones and the influence of environmental exposure on the generation of a DNA profile by collecting samples from cell phones recovered after an extended period of time in an outdoor context.

This presentation will impact the forensic science community by demonstrating effective sampling strategies when cell phones are found at crime scenes.

DNA analysis represents an important investigative tool for crime scene investigations. DNA can be collected from a variety of objects and analyzed in order to aid in human identification or link an individual to a crime scene. For example, published case reports have demonstrated that DNA profiles can be recovered from items such as steering wheels, pens, contact lenses, and even food products. Cell phones represent a common item that is used by a large portion of society and thus likely to be recovered as evidence from crime scenes. Cell phones are objects that are extensively handled due to frequent use by an individual and therefore represent a good surface for collecting a DNA sample. A 2007 study investigated the ability to obtain DNA profiles from flip phones; however, no studies have been conducted that systematically investigate the ability to obtain DNA profiles from other types of cell phones.

Different areas of cell phones are subject to different types of contact with the human body. For example, the keyboard mostly comes in contact with the human fingers, the backplate mostly comes in contact with the palm of the hand, and the screen mostly comes in contact with the ear, cheek, and mouth regions of the face. Different degrees of handling and different avenues of DNA deposit, namely sloughed skin cells, sweat, or saliva, suggest that there may be an optimal location for collecting DNA samples from a cell phone. Furthermore, different areas of the cell phone are subject to different types of environmental exposures with some areas being more vulnerable to environmental variables or contamination from extraneous DNA.

This pilot study investigates the best sampling strategy for obtaining analyzable DNA from several locations on three types of cell phones and explores the possibility of obtaining amplifiable DNA from cell phones that have been exposed to the environment for an extended period. The three cell phone types chosen for this study include handheld, flip phone, and touch screen cell phone models. Samples were taken from the keypad, backplate, and screen of each cell phone after 24-hours of use and again after placing the cell phones in an outdoor location that left them vulnerable to temperature fluctuations, rainfall, and sunlight (UV light). The samples were collected using sterile swabs. DNA was extracted using a common commercial DNA extraction kit, and quantified via quantitative PCR. DNA profiles were generated to establish whether the DNA samples represented a mixture of multiple donors or if a major contributor could be established and whether environmental exposure interfered with the DNA typing process.

DNA was collected from all samples taken from the handheld and flip phones, and 67% of the samples collected from the touch screen phones contained DNA of high enough quantity for DNA typing. The data suggest that optimal sampling locations vary by cell phone type and that samples collected from cell phones can produce complete profiles although exposure to environmental elements resulted in some loss of alleles. Single contributor profiles consistent with the user were produced from samples collected after 24-hours of use from the keyboard of the touch screen and flip phone models, and from the backplate of the handheld model. After seven days of environmental exposure, all DNA profiles consisted of a mixture or partial profile in which some of the user's alleles were detected, suggesting that environmental exposure for even a short amount of time can negatively influence DNA typing results.

DNA, Cell Phones, Sampling

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