## A20 Who's on Your Shoes? Investigating DNA Profiles From New and Worn Shoes

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The goal of this presentation is to demonstrate to the forensic community that multiple DNA profiles can be recovered from the soles of three types of shoes before being worn outside of the store and for some shoe types, the wearer can become the primary DNA contributor after just several hours of wear.

This presentation will impact the forensic science community by presenting a pilot study which successfully recovered DNA from the soles of all three shoe types. It will demonstrate that all three varieties of shoes produced mixed profiles when initially purchased, and will document at which point a major profile, consistent with the wearer, could be generated.

The recovery of DNA that can generate a DNA profile from crime scene evidence is an important aspect of forensic investigations. Shoes represent an item that could potentially be recovered from a crime scene and provide valuable information about the suspect or victim. Shoe impressions may be used to link a suspect with a crime scene and the shoes themselves can later be seized for additional laboratory analyses. Such additional investigations often involve the collection of DNA from the soles and heels of the shoes. A potentially complicating factor to the generation of a DNA profile is the possibility that DNA is deposited on the shoe when being tried on in the store. This could be a possible form of contamination and contribute to the generation of a mixed DNA profile. To date, no previous research has been discovered that investigates whether DNA is present on shoes when they are purchased. The goal of this research is to conduct a pilot study to determine if DNA is present on the soles of three types of new shoes before being worn outside of the store, if DNA is present before being worn, and at what time does the wearer become the primary contributor on the sole.

Three shoe types: flip-flops, close-toed casual shoes (commonly referred to as "flats"), and sneakers were chosen for this study because each has a different level of exposure to the environment and different levels of contact with the sole of the foot. The bare foot comes in direct contact with the flip-flops and the flats; however, sneakers are commonly worn with socks which could potentially reduce the chance of epithelial cells being deposited from the foot onto the sole of the shoe. In addition, the flats and sneakers represent a more closed environment while the flipflops expose the epithelial cell DNA to environmental factors. The sole of each shoe was swabbed before being tried on by the wearer after purchase. Then, the shoes were worn and swabbed again at four, eight, and twelve hour intervals of wear. Because suspects may throw their shoes away after a crime, or dispose of the shoes from their victims, the investigators were also interested in testing whether the placement of the shoes in an outdoor garbage receptacle would influence the ability to generate a DNA profile. Therefore, after the twelve hour wear interval, the shoes were placed in the garbage for six days and the soles were swabbed again after removal. All sampling was conducted using sterile swabs and the DNA was extracted using a common commercial DNA extraction kit. The DNA was quantified via quantitative PCR, and DNA profiles were generated to establish whether the DNA samples represented a mixture of multiple donors or if a major contributor could be established.

DNA of high enough quantity for subsequent DNA typing was recovered from 67% of the samples collected from the flip-flops, 67% of the samples collected from the flats, and 33% of the samples collected from the sneakers worn with socks. The quantification data suggests that some shoe types are better reservoirs for DNA than others. In addition, all three varieties of shoes produced mixed DNA profiles when initially purchased. Samples typed from both the flats and the sneakers suggest the wearer can become the primary DNA contributor after just several hours of wear, while samples taken from the flip-flops consistently generated mixed or incomplete profiles. The DNA typing data suggest that some shoe types will better reflect the actual wearer of the shoe, which may be a crucial link in a forensic investigation.

**DNA Profile, Shoes, Forensic Investigation**

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