Prevalence of DNA on Car Vehicles and/for Guidance in Collecting Samples

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INTRODUCTION

Crime Scene Investigators (CSI) collect many different sample types to be processed at the lab. One of the sample types include DNA swabs in which many of these swabs are used to collect "trace" DNA. Trace DNA is difficult to identify and collect as it is not clear whether an area will be probative unlike blood or seminal stains. This lack of visual identification results in an overabundance of swabs being submitted for DNA analysis. This leads to the DNA analyst to only use their best judgement and experience to submit samples that are likely to contain DNA.

There are additional challenges when it comes to vehicle processing. The first challenge is the time it takes to have the vehicle processed for evidence. This becomes an issue as any DNA present begins to degrade over time thus becoming obsolete to collect a DNA swab. The second challenge is the different sampling strategies utilized by CSI personnel. While all follow the same procedure for prepping the swab, individuals will differ in how the sample is collected. One person may focus on the outer portion of a handle while another will swab the whole handle, both outer and inner portions.

The purpose of the study is to examine the persistence of DNA on different areas of a vehicle that have been waiting for processing for a length of time. The study will determine which areas of a vehicle provide the best DNA results.

MATERIALS & METHODS

Sample Preparation Vehicles (n=17) were selected from the KCPD tow lot which were already processed by the crime scene unit and had been sitting out for at least a year. DNA was deposited by six donors with each donor being the sole depositor onto designated sample areas of a vehicle: exterior door handles, front interior door handles, front arm rests, steering wheel, and gear shift. The deposited DNA sat on the vehicles, exposed to all environmental conditions for up to 28 days before their designated collection date occurred. Three vehicles were swabbed at each time point.

RESULTS & DISCUSSION

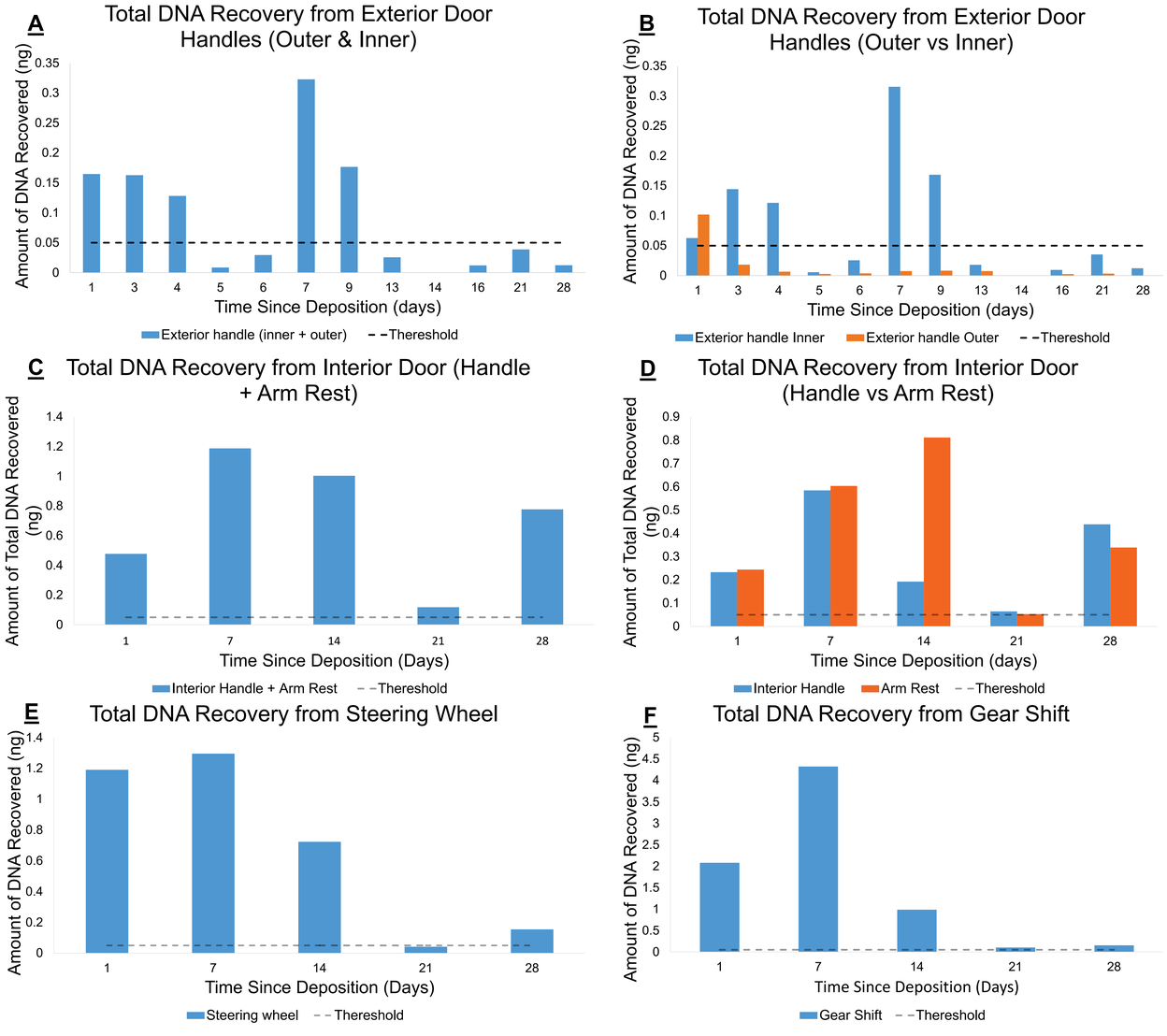

Figure 1. Total DNA recovery over time based on the human quantification values of the various collection locations. **A.** Combined quant values for the outer exterior handle and the inner exterior handle of the vehicle. **B.** Outer exterior handle against inner exterior handle. **C.** Combined quant values for the interior door handle and the interior arm rest. **D.** Interior door handle against the interior arm rest. **E.** Steering wheel recovery. **F.** Gear shift recovery.

- There is a general trend for DNA recovery to decrease as time goes on including the interior of the vehicle
- The rise in recovered DNA is potentially explained by the shedding status of the donors
- The study was conducted during the summer months thus temperature and weather could influence the persistence of DNA

MATERIALS & METHODS

Sample Collection DNA swabs were collected at the deposited sites. All swabs were collected as separate items thus, keeping to either the driver side or the passenger side. Two swabs were collected for the exterior handles: one for the outer portion and one for the inner portion. The entire interior door handle was swabbed on one swab. The other deposited locations were collected on one swab. Time and weather conditions were noted at the start of every collection. The steering wheel texture, material of the vehicle interior, and how the vehicle handle opened were documented.

Extraction Samples were extracted utilizing the Qiagen EZ1® Advanced XL large volume protocol following protocol outlined by the Kansas City Police Crime Laboratory (KCPCL).

Quantification DNA Extracts were quantified using Quantifiler™ Trio at half reaction volumes utilizing the QuantStudio™ 5 Real-time PCR System.

Amplification and Injection Selected extracts were amplified using Globalfiler™ PCR Amplification Kit. PCR products were separated using the Applied Biosystems 3500 Genetic Analyzer. The results were analyzed on Genemapper® v1.6.

CONCLUSIONS

- DNA was recovered from all time points
- High recovery from the interior of the vehicle with the highest recovery from the gear shift
- Recommended to swab the entire exterior door handle for better DNA recovery
- Interior handle and arm rest can be swabbed together for better recovery but can also be swabbed separately

ACKNOWLEDGEMENTS

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