



E77 A Tale of a White-Tailed Deer: Anomalous Serology and DNA Results Offer Clues in an Alleged Hit-and-Run Case

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Learning Overview: After attending this presentation, attendees will be familiar with certain types of biological evidence that can be encountered in hit-and-run cases and the potential for erroneous identification of evidence using DNA and serology testing.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating that forensic analysis of biological evidence in hit-and-run cases can lead to false conclusions and underscores the importance of integrating wildlife testing as a critical component in forensic identification.

Serious bodily injury or loss of life can result from an accidental or intentional impact between a motor vehicle and a pedestrian. In cases involving allegations of hit-and-run, the recovery and testing of biological evidence can assist in advancing investigative efforts and incident reconstruction. Testing for the presence of blood can become the driving force in the pursuit of the offending vehicle and ultimately the suspect. Presumptive tests for blood, such as the phenolphthalein-based Kastle-Meyer test, the Hemastix[®] test, and the luminol/Bluestar[®] test are easy to use and are relatively inexpensive to screen samples for the possible presence of blood. However, those tests are not specific to human blood and can result in false positive reactions to substances other than blood. The tests will react to hemoglobin-containing blood from any mammal as well as blood from other organisms. Using both the Kastle-Meyer test and the Bluestar[®] test, this study observed positive reactions to blood samples collected from birds, reptiles, amphibians, and bony fish. Also observed were positive reactions to samples collected from circulatory fluids of many invertebrates, such as annelids (earthworms), arthropods (spiders), and others. The circulatory systems of those organisms contain iron-rich hemoglobin or copper-rich hemocyanin for respiration. Prudence is warranted in general when testing suspicious stains or biological samples on motor vehicles with presumptive tests for blood. The opportunity exists for encountering stains from various wildlife species, thus potentially leading to false conclusions. To illustrate this issue, an actual case study with complex parameters involving two vehicles and an allegation of a hit-and-run scenario will be discussed.

A female decedent was killed after being struck by a motor vehicle. The case parameters indicated another vehicle, which initially fled the scene. Examination of that vehicle revealed the presence of suspected biological material that was pursued as evidence of involvement in the same incident. Ultimately, the investigation focused on the second vehicle and the driver was charged with homicide because, among other reasons, biological tissue that appeared to be of human origin was found adhered to the undercarriage of his vehicle. Samples from the biological tissue were tested and revealed positive results with the presumptive Kastle-Meyer blood test. Additional confirmatory tests for blood using the RSID[™] blood card revealed negative results. DNA analyses using the Identifiler[®] Human Identification typing kit were unsuccessful in developing a DNA profile from the tissue samples. The failed DNA testing was initially blamed on sample degradation. However, close examination of the profile data revealed the presence of an allelic peak near the amelogenin marker that has been previously described as an artifact of animal DNA amplification with the amelogenin locus primers.

Testing for wildlife DNA is a relatively simple genetic assay using Polymerase Chain Reaction (PCR) technology. It targets a portion of the mitochondrial DNA (mtDNA) commonly used for population studies of various species. Population genetics has provided ample material for comparison of sequence data to determine species from unknown samples. The tissue samples in this case were tested for DNA from a wildlife species. A small piece of the tissue was removed using a sterile scalpel. The sample was then extracted using a QIAGEN[®] DNA Investigator Kit. The extracted DNA was quantified and PCR amplified using primers that target the cytochrome b portion of the mtDNA. The resulting sequence was compared to all sequences contained in[®] via the Basic Local Alignment Search Tool (BLAST). In this case, the sequence aligned with *Odocoileus virginianus* (white-tailed deer) and not *Homo sapiens*. The results confirm the need to keep an open mind about the source of biological material that is adhered to a vehicle. In this case, the biological material found on the undercarriage of the suspect vehicle was most likely picked up when that vehicle ran over the remains of a deer.

DNA and Serology, Hit-and-Run, False Positive