



### **B151 Mosquitoes: A Potential Source for Human Identity**

*Shayna L. Gray, BS\*, Pennsylvania State University, University Park, PA 16802; Scott Lindner, PhD, Pennsylvania State University, University Park, PA 16802; Reena Roy, PhD, Pennsylvania State University, University Park, PA 16802*

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**Learning Overview:** After attending this presentation, attendees will learn how substrates other than those normally found in crime scenes can be used for human identity. Evidence such as insects can be useful for aiding in an investigation of a crime.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by demonstrating how the project utilizes a combination of direct amplification and massively parallel sequencing of DNA from the midgut of mosquitoes to aid the human identification process.

A combination of short tandem repeat sequence and single nucleotide polymorphism analysis using capillary electrophoresis and massively parallel sequencing technology allows for identification of the donor of the blood on which the mosquito has fed.

Evidence such as blood or saliva containing deoxyribonucleic acid (DNA) can be helpful in linking an individual to a crime scene. Common substrates from which DNA can be obtained at a crime scene include different types of fabric, objects used to drink or eat, cigarette butts, leaves, wood, grass, tools, and similar objects. Traditionally, DNA is obtained from body fluids deposited on substrates such as these. One of the more unusual sources that can be used for generation of DNA profiles are insects such as mosquitoes or flies. In addition to their role as infectious vectors for malaria and other diseases, mosquitoes are also useful from a forensic perspective. These insects are not generally included as potential sources of human DNA even though female mosquitoes feed on human blood and store the blood in their midgut for a period of time after feeding. This stored blood contains nucleated white blood cells that house nuclear DNA, which can potentially be used to identify the individual from which the blood meal is taken. Additionally, mosquitoes maintain a ubiquitous presence in the environment, especially in the summer or in geographical areas with hot climates. Therefore, it would not be unusual for them to be present at crime scenes. In fact, mosquitoes have been previously documented and collected at crime scenes around the world.

The primary goal of this research was to obtain forensic short tandem repeat (STR) DNA profiles as well as detect single nucleotide polymorphisms (SNPs) from the blood in the abdomen of mosquitos. Direct amplification using the PowerPlex® Fusion 6C System from Promega Corporation and the Investigator® 24plex GO! Kit from Qiagen was used to detect STR profiles. SNP analysis was performed using the Precision ID Identity Panel on the S5™ system from ThermoFisher. Mosquitoes were euthanized by freezing or by submerging the mosquitoes in ethanol at different time intervals after they were fed on human blood meals. These blood meals included both human blood, from single sources as well as mixtures. Another goal of this research was to determine the time when DNA from the blood starts to degrade within the abdomen of these insects after feeding.

It was concluded that DNA contained in the abdomen of the mosquito can be used to determine the donors' identity using both the STR and SNP technologies. The results indicated that profiles obtained from the blood in the mosquitoes were consistent with profiles obtained from reference blood of the same source. DNA from mosquitoes euthanized at different time intervals was assessed for degradation and it was determined that DNA was completely degraded when blood remained in the abdomens of these mosquitoes for 72 hours.

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#### **DNA Analysis, Massively Parallel Sequencing, Mosquitoes**