H91 The Recovery of Vertebrate DNA From the Gastrointestinal (GI) Tract of Flesh-Eating Insects: A Mass Disaster Simulation Study

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After attending this presentation, attendees will: (1) understand that genetic analyses of flesh-eating insect gut contents found on and near the scene may reveal the identity of missing humans or endangered wildlife species in cases in which the body remains are not visible or available; and, (2) recognize that the value of insects on crime is not limited to Postmortem Interval (PMI).

Mass disasters and terrorist attacks may leave bodies in pieces, burned beyond recognition, or unable to be immediately located. At times, bodies/body parts are moved or scavenged by wild animals in events such as brutal killings, natural deaths, and airplane crashes in remote areas. This presentation will impact the forensic science community by informing attendees that flesh-eating insects are known to colonize decomposing bodies and, when used in forensic cases, may provide crucial evidence that could bring closure to mysterious deaths, determine removal of remains from a suspected crime scene, and establish the credibility of witness statements.

In this investigation, adult *Dermestes maculatus* beetles and larvae were reared in three separate colonies. Each colony fed on fresh flesh meat (*Bos taurus* (beef), *Sus scrofa* (pork), and *Meleagris meleagris* (poultry)). The Quick-DNA™ Tissue/Insect Miniprep Kit was used to extract total DNA. The Polymerase Chain Reaction (PCR) assay utilized species-specific primers that successfully amplified fragments (poultry: 183bp; pork: 212bp; and beef: 271bp) of 12S ribosomal RNA (rRNA), 12S rRNA, and ATPase subunit 6 genes and 8 genes, respectively. The results imply that DNA recovered from the GI-tract reveal what flesh-eating insects fed on.

In a further study, human blood was mixed with beef meat to simulate a mass disaster. The beetles were exposed at room temperature at intervals of 2, 4, 8, 12, and 24 hours. Following extraction of the entire beetle/larvae a Quantifiler® Trio kit was used on a Real-Time PCR 7500 Sequence Detection System and the total amount of amplifiable human DNA and male DNA found ranged from 0.0002ng/µL to 0.184ng/µL. The thermal cycler protocol consisted of holding Stage (1 rep): Step 1, 95° for 2 minutes, cycling Stage (40 cycles): Step 1: 95° for 9 seconds, and Step 2: 60° for 30 seconds.

The GlobalFiler™ amplification kit that contained primers necessary to amplify 21 autosomal loci, Y indel, Y-chromosomal Short Tandem Repeat (Y-STR) locus, and sex determining marker (amelogenin) were used on the genetic analyzer GlobalFiler™ 3500. The protocol was: initial incubation step of 95°C for 1 minute, 29 cycles of denature 94°C 10 seconds, anneal/extend 59°C 90 seconds, final extension 60°C 10 minutes, and final hold was 4°C. A full female DNA profile and partial male DNA profile were developed and matched to the reference profiles made from buccal cheek swabs. The results show that human DNA can be recovered and individualized from flesh-eating insects that could be potential secondary sources of DNA.

Flesh-Eating Insects, Vertebrate DNA, Mass Disaster