K25 Methamphetamine, Amphetamine, and Norephedrine Levels in Dermestid Beetles From the Consumption of Dosed, Buried Rat Remains

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After attending this presentation, attendees will understand the potential to detect amphetamine and methamphetamine and their metabolites in dermestid beetles using a homogenization, solid phase extraction, and a Gas Chromatography/Mass Spectrometry (GC/MS) method. Attendees will also learn the effects of postmortem interval on drug detection and the best developmental stages (larvae, pupae, adult, and frass) for drug detection in dermestid beetles.

This presentation will impact the forensic science community by providing information on the use of dermestid beetles for the detection of drugs even at advanced stages of decomposition. This research identifies the best dermestid beetle developmental stage for detecting amphetamine and its metabolites when no other tissue remains.

There are multiple studies detecting various drugs within blow flies. Few studies have attempted to detect and quantify drugs within other insects such as dermestid beetles (Order: Coleoptera). These beetles are the last insects found feeding on decomposing remains. To date, the only reported studies dealing with Coleoptera have been on beetle exuviae, from which amitriptyline and nortriptyline were isolated.

It was determined that methamphetamine and amphetamine could be detected in four beetle developmental stages fed on buried rats dosed with 10mg/kg (*n*=4), 6mg/kg (*n*=4), 2mg/kg (*n*=4), 1mg/kg *n* 2), 0.6mg/kg (*n*=1), and 0.2mg/kg (*n*=2), amphetamine, and 5mg/kg (*n*=4), 3mg/kg (*n*=4), 2.5mg/kg (*n*=2), 1.5mg/kg (*n*=2), 0.5mg/kg (*n*=4), and 0.25mg/kg (*n*=2) methamphetamine. Three control rats were injected with saline and buried and two control rats were not injected and not buried. All rats were euthanized with Carbon Dioxide (CO_2) gas prior to burial. Buried rats were exhumed at different decomposition stages (89, 182, 395, and 819 Accumulated Degree Days (ADDs)) to determine the effects of decomposition on the ability to detect the drugs using GC/MS. After exhumation, rats were dissected, pelted, and dried before being fed to dermestid beetles (*Dermestidae maculatus*). Eight adult beetles were placed on each sample until they laid eggs, then removed. All offspring consumed meat of the dosed rats until only bones remained. Remaining adult beetles, larvae, and pupae were collected and homogenized using a mortar and pestle and liquid nitrogen; beetle frass was also collected. Samples were centrifuged and drugs extracted using solid phase extraction. The amounts of methamphetamine, amphetamine, and norephedrine were quantified in all beetle media using GC/MS with methamphetamine D5 and amphetamine D5 as internal standards.

As predicted, methamphetamine, amphetamine, and norephedrine were detected in all beetle mediums (larvae, pupae, adult, and frass). All non-drugged controls were negative. Samples that contained drugs exhibited a dose response relationship curve. This means that the higher the concentration of drug in the rat, the more that methamphetamine, amphetamine, and norephedrine were able to be detected in beetle mediums. Of all the mediums, frass was the easiest to handle while pupae were the hardest to collect since they were the most fragile.

Methamphetamine, Dermestid Beetles, GC/MS