

subtilis. Genomic DNA was extracted from *B. subtilis* and amplified using PCR. These selected amplicons were analyzed via Electrospray Ionization Time of Flight (ESI-TOF) MS. Using an integrated fluidics system, DNA samples could be introduced to the ESI source at a high flow rate but then electrosprayed at a slower flow rate to improve resolution. After deconvoluting the information from the mass spectrometer, the organism can be identified by comparison to a library using abundance estimation, joint maximum likelihood, and base composition analysis. The molecular weights from multiple strands, when combined, provide a unique molecular fingerprint which allows an organism to be identified down to the species and strain-level.

A binary set of strains from *B. subtilis* were mixed at various concentration levels to evaluate this MS-based approach in terms of speed and accuracy. An internal mass standard sequence of DNA was used to allow the concentrations of microbial DNA to be calculated after amplification. When using single-stranded oligonucleotides, more than 200 base compositions could be reported. However, using the complement strand at low concentrations has shown to reduce complexity and error in the data, improving the accuracy of the result.

An expansion and variation of the number of bacterial species and strains tested will occur as time permits for this presentation. As a bioterror event could result in thousands of organisms present in a sample, there will continue to be a need for methods which can select the correct organism, especially in the case of a novel strain for forensic studies.

ESI-TOF, Unknown Microbes, Base Composition

G14 Environmental Scanning Electron Microscopy and Other Techniques in Cutting Crime Investigation: Case Report and Review of the Literature

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After attending this presentation, attendees will understand some principles of investigation of a dismembered body concerning the cause of death and the identification of the tools used to separate arms and legs from the trunk.

This presentation will impact the forensic community by suggesting a novel approach for the analysis of cutting crimes in general and dismembering in particular.

Herein investigators present the case of a 40-year-old female killed by throat cutting and consequently dismembered. She was found cut into pieces inside three plastic bags in a garage.

Dismemberment is the act of cutting, tearing, pulling, wrenching, or otherwise removing the limbs from the trunk of a living or deceased subject. It may be practiced upon human beings as a form of capital punishment, a result of a traumatic accident, or in connection with murder, suicide, or cannibalism. After killing the victim, the murderer uses a very sharp cutting weapon (a saw, knife, axe, etc.) to sever the limbs and cut the body into pieces. The operation is generally carried out immediately after the crime, although more rarely a long time may pass between the two events. There are two types of dismemberment that are commonly seen: localized, such as the removal of the head or hands in an attempt to hinder identification of the victim, or generalized at multiple sites (commonly bisection of limbs or disarticulation of the joints) to aid in the disposal of the body. In these cases a new pattern of investigation must support classical techniques to solve the following forensic issues:

- The evaluation of the time since death and of the time since dismemberment. Indeed, exsanguinations and dismemberment of the body prevent an accurate evaluation of lividities and rigidity.
- The identification of the tools used to cut the body. Careful, thorough investigation is a key point to ensure that potential physical evidence is not tainted or destroyed. In particular it is essential to identify any potential sharp cutting weapons at the crime scene. Moreover, when saws are used to cut the body, characteristic tool marks are left on the bone. The nature of the marks depends on the size, shape, width of the saw, and on the sawing action of the user.

Environmental Scanning Electron Microscopy (ESEM) may help in identifying the specific saw that has been used in the act of dismemberment. ESEM can detect and measure different types of striations, paint traces (such as rust inhibitor paints) or metal residues remaining on the bone after the cutting.

In the case presented, the determination of potassium levels in the vitreous humour and their time changes showed that the victim had been killed 20 - 25 hours before the death scene investigation.

The absence of lividities combined to histological and immunohistochemical investigation of the skin let investigators classify the dismembering injuries as non-vital wounds and to estimate the time interval between the death and the dismembering.

However, the most interesting finding was the identification of the tools used to cut the soft tissues and the bones of the victim. Morphological and morphometrical analysis of the skin lesions pointed out that the arms and the legs were cut with a sharp knife, whereas the head was removed from the trunk by a woodworker saw. ESEM analysis determined that the bone injuries were produced by a particular type of saw covered by rust-inhibitor paint.

Cutting Crime, ESEM, Dismembering

G15 Exploration of Non-Cardiogenic Pulmonary Edema With Chronic Opiate Use: Case Studies and Scientific Review

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After attending this presentation, attendees will learn how to characterize non-cardiogenic pulmonary edema during autopsy caused by opiate use. Additionally, attendees will learn about alternative opiate sources which may lead to cases of non-cardiogenic pulmonary edema. Such cases may present during autopsy and potentially lead to classification of a secondary cause of death or change in the classification of manner of death.

This presentation will impact the forensic community by providing potential answers to cases in which underlying chronic opiate use potentiates mortality. Chronic opiate use may synergistically lead to fatal pathology not readily recognized when secondary to diseased states in the lung. The presentation focuses on the reliability of diagnosing cause and manner of death during autopsy with the goal of increasing the validity of techniques, processes, and methods used in forensic medicine.

Use of opiate variants, including pain management medications such as morphine and street drugs such as heroin, have all been implicated in causing acute respiratory distress marked by non-cardiogenic pulmonary edema (NCPE). Despite efforts to treat patients who develop NCPE through chronic use or acute over-dose, presentation of NCPE stills has a mortality rate of 30-50%. With significant mortality and the rise in cases, development of NCPE is increasingly significant to the forensic community. The molecular and cellular mechanisms by which opiates induce non-cardiogenic pulmonary edema (NCPE) remain elusive. NCPE is a clinical hallmark of opiate use in long-term drug

PROCEEDINGS

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