G15 Succession of Microfungi in Grave Soil

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After attending this presentation, attendees will understand that soil microfungi possess the potential to act as a tool to estimate extended postmortem and postburial interval.

This presentation will impact the forensic community and/or humanity by providing investigators with a novel method for estimating time since death in cases involving buried remains.

The estimation of postmortem interval (PMI) becomes increasingly inaccurate as decomposition proceeds. Estimating postmortem period in cases where a body is buried in soil is particularly difficult because soil typically prevents forensically important insects from accessing the body. Thus, the development of insect larvae is generally unavailable as a forensic tool in investigations involving burials. Therefore, a need exists to develop new techniques for estimating PMI of buried bodies and postburial interval (PBI). This need is particularly great for bodies associated with an extended postmortem period (months to years).

The forensic application of microfungal ecology has the potential to improve the estimation of extended postmortem periods. Like the macrofungi, microfungi respond to nutrient amendment. This response typically results in fungal proliferation and, as the nutrient source is utilized, a succession of microfungal taxa occurs. This phenomenon is similar to insect succession associated with cadaver decomposition on the soil surface. In addition, some microfungi, primarily from order Onygenales, possess the ability to access keratin as a food source. This might be of particular importance to forensic science, as a body in extended PMI primarily comprises keratinaceous material such as skin, hair and nails.

A study was carried out to identify fungal species present in grave soil over a period of six months following inhumation. In spring 2006 five pig (*Sus scrofa*) carcasses were placed in separate shallow graves (40-50 cm) and covered with soil. Carcasses were exhumed at monthly intervals for the 6-month period. Soil was collected from the walls and base of each grave. These soils were sprinkled or diluted in water and spread onto tapwater, cornmeal, or Mycosel® agar plates containing the antibiotic chloramphenicol. This antibiotic was used to suppress the growth of bacteria and rapidly proliferating fungi that can overwhelm the fungi of interest.

Following the first exhumation, minimal decomposition had occurred and the carcass was classified as being in the fresh/bloat stage. As expected, there was no discernable difference between microfungus communities in control soil samples (taken at four depths one meter away from the cadaver) and soil taken from various microsites in contact with the cadaver. Communities were dominated by *Trichoderma* spp., *Mucor* spp., *Acremonium* spp., *Sordaria fimicola*, and coelomycete spp.; all common soil microfungi. These findings were able to provide a thorough background of the microfungi community in the soil.

Following the second exhumation, considerable decomposition had occurred and the carcass was classified as being in the active/advanced decomposition stage. Discernible differences in the microfungi community were apparent between grave soil and control soil samples, particularly with regard to the soil nematode community. This stage of decomposition is associated with an increase in bacterial-feeding nematodes that are then succeeded by fungal-feeding nematodes.

Exhumations will continue for the remainder of the trial and results for the six month period will be presented. Based on the preliminary results, it is anticipated that communities of nematophagous fungi will change in response to shifts in nematode community composition. These changes should be predictable over time. As a result, community structure data for nematophagous fungi has the potential to act as an additional forensic tool in estimating PMI and PBI of buried remains.

Microfungi, Grave Soil, Postburial Interval

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