D13 Cadaver Mass and Decomposition: How Long Does It Take for a Cadaver to Increase the Concentration of Ninhydrin-Reactive Nitrogen in Soil?

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After attending this presentation, attendees will understand the relationship between cadaver mass and the concentration of ninhydrin- reactive nitrogen (NRN) released into the soil during decomposition, as well as the time required for a significant ($P < 0.05$) increase in gravesoil NRN.

This presentation will impact the forensic community and/or humanity by showing that NRN can be used to detect gravesoil within one week of the onset of decomposition.

A significant amount of NRN is released into gravesoil during cadaver decomposition. However, the time required for this process to occur is currently unknown. Further, it is unknown if this release is related to initial cadaver mass. It was hypothesized that a correlation exists between cadaver mass and the time required for a significant increase in gravesoil NRN, which would assist in locating sites of cadaver breakdown. To do this, cadaver mass loss and the concentration of gravesoil NRN over a period of 21 days during the summer (June 2007) was measured.

The experimental site was located at the University of Nebraska Agricultural Research Development Center located approximately 48 km north of Lincoln, Nebraska, USA. The site is a pasture that is intermittently grazed by cattle and horses. The soil at the site is a deep silty clay loam of the Yutan series (Mollic Hapludalf). The climate is temperate mid- continental characterized by hot summers, cold winters, and moderately strong surface winds. Average annual precipitation is 695 mm. Approximately 75 percent of the precipitation occurs between April and September. Mean annual temperature is 9.8°C with mean minimum and maximum temperatures ranging from 0 C (January) to 31°C (July). The vegetation at site is dominated by non-native grass (smooth brougham) and forb (white clover) with some native vegetation, including daisy fleabane, yellowwood sorrel nut sedge, and pasture rose.

Swine (*Sus scrofa*) carcasses of four contrasting masses approximating sizes from neonate to adult (~3 kg, ~20 kg, ~40 kg, and ~50 kg) plus a control (no cadaver) were used. Swine were killed with blunt force trauma to the cranium, weighed, and placed on their right side on the soil surface facing west. Soil samples were collected (0-5 cm depth) from adjacent to the cadaver at intervals of 24 hours for the initial 14 days. This experiment was replicated three times, which resulted in a total of 12 swine cadavers.

The concentration of gravesoil NRN increased significantly within the first week of cadaver decomposition. This demonstrates that NRN can be used a presumptive test for gravesoil within seven days of death. Neither a simple correlation nor a simple correction factor between cadaver mass and NRN concentration developed. The smallest mass, the neonatal swine, decomposed much faster than the other the adult (50 kg) swine, probably because there was less tissue to be consumed by insects and microbes. The neonatal swine were dry within 10 days, whereas adult cadavers took up to 18 days to dry. Future research should focus on the persistence of NRN in gravesoil to determine the maximum amount of time gravesoil NRN is significantly greater than basal NRN.

Ninhydrin, Forensic Taphonomy, Decomposition

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