## G92 How Does Season Affect the Release of Ninhydrin - Reactive Nitrogen Into Grave Soil?

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After attending this presentation, attendees will understand that seasonality can significantly affect the rate at which ninhydrin - reactive nitrogen (NRN) enters grave soil and that the dynamics of grave soil NRN can contribute to the estimation of postmortem interval (PMI).

This presentation will impact the forensic community by serving as a fundamental investigation into the estimation of extended PMI. Accurate estimates of extended PMI are currently difficult to achieve.

During the summer months, when temperatures are warm, bodies tend to decompose at a more rapid rate. Recent research has shown that a body releases NRN into grave soil during decomposition. At present, few studies have investigated NRN in grave soil when decomposition begins during colder months. The release of NRN has primarily been used to locate graves, but more recently, has been investigated for its use in estimating PMI. To investigate this use, researchers decomposed carcasses in winter and summer to compare the release of NRN into grave soil.

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 midcontinental 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 (~40 kg) plus a control (no cadaver) were used. Swine were killed with blunt force trauma to the cranium and placed on their right side on the soil surface facing west. Swine were killed and placed on the soil surface during February 2008 (winter) and June 2008 (summer). Soil samples were collected (0-5 cm depth) from adjacent to the cadaver at intervals of 15 days for the initial 30 days. This experiment was replicated three times, which resulted in a total of six cadavers.

The concentration of NRN during the summer months was greater than during the winter months. Elevated levels of NRN were observed during the summer months after 15 and 30 days postmortem. In contrast, a significant increase in NRN was not observed during the initial 15 days of decomposition during the winter months. These results demonstrate that NRN would not be an accurate method to test for the presence of grave soil during the initial 15 days of death. As decomposition in terrestrial ecosystems is primarily biologically mediated, this influx was likely more rapid during the summer months because of greater insect and microbial activity. A more accurate way to measure postmortem interval during the winter months would be to use degree days, which will be presented along with measurements of NRN after 60 and 90 days.

**Forensic Taphonomy, Postmortem Interval, Temperature**

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