G76 The Investigation of Animal Tissue as an Analogue for Human Tissue in Decomposition Studies in Soil

Kathryn L. Stokes, BSc, Centre for Forensic Science, University of Western Australia, 35 Stirling Highway, Nedlands, Perth, Western Australia 6009, Australia; Shari Forbes, PhD, University of Ontario Institute of Technology, Faculty of Science, University of Ontario Institute of Technology, 2000 Simcoe Street North, Oshawa, ON L1H 7K4, Canada; and Mark Tibbett, PhD, Centre for Land Rehabilitation, School of Earth and Geographical Sciences, Faculty of Natural and Agricultural Sciences, University of Western Australia, 35 Stirling Highway, Nedlands, Perth, Western Australia 6009, Australia*

After attending this presentation, attendees will understand the chemical process of decomposition, the compounds released during the decomposition of muscle tissue of different species, and their interaction with the soil environment. The aim of this presentation is to compare the use of animal tissue as an accepted model for human tissue in decomposition trials.

This presentation will impact the forensic community and/or humanity by showing direct comparisons between the decomposition chemistry of human and various animal tissues in a soil environment. The identification of both similarities and differences between the different tissue types will help identify the best animal analogue for future decomposition studies.

Pig (*Sus scrofa)* carcasses are currently accepted as the closest model to human decomposition due to their physiological similarities to humans. For this reason they are commonly used in a range of decomposition studies involving microbial activity and entomology. However from a chemical perspective there are limitations with this model due to variations in the decomposition compounds produced by humans and animals. Furthermore, the behavior of these compounds in soil is unknown with respect to the subsequent nutrient dynamics. The current study was therefore conducted to investigate the chemical decomposition of skeletal muscle tissue in soil and to compare similarities and/or differences between human and animal tissue. The results will assist in determining the most useful animal model in chemical decomposition studies. The research may benefit forensic investigations involving decomposed remains whereby the species determination is in question.

A laboratory incubation method was used to monitor chemical changes during decomposition. The soil in each microcosm was a sand texture adjusted to 50% water holding capacity to provide optimal conditions for microbial activity. Cuboid pieces of skeletal muscle tissue from four different species, namely porcine, bovine, ovine and human, were interred at 1 cm depth in the soil and incubated at 25^{o}C for 37 days. Carbon dioxide evolution was used as an index of soil microbial activity. Aerobic conditions were maintained by opening the microcosms daily to replace oxygen depleted air from the container. The microcosms were destructively harvested at periods of 2, 4, 6, 8, 12, 16, 23, 30 and 37 days. Any remaining skeletal muscle tissue was removed, weighed, and dried to ascertain mass loss. The soil immediately surrounding the site of muscle tissue decomposition (detritosphere) was collected and analysed. The mineralization of nutrients was monitored by analyzing inorganic molecules within the soil using colorimetric methods for ammonium, nitrate and phosphate, and atomic absorption spectroscopy for potassium levels. The release of long chain fatty acids into the soil was also monitored using GC-MS.

Results have demonstrated that for all skeletal muscle tissues there is an observed increase in pH before a decrease back to the starting pH measured prior to muscle tissue interment. Electrical conductivity also increases for all different types of skeletal muscle tissue. Further results from organic and inorganic chemical analyses will be discussed in the presentation.

Animal models are commonly used for decomposition studies due to restrictions on the use of human cadavers. The results from this study will impact the forensic community by showing direct comparisons between the decomposition chemistry of human and various animal tissues in a soil environment. The identification of both similarities and differences between the different tissue types will help identify the best animal analogue for future decomposition studies.

Animal Tissue, Human Models, Decomposition

 ** Presenting Author*