H87 Estimating Time Since Death From Human Skeletal Remains by Radioisotope and Trace Element Analysis

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After attending this presentation, attendees will understand a potential new technique to estimate time since death.

This presentation will impact the forensic community and/or humanity by giving forensic anthropologists another way to estimate time since death. It will also encourage people from different countries to try this technique on human material from their own country.

One of the first concerns for forensic anthropologists in dealing with found skeletal remains in the Australian context is the determination of whether the remains are of anthropological, historical or archaeological interest. If fewer than 75 years have lapsed since death, remains are classified as anthropological and of forensic interest. Those from the historical (75-149 years dead) and archaeological (>150 years dead) periods are, if aboriginal subject to the Aboriginal and Torres Strait Islander Heritage Protection Act 1984. However, an accurate and reliable method for estimating time since death (TSD) from human skeletal remains has thus far eluded forensic anthropologists. This study investigates the application in an Australian context of a novel approach recently proposed to dating skeletal remains from levels of radioisotopes ^{210}Po, ^{238}U and ^{226}Ra and trace elements. Radionuclide activity concentrations were by determined alpha spectrometry and trace element concentrations by inductively coupled plasma mass spectrometry (ICP-MS).

Discriminant analysis of the combination of activity concentration values for ^{210}Po, ^{238}U and ^{226}Ra clearly separated bones derived from individuals who had died in the three eras of interest, as did the combinations of trace element concentrations. Bone radionuclide activity and calcium concentrations were all significantly higher in bones from the archaeological era than those from more recent eras, while trace lead concentrations from samples from the historical era were significantly higher than those from other eras. Barium, lanthanum, rubidium, strontium, cerium and neodymium concentrations were all significantly correlated with one another and with radionuclide activity concentrations. Significant differences were found between the patterns of radionuclide activity and trace element concentrations in different types of bone.

The results of this study lend support to suggestions that multivariate consideration of trace element concentrations and radionuclide activity levels can aid in the estimation of time since death from bony remains in Australia. This was a very small study, but its results clearly indicated the need to take into account variations arising from lifetime activities, diagenesis and bone type in applying the techniques to estimations of time since death. It highlights the great need for a large scale study which systematically examines these influences on the estimation of time since death in bone of known ages ranging from the very recent through to archaeological times.

Time Since Death, Radionuclides, Forensic Anthropology

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