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Decomposing pig bodies could help identify human remains – new study finds

Photo: Winter 2021 deployment site, in Delft, Cape Town.

The identification of unknown human remains is a significant and ongoing challenge in South Africa, worsened by the country's high murder rate. The rate of decomposition is significantly influenced by vertebrate scavenging, which, if not considered, can impede the accurate estimation of the post-mortem interval.

Research led by the University of Cape Town's Professor Victoria Gibbon and collaborator Dr Devin Finaughty and PhD student Dr Kara Adams has provided new insight into positively identifying human remains using cutting-edge technology. Because human bodies are not permitted for use in taphonomic research in South Africa, large pigs – the next best

alternative – were used instead. Pigs are regularly used globally for human analogues because they are anatomically similar to human beings.

Titled "Forensic taphonomic experimental design matters: a study assessing clothing and carrion biomass load on scavenging in Cape Town, South Africa", the research is published in the *International Journal of Legal Medicine*.

The PhD research included two parts. For the first, Adams collected forensically relevant data and incorporated six single, clothed porcine bodies, weighing 60 kg each, into her research methodology. She said the pigs were dressed in common clothing items used for local medico-legal cases. These season-specific items included underwear, cotton t-shirts, denim pants and leather belts, as well as socks, shoes and jerseys. Each piece of clothing was tailored to fit the six pigs and Kara examined their decomposition over a period of 18 months (between July 2021 and March 2023) to draw her conclusions.

The decomposition process

Once she obtained the porcine bodies, Adams needed to examine the decomposition process. She placed two in a peri-urban habitat (Delft) and four in a suburban habitat (Rosebank) in Cape Town, during the summer and winter months. Each porcine body was placed on an autonomous weighing apparatus, developed and designed by Professor Gibbon and Dr Finaughty, in partnership with the Department of Electrical Engineering's Justin Pead. The apparatus automatically recorded the weight of each pig every evening, and cameras placed around the carcasses monitored any scavenging activities.

Adams research findings indicate that the decomposition process was delayed significantly during the winter season and expedited in summer. This, she explained, also meant that clothing types and seasonality affect the decomposition process. Interestingly, on the peri-urban research site, she said, a Cape grey mongoose that scavenged the area also played an integral role in the porcine bodies' quick decay.

"The scavenging by the Cape grey mongoose accelerated the decomposition process in Delft. In Rosebank there were no mongooses present, which means it took a lot longer for the porcine bodies there to start decomposing," she said. "These results advocate for using single, clothed porcine bodies, deployed across multiple seasonal trials in forensically significant locations to produce data that can be considered forensically realistic."

Precocious mummification

During the second part of her research undertaking, Adams used the porcine bodies to study precocious mummification (natural mummification that occurs in less than a month) – a unique phenomenon in the Western Cape. Printed computing boards were inserted into each carcass's tissue to measure and record the tissue moisture content during 15-minute intervals. The results, she added, were then analysed using generalised additive modelling, which included environmental conditions like the temperature and rain to help her establish how environmental factors influence desiccation.

This leg of her research project was particularly special because it forms part of the first qualitative assessment of desiccation that has ultimately led to precocious mummification.

"This research provides valuable insights. Desiccation in summer appeared to follow an exponential decline and temperature was the most influential environmental factor. This data collection demonstrates the potential of using accumulative degree days and moisture content to estimate the post-mortem interval," Adams said.

An automated field site

The cutting-edge technology used in this study was instrumental in reaching the array of research conclusions, which Adams described as a huge blessing, but at times also "a challenge".

"We made use of numerous autonomous technological advances to collect the forensic taphonomic data at our sites. This was crucial as we move towards a more standardised method of data collection within the field. But as with trialling any new technology, there are always some challenges along the way. Thankfully, we could sort those all out," she said.

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