

Clothed pig carcasses reveal the secrets of mummification—study provides insights for forensic scientists

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It was the kind of task any competent seamstress has completed hundreds of times before: altering denim jeans and jerseys. But there was something different about this piece of work. Though our team of scientists were paying for it, we weren't her ultimate customers—the clothes were to be worn by dead pigs.

The pigs and their specially tailored outfits were central to [research](#) conducted by ourselves, Devin Finaughty and our colleagues from South Africa's University of Cape Town (UCT), a group of forensic scientists known as [taphonomists](#). We study the environmental forces that drive changes to a body after death. A key aspect is estimating time-since-death, the length of time between death and a body being recovered. Ascertaining this detail can help to identify the person and reconstruct the circumstances around their death.

Legal and ethical challenges prohibit taphonomic research using donated human remains in most countries. Currently, human taphonomic facilities only exist in the [US](#), the [Netherlands](#), [Australia](#) and [Canada](#). These facilities have been proposed in other countries, including the UK and India, but have not overcome legal and public resistance.

These human facilities are not legal in South Africa, and as a result pigs are used. Pigs, specifically those weighing around 60kg, are useful for human decomposition studies because they have anatomical similarities to humans. They have been used in taphonomic research since the 1980s.

But it's not just the human body that decomposes after death. Clothing degrades too and, to obtain forensically realistic information, clothing tailored to the body is required. That's why a seamstress was so central to this study. Once the alterations were done, we dressed six pig carcasses and left them to decompose in two forensically significant Cape Town habitats, one in Delft at the South African Medical Research Council's research facility and one in a secure area in the suburb of Rosebank.

We found, overall, that winter-season clothing delayed decomposition. Summer-season clothing accelerated the process. Carcass weight loss was directly affected by the scavenging of the Cape gray mongoose (*Galerella pulverulenta*), which accelerated the decomposition rate. And single carcasses within the same habitat decomposed faster than when two or more carcasses are dumped together.

These findings have helped deepen our understanding of how soft tissue desiccates (dries out or mummifies), which is central to improving the accuracy of time-since-death estimations and can assist in criminal investigations.

A unique experiment

This study, which was part of Dr. Adams' Ph.D., is the latest conducted by our research team, which has been collecting data since 2014. The team has years of local data; for instance, we were the first to show that mongoose scavenge from bodies.

In this experiment we focused on mummification. This isn't the process you might associate with ancient Egyptian practices. Cape Town summers are hot with dry winds; this can produce a rare natural phenomenon known as [precocious mummification](#). This occurs when the body desiccates in less than 30 days through the gradual removal of moisture from tissues. It is usually the result of climatic extremes, such as in an arid desert, and hot, dry micro-environments, such as in a sealed house.

The phenomenon was [first documented in Cape Town only in 2019](#) by members of our team. Our new experiment sought to build on those findings by analyzing the specific environmental driving forces of desiccation in Cape Town. Courts of law prefer quantifiable data with low levels of subjectivity, so this is critical for justice.

Clothing was a key part of this experiment. That's because most of the dead bodies found outdoors in the Cape Town area are dressed in seasonally appropriate clothing.

The majority of these cases involve a single deceased person. We chose clothing for the pig carcasses based on a [previous survey](#) of the most common items found in actual local forensic cases.

Sensors gather rich data

An [electrical engineer](#) at UCT, Justin Pead, helped us design and develop sensors that were inserted into the pig bodies (one in the head, one in the neck and one in the lower body). These devices measure tissue resistivity at various depths within decomposing bodies, which is related to the drying out of the tissue.

The sensors were tested across two summer seasons and one winter. The data they collected illustrate the complex interplay between environmental conditions and mummification processes.

In the high heat of summer, the body rapidly desiccated, with tissues gradually losing moisture until reaching a state of mummification in under 30 days. In the coolness of winter, the bodies reached a stage of advanced decomposition and lost about 20kg of their initial weight but never lost any more weight and never reached the skeleton stage. The colder temperatures and higher humidity levels prevented them from drying out. Cape Town has rainy, stormy conditions in winter.

A global first

Measuring desiccation for estimating time-since-death opens new avenues for research. It has implications for several disciplines. Forensic

anthropologists, forensic taphonomists, electrical engineers and statisticians all have a role to play.

Our approach also offers the court system some more objective data.

The integration of innovative methodologies and technologies, such as the use of sensors on custom-designed printed circuit boards inserted in decomposing tissue, is especially exciting. It promises to change forensic taphonomy practices and enhance understanding of postmortem processes everywhere.

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