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FORENSIC FORUM

Body farms

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The establishment of the first 'body farm' in 1981 by Dr. William Bass, a forensic anthropologist at the University of Tennessee Knoxville (UTK), represented a unique opportunity in the forensic sciences to study human decomposition using cadavers in a controlled research environment. Until that time, the literature relating to human decomposition had relied upon anecdotal evidence following exhumations of historical and archaeological grave sites [1–3] or case reports by forensic pathologists [4, 5], often providing contradictory results. Prior to, and following, its opening, controlled research typically utilized animal analogues (particularly porcine remains) to simulate human decomposition [6–8]. The Anthropology Research Facility (as it was formerly known) provided the first opportunity to compare human and pig decomposition in the same environment [9], providing an important finding for forensic taphonomic studies. Disappointingly this study was not repeated until recently at the same facility and many researchers (including this author) have used this study over the past two decades as evidence of the similarities between pig and human decomposition, even though we now know there is little evidence to support this.

The recent study comparing pig and human decomposition at the Forensic Anthropology Centre (FAC - as it is now known) at UTK highlights the differences observed between human and other animal (namely pig and rabbit) decomposition [10] and the reason why human subjects are recommended for forensic taphonomy studies. The research team found that pig remains decompose faster than human remains, a finding also confirmed (but not yet published) at Australia's only 'body farm', the Australian Facility for Taphonomic Experimental Research (AFTER). Given the impact this can have on the estimation of time since death of decomposed remains, the use of pig remains has been called into question. This highlights the importance of conducting research using human cadavers to enhance our ability to estimate the postmortem interval where this parameter is key in a death investigation.

It has however been noted that human decomposition is an extremely variable process, even between individuals of similar physiology placed in the same environment. As we are all unique during life, it is perhaps not surprising that we will decompose differently following death, particularly when considering the range of physiological variables that can impact an individual (e.g. diet, body mass, genetics, medication, treatments such as chemotherapy, etc.). This might be considered a failure of these facilities as it is assumed that there is a lack of repeatability in the studies conducted at body farms, and some would argue that this could be better modelled using pig (or other animal) remains. Granted, pig remains may provide more replicability in terms of similar body mass, diet, genetics, etc. but given the observations above, no amount of repeatability will account for the differences observed when compared to human decomposition. Rather this highlights the need for body farms to repeat studies as frequently as possible to establish a longitudinal data set that can be used to estimate average rates of decomposition. Although we see considerable variation in the processes of decomposition at AFTER, we have already identified some trends (unpublished data) which can be used to better understand the rate of decomposition, particularly in the latter stages. It is also important to remember that although we strive to enhance our ability to estimate time since death using these studies, there are many other important applications of the research conducted at body farms, including improving current search and recovery methods, as well as the identification of victim remains [11].

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Human variability plays less of a role in these types of research but the use of human subjects is still preferred to accurately replicate the scenario being investigated (e.g. locating a clandestine grave).

In addition to conducting research, body farms also offer the opportunity to conduct training in the search and recovery of human remains for law enforcement agencies and other relevant personnel. Such training has been conducted at FAC in collaboration with the Federal Bureau of Investigation (FBI) since 1999 [12], representing a unique opportunity to gain practical experience in the recovery of human remains, prior to their first exposure on the job. This is particularly important for those police agencies that do not have a forensic anthropologist/archaeologist to assist with such crime scenes and conduct recoveries with limited expertise. These training opportunities also provide greater opportunities for collaboration between scientists/researchers and the police, ensuring that the data being generated at body farms is applicable to police investigations. At AFTER we have seen a considerable increase in the contact by local police agencies since opening, compared to when our studies involved animal remains. As a result, the police and other law enforcement agencies are now directly advising on scenarios that require investigation at AFTER and several of these studies have already assisted with their investigations, demonstrating an early success of our facility. Although body farms may not regularly publish their casework findings due to legislative restrictions, most Directors have many examples where research conducted at their facility has directly assisted a police investigation, albeit in their local environment.

This highlights a limitation of these facilities, namely that the research is only applicable to the immediate environment, particularly when estimating time since death. This is certainly true and all facilities advise against extrapolating data to distinctly different climatic zones, given the inherent environmental impact on the rate and processes of human decomposition [13, 14]. In an attempt to address this limitation, other facilities have opened over the past 15 years in different geographical zones of the USA. Internationally, AFTER represents the only body farm located outside the USA although recent plans for a facility in the Netherlands have also been reported [15]. Clearly, this does not represent the range of climatic zones across the globe, but the opening of facilities outside of the USA will ideally encourage future body farms to be established in other regions of the northern and southern hemisphere which can only be beneficial to the forensic taphonomy community. It is intended that additional facilities will open in Australia to better cover the range of environments where victim remains are typically recovered. While it is impossible to replicate all environments, research at the current and future sites can account for the regions where the majority of victim remains are found in Australia and provide more accurate information than currently available using animal analogues in these locations.

A search of the literature using the key word 'body farms' is unlikely to identify publications from these facilities. This term is actively avoided within the field of forensics as it is not representative of the research being conducted. Rather, each facility has its own acronym such as FAC at UTK, FOREST (Forensic Osteology Research Station) at Western Carolina University, and CFAR (Complex for Forensic Anthropology Research) at Southern Illinois University. A search of these terms is likely to identify a much broader range of research that has been conducted over the years and a detailed list of references can be found in recent publications such as in the publication by Vidoli et al. [12]. Not only does this research benefit death investigations involving missing persons and victims of homicide, research is now being focused in areas of mass disaster and human rights investigations involving mass graves [11, 12], demonstrating the impact that these facilities can have on a global scale, even when the environment may be distinctly different.

Although there are valid limitations to the application of research conducted at body farms, there is a clear need for these facilities, particularly if we hope to better understand the rate of decomposition in our local environments. The use of animal analogues should not be ruled out entirely given the lack of these facilities worldwide however where human remains can be utilized for research, this appears to be the preferred subject (based on preliminary data). While the research at body farms can assist in estimating time since death, its application is much greater to the forensic community with studies focused on improving the method of locating, recovering and identifying victim remains. Given the recent prevalence of mass disasters and war crimes, this highlights an opportunity for future research at these facilities to benefit international investigations. Traditionally, body farms have formed out of forensic anthropology programs however, their use is much greater than this discipline alone. It is recommended that in the future, human decomposition facilities continue to expand their focus to cover the broad range of multidisciplinary research being investigated in the field of forensic taphonomy [11, 12].

Compliance with ethical standards

Conflict of interest The Author declares that she has no conflict of interest.

Human studies This article does not contain any studies with human participants performed by any of the authors.

References

1. Evans WED. The chemistry of death. C. Thomas: Illinois; 1963.
2. Mant AK. Adipocere – a review. J Forensic Med. 1957;4:18–35.

3. Boddington A, Garland AN, Janaway RC. Death, decay and reconstruction: approaches to archaeology and forensic science. Manchester: University Press; 1987.
4. Polson CJ, Gee DJ, Knight B. The essentials of forensic medicine. 4th ed. Oxford: Pergamon Press; 1985.
5. Dix J, Graham M. Time of death, decomposition and identification: an atlas. Florida: CRC Press; 1999.
6. Payne JA, King EW, Beinhart G. Arthropod succession and decomposition of buried pigs. Nature. 1968;219:1180–1.
7. Hewadikaram KA, Goff ML. Effect of carcass size on rate of decomposition and arthropod succession patterns. Am J Forensic Med Pathol. 1991;12:235–40.
8. Shean BS, Messinger L, Papworth M. Observations of differential decomposition on sun exposed v. Shaded pig carrion in coastal Washington state. J Forensic Sci. 1993;38:938–49.
9. Haskell NH. Testing reliability of animal models in forensic entomology with 50-200lb pig vs. humans in Tennessee. In: Proceedings of the XXI International Congress on Entomology, Abstract 2943. Brazil; 2000.
10. https://www.sciencealert.com/pigs-may-not-be-the-most-amazing-forensic-tool-after-all-finds-body-farm-researchers. Accessed 30 Aug 2017.
11. Forbes SL. Australia launches its first body farm. Aust Police J. 2016;70:54–9.
12. Vidoli GM, Steadman DW, Devlin JB, Jantz LM. History and development of the first anthropology research facility, Knoxville, Tennessee. In: Schotsmans EMJ, Marquez-Grant M, Forbes SL, editors. Taphonomy of human remains: forensic analysis of the dead and the depositional environment. Oxford: Wiley; 2017. p. 606–21.
13. Zhou C, Byard RW. Factors and processes causing accelerated decomposition in human cadavers. An overview J Forensic Leg Med. 2011;18:6–9.
14. Rodriguez WC, Bass WM. Insect activity and its relationship to decay rates of human cadavers in east Tennessee. J Forensic Sci. 1983;28:423–32.
15. https://www.forensicmag.com/news/2017/01/netherlands-starting-taphonomic-cemetery-first-body-farm-europe. Accessed 30 Aug 2017.