



The Feasibility of a
United Kingdom
Human Taphonomic Research Centre
(UKHTRC)

by
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1.0 Acknowledgements

The authors wish to thank all of those individuals who took part in this study

This study represents the undergraduate project work of IW as supervised by JC.

2.0 Foreword By Professor John Cassella.

The United States have had Taphonomy facilities for some decades. The UK and indeed Europe have fallen behind in conducting important research in this area of fundamental basic science and in the forensic sciences arena. Until an open and sensible debate discussing the creation of such a facility in the UK is entered into, without the rhetoric cries of emotion, this science shall continue to languish unsupported. This will have a direct impact on how this science moves forward and how the Police and Forensic Services of the UK are able to conduct their investigations using the latest cutting-edge research findings.

At present there is no dedicated human taphonomic facility in the United Kingdom or indeed Europe. The success of such facilities in the United States of America dictates that Europe will fall behind in human specific taphonomic studies if such a facility is not created in the foreseeable future. The ethical, legislative, logistical, environmental, scientific and financial complexities are considered here in the plans to construct the first UK facility through a private enterprise initiative with

the input of stakeholders across a wide range of roles and interests. The problems and the limitations associated with establishing an open-air taphonomic facility are numerous, but it is clearly recognised by researchers and practitioners alike that there is a need for more establishments in the USA and hence by implication around the globe. These existing facilities have served to act as major nexus contributing to our knowledge of aspects of human decomposition and associated environmental issues and as such should be developed further to realise their full potential into the 21st Century.

Many questions remain to be answered as part of the complex process of initiating this UK based national facility, however the time to start this process is now before UK science falls behind in our understanding of the systems of life through death. Not to construct such a facility could be acutely damaging to UK taphonomic research over the next decade for researchers and for those who use the intelligence and the data generated from it. Equally, to construct such a facility without proper consideration of the many complex issues would be equally damaging.

The work presented aims to initiate that debate.....

3.0 Abstract

Forensic Taphonomy is the study of the human decomposition process (the post mortem fate of human remains), to further knowledge to assist the scientific and legal community. Currently there are seven facilities located in America, ranging in

size and research focus. However the scientific findings from these facilities are not entirely relevant to the European environment as this research is highly climate and geography specific. Therefore, there is a need for a UK based Taphonomic Research Facility. Whilst low numbers on human cadavers is a potential limitation, specific knowledge cannot be furthered without such research using the pig as a proxy. Therefore the ethical, moral, logistical and legal factors governing cadaver donation, biosecurity and management have been debated. Architectural plans have been developed with close considerations made towards site suitability, security and training potential. Public opinion was determined using an online survey (Qualtrics) with findings suggesting that the general public were extremely supportive of the principle and methodology however locality remained a contentious issue. In conclusion it is not so much the feasibility that is the question but rather when and where the first Human Taphonomic Research facility (HTRC) in the UK will be developed.

4.0 Introduction

Albert Einstein is reported to have once said "Learn from yesterday, live for today, hope for tomorrow. The important thing is to not stop questioning" (Darbellay, Cockell, Billotte & Waldvogel, 2008, p.xix). This is a powerful quote that highlights the value of research and implications that it has

within the scientific community. Research has always been at the forefront in the development of knowledge and therefore without it scientific understanding cannot proceed.

One area in particular where scientific knowledge needs to be developed is within the area of Forensic Taphonomy (FT); this is the study of the human decomposition process which is subject to an indeterminate number of variables that effect the time and extent of decomposition though the idea of studying human decomposition is not just a recent thought, in 1923 Harris Wilder reported "There is thus great need of studying the various conditions to which dead bodies are subjected, and the responses of the parts to these conditions"(p.198). Wilder went on to coin the terms necrodynamics and necrokinetics in an attempt to provide this new field with a name but it was not until 1940 when Efrémov coined the term taphonomy and defined it as "the study of the transition of animal (but for this purpose 'human') remains from the biosphere to the lithosphere"; that research began focusing on the decomposition process. Therefore a Human Taphonomic Research Centre (HTRC) is a scientific facility that is solely dedicated to research and teaching into all fields relating to the taphonomic process, where the principle model used is the human cadaver with findings from these facilities aimed at aiding the process of science within the legal framework, to ensure that relevant data is available for the investigation of

criminal cases.

FT was not developed as a research focus until 1977; this was as a result of a significant misinterpretation of decomposition rates. Dr Bill Bass who is widely regarded as the Godfather of FT, had been called out to inspect some recently disturbed human remains. Based on Bass' field notes and prior knowledge he estimated that the remains were of forensic significance estimating the period that they had been present in the grave was around 1 year. Further analysis however led Bass to determine that the remains were in fact those of a Colonel William M. Shy who had passed away no less than 113 years prior. Bass went on to consult the literature and to his astonishment, very little relevant data was available to aid his interpretation; three years later the Anthropological Research Facility (FAC) at the University of Tennessee (UT) was established in an attempt to fill the research void (Shirley, Wilson & Jantz, 2011). Another primary objective of the facility was to establish a modern collection of reference skeletal remains as many of the established skeletal collections consisted of historical examples whose characteristics were not representative of the modern man (Rissech, Márquez-Grant & Turbón, 2012; Forensic Anthropology Centre, n. d.)

Since the inception of the FAC, six further research facilities have been developed in North America; each one is associated with a university and are

located throughout the United States in varying temperate climates. The seven facilities are:

1. Forensic Anthropology Centre (FAC), University of Tennessee (UT)
2. West Carolina Human Identification Laboratory (WCHIL), University of West Carolina
3. Forensic Anthropology Research Facility (FARF), Texas State University
4. Southeast Texas Applied Forensic Science Facility (STAFS), Sam Houston State University
5. Institute of Criminological and Forensic Sciences, California University of Pennsylvania
6. Forensic Investigation Research Station (FIRS), Colorado Mesa University
7. Forensic Field Training School (FFTS), Fox Valley Technical College (Raymunt, 2010; Cassella, 2011; Graczyk, 2012; The Grand Junction Daily Sentinel, 2010; Ng, 2012; Whitmire, 2006; Colorado Mesa University, 2013; Behenke, 2014)

The development of each of these facilities has not been without public concern and each facility coming up against resistance at some point or another, whether it be the concern of increased animal activity such as coyotes (Witt, 2007) or the presence of unwanted odours (The Grand Junction Daily Sentinel, 2010). Each of the facilities vary in size, however each contributes vital data to the field, with climate specific findings (Raymunt,

2010; Witt 2007; Whitmire, 2006; Armstrong, 2007). From their inception each of these facilities has presented an invaluable learning process and precedent for future facilities providing lessons, guidelines and standards which should be considered and adhered to. Figure 1 shows the location of each facility within the United States. Table 3 outlines the environment and distance from neighbours of each facility.

Within the UK there are two facilities that conduct taphonomy research based on porcine cadavers with a third facility planned at the University of Huddersfield; TRACES (Taphonomic Research in Anthropology: Centre for Experimental Studies) is associated with UCLAN (University of Central Lancashire) and the Forensic Fieldwork Facility at Cranfield University. These facilities are the first of their kind anywhere in Europe, contributing valuable knowledge to the research pool. These facilities are however concerned and limited to the taphonomic process within animal cadavers and although essential research, these facilities are not able to provide directly relatable data to real life crime; due to the use of porcine cadavers as proxy for humans. During the development of TRACES, Cross, Simmons, Cunliffe and Chatfield (2009) addressed and documented many of the potential issues that may arise during the development of a United Kingdom Human Taphonomic Research Centre (UKHTRC) and therefore their experiences are invaluable in the sense

that these facilities have acted as a pilot study for a UKHTRC, highlighting the research need, paving the way for its potential development. Figure 2 depicts the location of the Taphonomic research conducted in Europe. In Italy LABANOF (Laboratory of Anthropology and

Forensic Odontology) is a scientific facility that is concerned with the recovery and study of human remains, particularly the identification of unknown cadavers, (LABANOF, 2012) whilst not observing the decomposition process, their research is part and parcel of the related field. Porcine decomposition research has also been conducted within Western Poland (Matuszewski et al., 2008; Matuszewski et al., 2010; Matuszewski et al. 2014) and Western Australia (Voss, 2011); with Kočárek (2003) completing related research on rat cadavers in the Czech Republic. There are also aspirations for a HTRC in India under the supervision of Roma Kahn (Ramslund, n.d.; Aggrawal, 2010) known as the Investigative Scientific and Anthropological Analysis Facility (INSAAF)(INSAAF, 2011).

Due to the climate and geographical specificity of taphonomic research there is a need for a dedicated research centre based within the United Kingdom (Clinton, 2013). Karoniti and Paine (2011) were highly critical of European scientists claiming in some circumstances they did not have adequate or equivalent training to their American counterparts; whilst the progress that has been made,

specifically in the UK, was recognised the use of forensic anthropologists in case work was still considered to be limited (Kranioti & Paine, 2010). One particular body of researchers in the UK that are striving for the development of Forensic taphonomy is the Burial Research Consortium (2014).

These researchers have already contributed a vast amount of academic research and consists of some of the world's most renowned scientists in their fields. In particular the UK Burial Research Consortium are particularly interested in sharing research and collaborating on future taphonomy and decomposition research.

Media coverage and public education also appear to be significant factors within the development of HTRC. In America and in the UK, crime dramas have increased the public's knowledge and interest within the field of Forensic Science, however the depicted forensic science processes present an unrealistic and unreasonable turnaround time (aka the CSI Effect) (Schweitzer & Saks, 2007), the likes of Patricia Cornwell's novel "The Body Farm" and UK Television series by the same name have helped to familiarise the public with the concept and sub-consciously assist to educate the worth and potential of such a facility within the UK. In America due to extensive and positive media exposure, HTRC have been generally well received (The Grand Junction Daily Sentinel, 2010), though there is very much a NIMBY (Not In My Back Yard) attitude when a facility is establishing

itself (Witt, 2007); however providing the public with the opportunity to voice their opinion and ask questions with complete transparency often proves to be beneficial to the engagement process (Cross et al, 2010; The Grand Junction Daily Sentinel, 2010).

Security and architectural structure are also key concepts that need to be considered in the development of a HTRC. Simultaneously sensitive material needs to be prevented from leaving the site, whilst trespassers need to be kept out, not only for their safety but also for the dignity of the donated cadavers and the robustness and integrity of the research data. Architectural plans have been generated by Roger Stretton (Dip Arch (Oxford), RIBA), who has "expertise in the design and co-ordination of complex laboratory projects" (Berman Guedes Stretton, n. d.) from an architectural brief informed from the desk based analysis. Security implications were informed through consultation with Ian Witt a security manager with 40 years' experience providing security solutions and protocols at both Sellafield Ltd. the company responsible for the Sellafield nuclear power plant, Cumbria and various Royal Air Force (RAF) facilities on British Sovereign Territory. Within research moral and ethical considerations are always at the forefront of any proposals. Particularly within this project the contentious issue of using human cadavers will be discussed, focusing on what has

happened in the past and what guidelines need to be followed.

Related to this is the legality behind the use of human material in research; governed by the Human Tissue Act 2004, implemented and regulated by the Human Tissue Authority (HTA).

One particularly contentious issue in the development of a UKHTRC is the location, whilst no individual site will be suggested, the requirement for the site will be outlined and discussed by looking at the location choices of established facilities but also the requirements of environmental and ecological bodies as well as the best location that avoids any moral or ethical concerns. The environmental and ecological impact will also be addressed following findings generated again from the established facilities but also through the impact that graveyards and cemeteries have had on the environment as UK specific examples.

Governing bodies are major stakeholders and would need to play an integral role in the establishment and regulation of a UKHTRC to ensure that strict ethical and legal guidelines are followed. In particular the HTA would play a significant role ensuring the Human Tissue Act 2004 is followed. The UK Environmental Agency would oversee the protection of the environment and groundwater considerations. Ethical practices and well-being would be overseen by the National Research Ethics Service (NRES) who facilitate and promote

ethical research. Association and recognition from the Coroners Society of England and Wales would provide a significant credit to the facility, and would no doubt benefit from the research that was to be conducted at a HTRC. A close working relationship with the Association of Chief Police Officers (ACPO), Centre for Applied Science and Technology (CAST), College of Policing (CoP) and the Chartered Society of Forensic Science would also be beneficial allowing for relevant and useful research to be conducted which would directly guide and inform legal investigations (Cassella, 2011).

Further regulatory bodies that would require involvement in a UKHTRC include the Health and Safety Executive (HSE) who are a national watchdog that oversee the maintenance and improvement of work place related health and safety. This is particularly important at a HTRC where the risk of infection and the use of chemicals are a daily occurrence, though greatly decreased providing that appropriate health and safety rules and guidelines are implemented. A variety of societies and research groups would also ensure that high standards were maintained at the HTRC, in particular organisations such as the the Royal College of Pathologists, Association of Anatomical Pathology Technologists UK (Cassella, 2011).

The research potential of a UKHTRC is virtually untapped, simply down to the fact that there is not a HTRC that exists

outside of America. The depth and breadth of research that could be conducted at a dedicated research centre is immense and impactful. Just one example includes the effect of different soil types; in the UK alone there are 27 'Soilscapes' which groups over 700 soil types (Natural England, n. d.), each of these would need to be investigated and considered for their taphonomic impact, before the influence of flora, fauna, temperature, humidity, weather, exposure, scavengers and geography to name but a few is considered. The range of forensic disciplines that would also benefit from a dedicated HTRC is great (Cassella, 2011); Table 2 highlights the main beneficiaries however essentially most forensic disciplines have some common interest in some form or another relating to a UKHTRC. The facility would also allow for experimental recovery techniques to be investigated so that the most evidentially useful recovery techniques are employed in real life situations so that perpetrators of some of the country's most depraved crimes can be brought to justice.

Following on from the research potential, the training potential for such a facility is equally as vast as fundamentally any research areas which are focused upon will allow for training and education to be developed and enhanced. However particular training opportunities that would be unique to a HTRC would be; real world training for cadaver dogs in the identification of missing persons, recovery and

identification of human remains from a forensic archaeological perspective and crime scene investigation techniques.

The research aim was therefore to investigate the feasibility of a UKHTRC whilst highlighting the awareness, need and potential for such a facility in Europe and more importantly the UK. This was achieved through a desk based analysis that considered and attempted to provide solutions for any and all potential variables that would otherwise prevent the development of a HTRC. Particular variables that were focused upon have been expanded on above but Table 1 outlines each topic explicitly. A specific focus was placed on the attitudes and perceptions of the general public in an effort to gauge public consensus as to whether there is a need for such a facility within the UK. This was achieved using an online survey (Qualtrics) that was generated and distributed to students studying at Staffordshire University as well as members of the general public in order to gather a demographically representative sample. Lastly architectural designs were developed by Roger Stretton using an architectural brief informed through the literature review and interviews conducted.

5.0 Methodology

Two distinct paths provided the methodology for this project; a desk based analysis was employed to search for relevant journal articles, legislation and statistical data; whilst an online

survey (Qualtrics) was developed to gauge the general public's opinions towards a United Kingdom Human Taphonomic Research Centre (UKHTRC). The survey consisted of 39 questions that were developed following the research generated from the desk based analysis. The survey was distributed via social media (Facebook, Twitter) and email. Participants were asked to follow the URL (Uniform Resource Locator) to the survey; this presented the information sheet about the project to the participants. Confirmation that individuals had read the information sheet was required for progression. Participants then had to complete the projects consent form; aged over 18 and not bereaved within the past year. Participants that had been bereaved were recommended not to participate however if they felt compelled to participate then they would be allowed to, although their data would not be used within any subsequent data analysis. Completion of the consent form meeting all the criteria allowed for progression within the study. The first question presented was used to test individuals understanding of what a HTRC is. This had been explained to participants within the information sheet, therefore allowing researchers to ensure that the information sheet had in fact been read. Participants were then presented with the correct answer regardless of their previous answer. Following this, individuals were asked to complete a series of 7 or 9 point Likert scale style questions to indicate the extent to which they agreed or

disagreed with the statement. Statements were worded both positively and negatively. The 9 point Likert scale was used to judge individuals feeling towards a UKHTRC ranging from *Hostile* to *Enthusiastic*. This was based loosely upon the PANAS scale (Positive and Negative Affect Schedule) (Watson, Clark & Tellegen, 1988) to ensure that the full range of possible emotions were afforded. In summary participants were asked to provide a 'yes' or 'no' answer to the necessity of a UKHTRC as well as being asked to indicate their feelings in a single word. The opportunity was also provided for individuals to further articulate any of their thoughts relating to the research question. Upon completion, participants were provided with a debrief form informing them how the data was to be used as well as the steps required should they feel compelled to withdraw from the research.

Over an eleven week period 154 surveys were distributed; a total of 106 complete surveys (31 Males, 75 Female) were received. Twenty-Five surveys were removed due to being incomplete, nineteen records were removed due to data corruption and four results were removed from analysis as a result of individuals being recently bereaved. Participants were aged eighteen to sixty-four years old with a mean (S.D) of 27 (11.67) years. Students consisted of 71.7% of the sample with 23.6% employed and 4.6% either retired, housewife/househusband or other. White Caucasians (91.5%) were the largest ethnic group, followed

Figure 1 - Location of HTRC in America

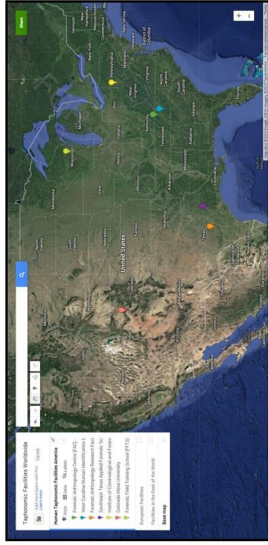
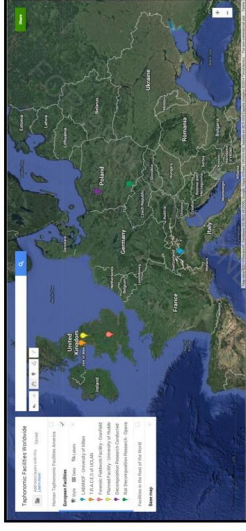
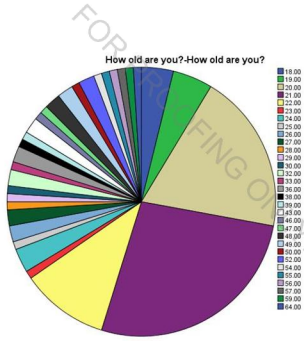
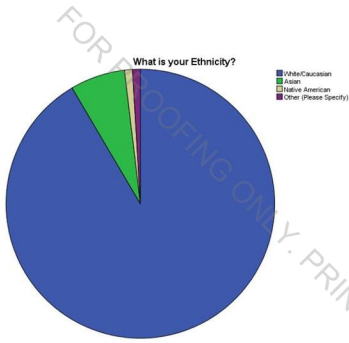


Figure 2 - Location of Taphonomic Related Research Facilities in Europe

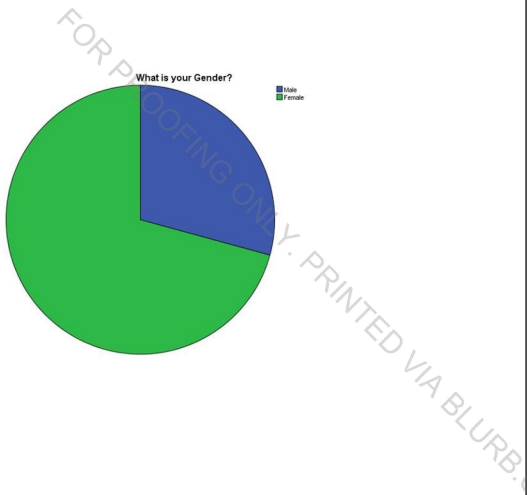


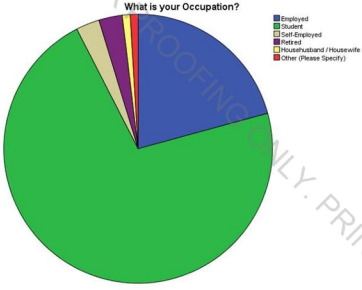


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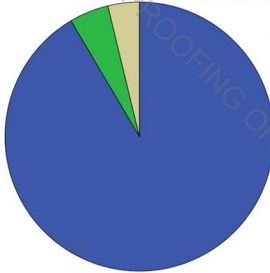




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What is a Human Taphonomic Research Facility?

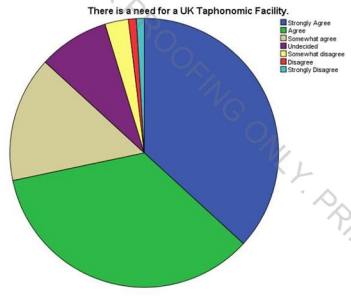


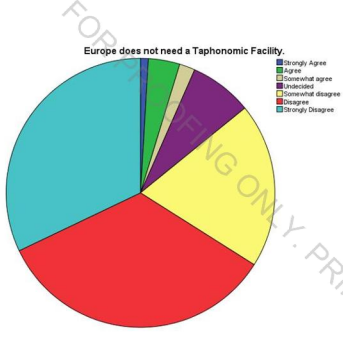
A scientific research facility that allows for forensic investigations to be conducted using human bodies on the decomposition process that occurs when bodies are with a variety of parameters in the soil of the soil process that ensues following death.

A scientific research facility that allows for forensic investigations to be conducted using animal bodies on the decomposition process that occurs when bodies are left in a variety of parameters in the soil of the soil process that ensues following death.

A facility that conducts experiments on human cadavers for the sake of research related to the forensic process of decomposition in controlled cases with minimal control on variables to experiment in and the facility.

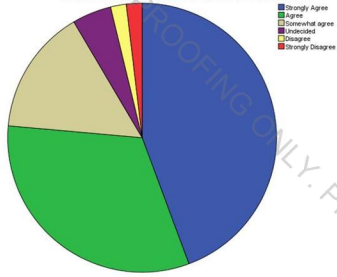
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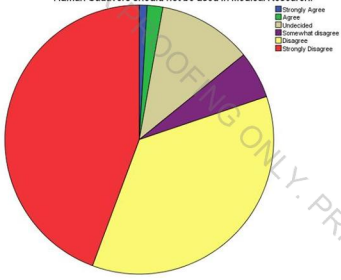
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Human Cadavers should be used in Forensic Research.



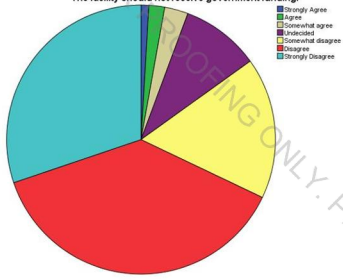
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Human Cadavers should not be used in Medical Research.

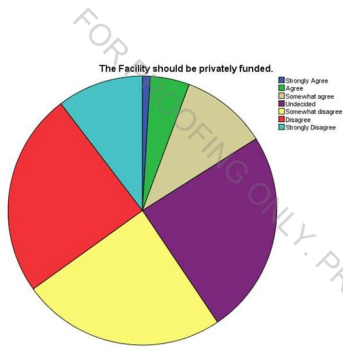


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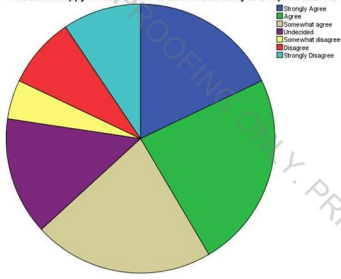
The facility should not receive government funding.



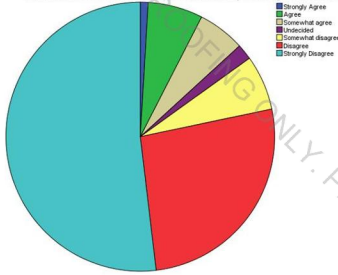
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I would be happy for a loved one to donate their body to a Taphonomic Facility.

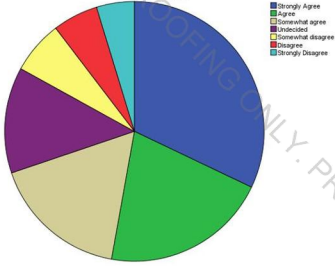


I would have concerns for a Taphonomic Facility for Religious reasons.



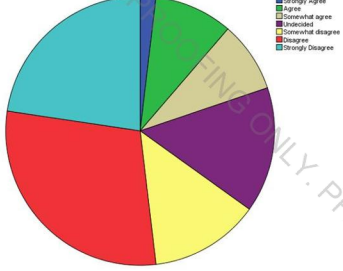
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I would like to be informed if a Taphonomic facility was developed in my local area.



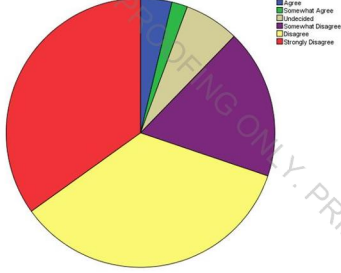
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I would feel uneasy if a Taphonomic facility was developed in my local area.



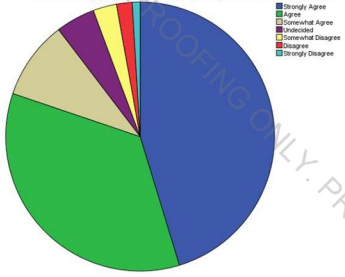
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I would feel angry if a Taphonomic Facility was developed in my local area.



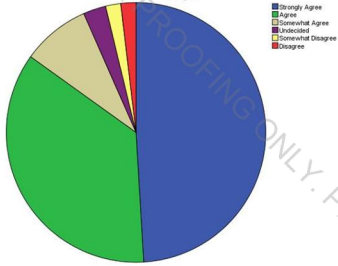
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I would be Happy for a facility to be developed somewhere in the UK.



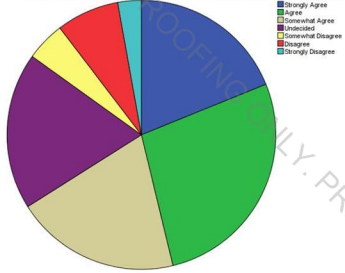
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I would be happy for a Taphonomic Facility to be developed somewhere in Europe.



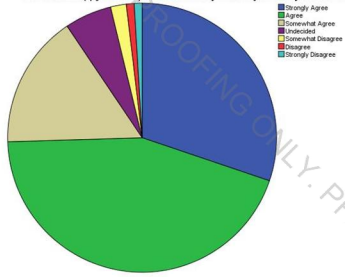
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I would feel Happy if a taphonomic facility was developed in my local area.



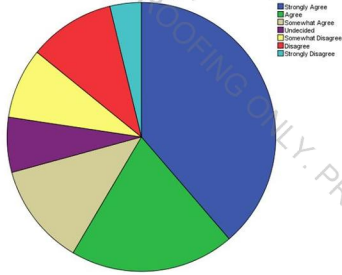
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I would be happy if the Taphonomic facility created jobs in my local area.



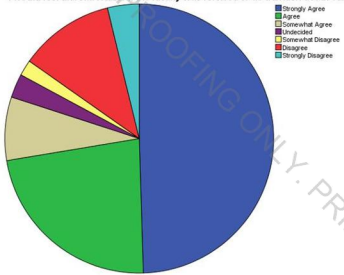
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I would feel uncomfortable if the facility was referred to as a Zombie farm.



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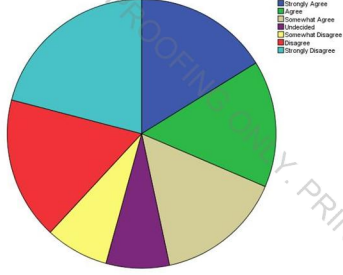
I would feel uncomfortable if the facility was referred to as a British death camp.



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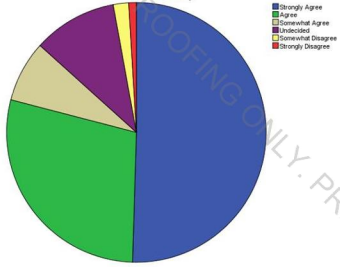
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I would be happy for the facility to be called a 'body farm'.



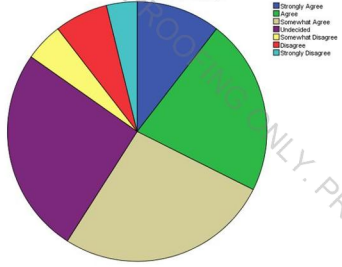
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I would prefer for the facility to be known as a Human Taphonomic research facility.

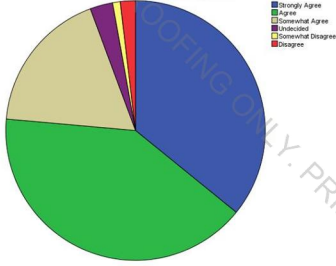


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I would have concerns if control of the media occurred in relation to the
epidemiologic facility.

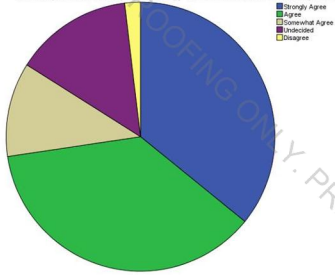


I would have less concerns about a Taphonomic facility if it was regularly inspected and regulated.



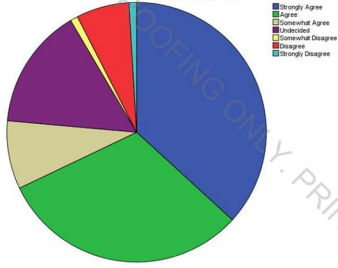
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I would prefer the facility to be energy efficient and environmentally friendly.



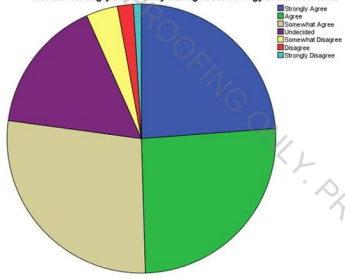
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I would prefer that once donated remains had served their purpose that they are returned to their loved ones.



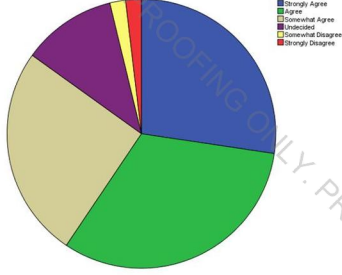
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I would feel angry if the facility damaged the ecology of the local area.



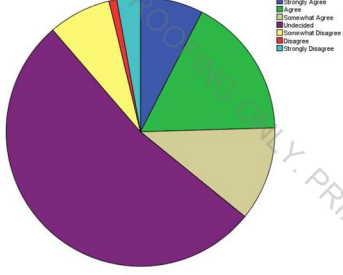
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I would be unhappy if the facility damaged the environment.



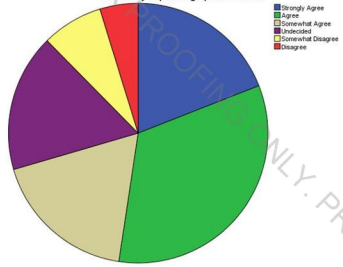
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Britain is the best location for a Taphonomic facility in Europe.



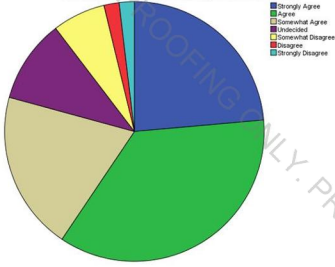
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I would be happy for the facility to start off small with the prospect of the facility eventually expanding up to 20 acres.

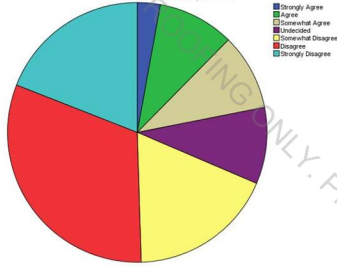


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The fact that there are already established facilities in The US makes me more comfortable with the idea of having a UK based facility.

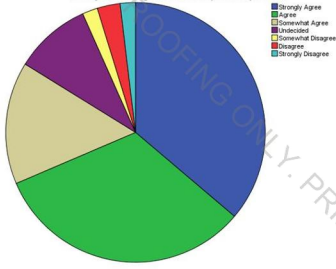


I would be uncomfortable if I knew cadavers were left on the surface to study the decomposition process.



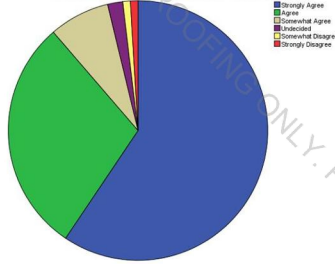
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I would be happy for the Taphonomic facility to act as a European research facility to investigate the decomposition process.



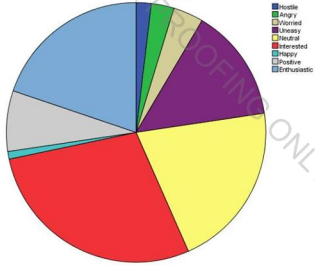
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I would feel comfortable if the facility featured heavy security to deter intruders and to ensure that sensitive material does not leave the site.



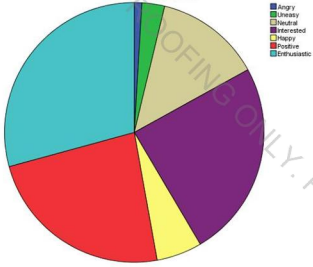
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If a taphonomic facility was developed... I would feel...: Likert Scale-4n my local area



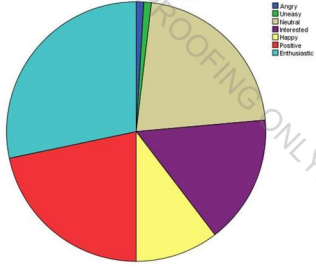
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If a taphonomic facility was developed... I would feel... : Likert Scale-Somewhere in the UK



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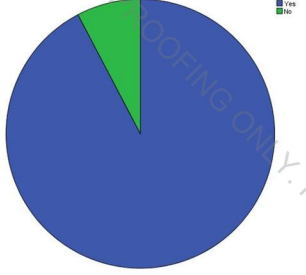
If a taphonomic facility was developed... I would feel... : Likert Scale-Somewhere in Europe



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Should the UK have a Human Taphonomic Research Facility?



by Asian (6.6%), Native American (0.9%) and Asian Caucasian (0.9%).

experienced, knowledgeable and respected individuals from a range of academic fields, religious institutions and professional backgrounds. This is particularly important due to the contentious issue of using human cadavers in medical and forensic research (Christensen, 2006). The NRES oversee all ethics applications within the UK, these committees consist of a maximum of 18 individuals, a third of which must not have a main professional interest in the research area. In turn their responsibility is to ensure that the rights, safety, dignity and well-being of participants is maintained (Health Research Authority, n.d.).

6.0 Results and Discussion

Within this research many of the main research areas have interactions and implications for each other. A coherent and succinct discussion has been attempted to draw together and unpick each of the core research areas, incorporated with the data that was gathered through the public survey.

6.1 Ethics, Moral Responsibility, Cadaver Donation and Legality

Ever since and indeed before the Anatomy Act 1832, throughout the country medical schools and research facilities have used donated human cadavers to study and teach the future of those in the medical profession (Harris, 1920) without such opportunities advances in modern medicine would not be where they are today (Gunderman & Wilson, 2005). These days however ethical and moral considerations need to be made in all instances.

In the UK, all academic research is governed by each institutions respective ethics panel. A HTRC would be no exception and would require a board of

The responsibility of the HTRC would be to follow the Human Tissue Act 2004 guidelines robustly. However in terms of ethics, the facility would go beyond their remit in order to safeguard the desires of the donors and their families by only accepting willed donors, who have committed to donate prior to their death with an insistence placed on relevant donation documentation being witnessed in the presence of a solicitor. Furthermore the facility would offer the family the opportunity to rescind any donation before the donation is accepted. Correspondingly, remains from medical schools could perhaps be donated to HTRC, providing consent had been granted by the donor prior to death.

Unfortunately, due to the embalming process employed within medical dissection procedures to ensure that the

cadavers do not decay (Compton, 2012), their remains in terms of skeletal remains could not be utilised for further research (Armstrong, 2007).

In America, established facilities do not accept donations from individuals that suffered from a transmittable disease(s). This would also be the case in the UK, unless remains are cremated prior to donation; arrangements would have to be implemented before bereavement though as the HTRC would need to contact the crematoria to ensure the remains are not ground down (Jantz, 2012). Although the UK Human Tissue Act 2004 does not mention anything about cremated remains being donated, this would need to be considered. Similarly individuals who are obese that would ordinarily be refused the opportunity to donate to a medical school are still able to contribute their remains to science through the established taphonomy facilities (Raymunt, 2010). It is a similar story in the UK (Searle, 2011), when an individual wishes to donate their body they are unable to if they are suffering from obesity, this is however not an issue for a HTRC, in fact it would serve as an ideal opportunity to study the effect of Body Mass Index (BMI) on post mortem intervals to be observed thus furthering related work that has already been conducted on porcine proxies (Mauszewski, 2014).

The HTA oversees and regulates the Human Tissue Act 2004 and within their key doctrine it is stated that a donated body can be used for research,

education and training (Human Tissue Authority, n.d.); three key values that would be shared by a HTRC. However due to the lack of an established HTRC the current legislation does not explicitly allow for forensic research to be conducted using human cadavers at a HTRC. As a result, the established legislation requires updating should a UKHTRC be developed, though the approval for this should not come against significant friction providing that the tenets of both the legislation and research facility are recognised to be the same. Interestingly, when the public were asked if human cadavers should be used in forensic science 91.5% agreed, more so than in medical research (85.8%) however 4.7% and 11.7% were undecided respectively.

In an effort to meet the wishes of the donors' families the established facilities (Armstrong, 2007) do allow for relatives to view their relatives once they have been collected and cleaned from the decomposition area, access to this area is forbidden (Colorado Mesa University, n.d.). Participants were asked about their attitudes towards a loved one donating their body, their results significantly varied with 63.2% 'happy' for their relative, though 22.6% were not so. Most people (76.2%) also felt that once donated remains had served their purpose they should be returned to their families. Though one particularly commendable idea that is conducted at the FAC is for an annual memorial service to be conducted where one set of remains from the collection is selected at random to be laid to rest in a

more traditional sense, relatives that wish to attend the service are able to do so and the one set of remains represents the entirety of the collection (Armstrong, 2007). It has however also been suggested that a memorial garden be developed at a UKHTRC, as a place for relatives of donors to be able to pay their respects (Cassella, 2013).

From a moral responsibility perspective, Christensen (2006) recognised the respect that is afforded to the donors which has been highlighted on many occasions (The Grand Junction Sentinel, 2010; Armstrong, 2006; Whitmire, 2006; Ng, 2012), in how they are treated and catering to the wishes of loved ones. For some, the process of surface deposition of donors is seen as disrespectful; (Christensen, 2006). However the sample found that just under a quarter (21.6%) of participants felt uncomfortable with remains being left on the surface with 68.5% who were not unduly worried.

The topic of religion as a possible objection to donation was also raised, whilst no major religious groups object to the donation of organs (Bruzzone, 2008) and by extension the full body, it is still a reason that people provide (13.2%); though the vast majority (84.9%) of the survey would not have concerns for religious reasons. Christensen (2006) make the valid point that decomposition of remains will occur regardless of whether a scientist observes the process or not, but also that people are seeing cadaver donation as a new method of 'doing good' once

they are deceased. This is partly the result of further education and clarifying of the truth over decomposition research which could see the method of cadaver donation move to be considered a 'social norm', which in turn would alter individuals moral perspective to the practice, therefore, providing that donors are treated with respect, the research falls within ethical codes of practice determined by the National Research Ethics Committee. The wishes and beliefs of the family and the donor are respected and the donated material is used in keeping with the Human Tissue Act 2004 then the use of human cadavers within forensic research should be deemed as ethically sound.

6.1.1 Cadaver vs Porcine Proxy

Cadaver donation has been described as expensive, time consuming and potentially hazardous (Aziz et al. 2002) as a result there have been calls for the use of biomedical informatics over cadaver dissection in anatomy training; whereas Miles (2004) opposes this claiming that the two methods are complementary.

In the UK the lack of a HTRC has been attributed to fears over a public outcry (Clinton, 2013) though as outlined in Section 6.10 this is not the case. As a result significance has been placed upon the use of pig cadavers within taphonomic research. The relevance and validity of this research in terms of its application has recently been called

into question though with recent findings suggesting on (a chemical level) humans are similar to chickens than they are pigs (Cablk et al., 2012). Furthermore the use of pig cadavers has also been criticised by Michelle Hamilton, Assistant Professor of Texas State University suggesting that "pigs and humans are not equal" when referring to taphonomic research (Graczyk, 2012, p.1); Similarly, Dawnie Steadman, Director of FAC stated that "If you're going to answer police questions about decomposition, then you really need to use humans" (Ng, 2012, p.1)

Whilst the use of porcine cadavers in taphonomic research is vital to the contribution of knowledge (Schoenly et al., 2006) in environments where there is an absence of a HTRC, the establishment of a dedicated HTRC is recommended (Clinton, 2013); as in 1543 when Andreas Vesalius stressed the need for human dissection over animal for the progression of anatomy (Vesalius, 1543). There is no denying that porcine facilities do provide the opportunity for increased numbers of repeats as well as the opportunity for greater control over the donated cadaveric material (in terms of size, age, knowledge of medical history etc.); [Williams, 2013] nonetheless this does not get away from the fact that they are not human material and may not be a subset of the human condition (Cablk, Szelagowski & Sagebiel, 2012). Porcine cadavers also do not allow for the effect of specific human medical conditions on

the decomposition process to be observed; such as degenerative / heart diseases and the effect of drugs (both legal and illicit) on the body (Clinton, 2012).

6.2 Architectural design

The architectural design was guided through personal communication with Professor John Cassella (Cassella, 2013) and a review of the established facilities at HTRCs in America. From this an architectural brief was developed for Roger Stretton to develop Architectural plans for the potential UK facility. Five key themes were outlined for the facility (secure, environmentally friendly, energy efficient, clean and controlled), these were determined to be the essence of how the facility should be designed so as to ensure the facility stood up to scrutiny from both professionals and the public. In terms of the size of the HTRC it was suggested that for the facility to establish itself, a minimum of one acre would be required for the facilitation of decomposition research to be conducted, however this was with the provision for the facility to develop to 20 acres in subsequent years. In terms of budget there was also equal ambiguity owing to the fact that the development of this facility is within the conceptual stages, though it was appreciated that the development of a state of the art facility would cost in excess of £5 million, an interesting

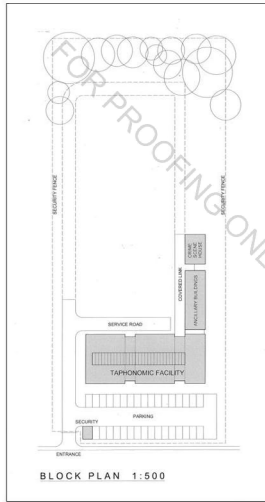
finding from the survey found that of the public surveyed 84.9% thought that the facility should be publicly funded, this was contrary to what was expected following from the established facilities which are each associated with a University. One significant limitation of the facility being publically funded and which will be expanded on more within 6.6 Governing bodies and Inspections is that the Research Council UK would not be able to promote or support research at the facility if it was primarily owned, established or funded (Over 50%) for research purposes by the public sector. Environmental considerations were also made which will be addressed in 6.5. The full architectural brief is available within appendix 4 along with the floor plans generated by BGS Architects (Figures 5, 6, 7) as well as the full specifications required for a UKHTRC.

6.3 Location

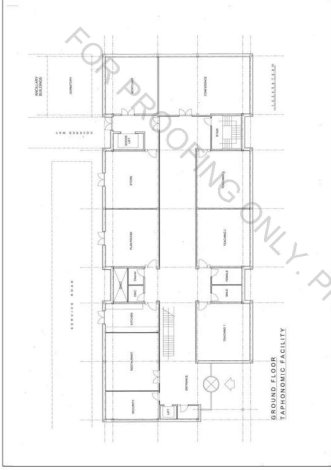
In Section 1.0 the location of each of the established HTRC and porcine facilities was outlined but is the UK the best location for a HTRC? In terms of progress made within the field of Taphonomy the UK is by far the most advanced country within Europe, as a result of the established porcine facilities, furthermore there is also a concerted UK based interest within research of the field through the *Burial Research Consortium* (<http://burialresearch.blogspot.co.uk/>). In terms of facts and figures the UK also presents a greater need compared to

other countries due to England having 395 people per sq km making it one of the most densely populated countries in the world (Spillius, 2009) associated with this the UK has the 60th highest death rate in the world (9.64 / 1000 population) (CIA, 2014). Crime figures are also significant with 552 murders in 2012/13, despite this being the lowest figure since 2000/1, there continues to be on average over one murder occurring everyday within England (Citizens Report, 2013). When participants within the survey were asked whether Britain is the best location the public remained undecided (52.8%) though only 11.2% disagreed that the UK was the best location. That said, the majority of participants (89.6%) were happy for a HTRC to be developed somewhere in the UK whilst even more people (93.4%) were happy for a facility in Europe though as expected less people were optimistic about a facility being developed locally (66.1%).

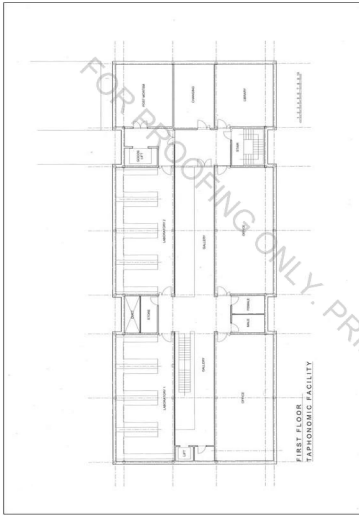
Location poses the most risk to the feasibility of a UK-HTRC this much has been learnt from the established facilities. In America, the FAC was established on land which was once used to burn the refuse of the UT, over time the surrounding area of the facility had been developed resulting in the centre being within close proximity of several car parks (Armstrong, 2007) which are just over 500 feet away. Subsequent facilities however have made a concerted effort to develop a rural site (WCHIL, FARF, FIRS, The Grand Junction Daily Sentinel, 2010; Stewart, 2012) this has however not



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been without issue, the FARE were forced to reconsider sites until a suitable location was found, in this example the original plan was to develop the facility in an area two miles away from a large mall (Witt, 2007), near a two lane highway (The Grand Junction Daily Sentinel, 2010), though officials were worried of increased bug and insect activity in the area (Witt, 2007) a common concern discussed in 6.10 Social Implications. The other sight was rejected due to its proximity to the local airport and the increased risk of bird strikes (Ramsland, n.d.; Witt, 2007; The Grand Junction Daily Sentinel, 2010; Bliss, 2007), however in each case a suitable site was established, patience and forward planning are essential (Cassella, 2011).

The ideal specifications for a HTRC therefore include a rural location that is flat, perhaps on a slight angle to encourage run off on virgin ground (Cassella, 2013) (aka. ground that has not been constructed on), with a variety of environments/habitats (Open grass, woods, still/running water etc.) available for research. Having a linear perimeter would also benefit the security considerations of the facility (Witt, 2013) whilst utilising any natural visual barriers such as trees to further ensure the dignity of the individuals is maintained. Ground water levels also require consideration; though this is discussed in 6.5. A good example of how to select and develop a UK based site is outlined by Cross et al. (2010). The development

of a UK based (animal) facility would also satisfy calls from North America for more research to be conducted geographically (Raymunt, 2010). The location of a HTRC would ideally be in a central area within the UK so that the facility can easily be reached from a range of locations with good transport links and that experiences a range of the typical weather conditions within the UK so as to ensure the data generated is applicable within the UK (Cassella, 2013).

6.4 Security

Security within a taphonomic facility would be of the utmost importance as sensitive material would need to be prevented from leaving the facility whilst simultaneously preventing the access of trespassers. The principle form of security would therefore be a perimeter fence around the facility. The security of this fence would be similar to that used within military bases or nuclear facilities (Witt, 2013). The perimeter would be protected through high security fencing; this method is employed within each of the established facilities in the USA (Stewart, 2012; Armstrong 2007; Whitmire, 2006). The use of a gabion style fence would be more appropriate for the nature of the facility (Witt, 2013). A gabion is often associated with structural reinforcing of a land mass however the method of containing stones and rocks within a metal cage also lends itself to defence (Witt, 2013). Utilised in "Camp Bastion" in

Afghanistan by the British Army this method prevented unauthorised access whilst simultaneously preventing the photography of sensitive material. For added security, this structure would be partially submerged to prevent large scavengers from burrowing in to the facility coupled with Hawthorn and Berberis style plants to act as natural razor wire. Such plants are naturally hardy (easily grow). This security option is also considerably cheaper to its typical high security counterpart which is normally utilised within the established HTRC in North America (Jantz & Jantz, 2008, Bass 1997, Figure 4). However as a further security precaution it would be recommended to have razor wire on top of the gabion fence with an internal high security fence round the decomposition area should there be a security breach (Witt, 2013).

Further security would include the more typical measures associated with a controlled environment, through the use of a manned security access point and barrier in tow, so that only authorised individuals will be able to access the facility through a smart card access system, for restricted and controlled areas. Closed Circuit Television (CCTV) (Armstrong, 2007) would also be implemented internally and externally utilising both motion sensor and infrared technology (Witt, 2013). Following these recommendations this security would ensure the protection of the research and the dignity donors.

6.5 Biosecurity, Environment and Ecology

Biosecurity and protection of the environment is another factor that needs particular attention in regards to a HTRC; possible contamination through the decomposition of cadavers can occur. As a result of the lack of HTRC within the UK, it is necessary to look at the potential pollution from cemeteries in order to understand the potential impact that the facility could have on the UK environment. Within the human body there is a myriad of bacteria that exist within the intestine. These bacteria get into the soil through putrefaction of the human cadaver causing bacterial seepage into water sources (Europe. WHO, 1998). The survival and retention of bacteria and viruses is dependent on the soil type, temperature and pH of the soil (Europe. WHO, 1998). Research conducted at the Forensic Anthropology Centre in Tennessee, North America have highlighted that there is the potential for soil enrichment (Damann, Tanittaisong & Carter, 2012) of the environment within HTRC. In particular an increase in pH, soil moisture content and nitrogen percentage, whilst a lower carbon to nitrogen percentage was found compared to control samples taken from outside the facility. Another consideration of a UKHTRC is the protection of ground water; this would be ensured through groundwater vulnerability assessments and

identification of Source Protection Zones (SPZ). Porcine carcasses have to be at least one meter above ground water (Cross et al., 2010) and in terms of humans the cemetery guidelines state that a grave should be at least ten metres from standing/running water, fifty meters from a well, no standing water at the bottom of the grave, not dug in sandy soil and at least 1.8 metres below ground level (United Kingdom, Environment Agency, 2004); though in this case, special guidelines for a HTRC would have to be sought from the Environmental Agency UK (discussed further in 6.6.

From the survey that was conducted particular importance was placed upon the facilities environmental impact and how the public would feel in a range of different circumstances. It was established that the majority (83.9%) of participants would prefer for a HTRC to be energy efficient and environmentally friendly with 77.1% and 85% who would be angry if the ecology or environment was damaged. As a result one counteractive measure that could be implemented to remove some viruses and bacteria from the soil as well as reduce movement of others by absorbing the ground water and reducing the ground water level would be through the strategic planting of plants and trees around the perimeter of the facility (Europe, WHO,1998). Transmittance of infectious diseases is minimised due to the protocols derived from the operationalisation Human Tissue Act 2004 discussed in 6.1;

however it is recommended that constant monitoring of the soil and its composition is conducted at a HTRC to truly understand the effect of cadaver decomposition within the soil environment (Damann et al., 2012) so that appropriate measures can be implemented should the need arise to treat the soil.

From an ecological perspective, soil regular investigations and monitoring of soil conditions would need to be conducted to ensure that the condition of the flora and fauna was not detrimentally affected. However changes that may occur could be possible indicators of the presence of a clandestine grave therefore it would be important that these are documented. Through the suggested security considerations in Section 6.4 the prevention of larger scavengers such as foxes would be ensured, however the use of cages over donors may have to be considered to prevent larger birds of prey such as hawks or kites, these would however still allow for decomposition to occur on an entomological and rodent level is in keeping within the established facilities (FARF, WCHIL, FAC, The Grand Junction Sentinel, 2010).

Inspections of the facilities and management of environmental conditions could be conducted by the Environmental Agency UK, however it would also be recommended to have an individual dedicated to the monitoring of

soil and ecological conditions of the facility on a permanent basis so as to ensure complete and comprehensive details are kept.

As mentioned in Section 6.2, two of the key principles of the facility are for it to be environmentally friendly and energy efficient. As a result natural energy sources would be used to at least support the energy requirements of the facility through solar panels and wind turbines. The use of recycled materials in the construction of the facility would also be prioritised wherever practical, such as the use of Icynene insulation made from Castor oil or recycled tyres for the pavements and parking facilities. The purpose of this is to reassure the public that the facility is conscientious of the environment and to reduce the impact of the carbon footprint and its impact on the environment.

6.6 Governing bodies and Inspections

As mentioned in Section 1.0, there are a range of governing bodies and stakeholders that would be involved with the inspection and regulation of a UKHTRC. Regular inspections would be recommended to confirm and ensure that the facility maintains high standards, increasing the credentials and ensuring public support and confidence. This could be orchestrated and monitored by the HTA (HTA, 2014) through both desk based and onsite inspections, who would ensure that the

regulations and standards outlined in the Human Tissue Act 2004 were followed and that facilities, staff and practices were appropriate.

Maintenance of high standards in health and safety would be managed by HSE who provide advice and inspections into health and safety standards (HSE, 2014). Ethical approval and guidelines could be supported through the National Research Ethics Service as mentioned in Section 6.1. The Environmental Agency UK could also play a vital role in environmental protection; following the precedent set by Cross et al. and contact with the agency would be made early on in the planning stages of a UKHTRC to establish a sites suitability. The agency is concerned with the protection and improvement of water, land and air, working with business to use resources sustainably (Environmental Agency UK, 2014).

Therefore they would ensure that the environmental issues highlighted in Section 6.5 are considered and that appropriate methodologies are implemented and followed at a UKHTRC. Further organisations that would ensure that good practice was conducted at the facility would include the Cemeteries Research group, the Chartered Society of Forensic Science, the Coroners Society of England, Royal College of Pathologists and Association of Anatomical Pathology Technologists UK, each of these would provide advice and inspection of the facilities and protocols employed at the centre to ensure that the research being conducted was scientifically and

methodologically sound through regular peer review (Cassella, 2011).

6.7 Management

Contrary to the findings from the survey generated, should a UKHTRC come to fruition it is likely that the facility would be funded privately either by a forensic science provider or UK university, although there would be interest within the centre and its facilities from government agencies namely the Chartered Society of Forensic Science, ACPO, NPIA and CAST who could potentially use the centre for research and training and meetings.

As a result the facility could be managed following a structure familiar to many businesses in the form of a Director supported by management groups.

For a facility to be developed, one key finding from the literature is that administrative and/or public support (Melbye & Hamilton, 2010; Cross et al. 2010) is essential for the success of a HTRC. As mentioned in Section 6.2, funding of the facility is likely to be in the region of two to four million pounds. The training and research opportunities would aid in the funding of the facility though the general public were satisfied (69.8%) for the facility to begin as ammoderate concern and to eventually expand to around 20 acres. It was also determined that participants were happy for the facility to act as a European research centre (83%). Funding however has been a major issue in the development of HTRC, for example a

facility planned for Las Vegas failed after investors could not be found to finance the project (Goldman, 2008).

6.8 Research Potential

As outlined in Section 1.0 the research topics and forensic fields that a HTRC impact are great, limited only by the facilities and financing of the research at a HTRC. Until the closure of the Forensic Science Service, the UK was one of the world leaders in the development of forensic technologies, with the development of DNA profiling and databases which are now implemented all over the world (Hackett, 2014). Since the closure in 2012, the UK has fallen behind countries such North America, who have recently developed a technology that can automatically test a sample and produce a DNA profile in 190 minutes (Hackett, 2014). As a result, the development of a UKHTRC would greatly assist the UK in regaining influence in the forensic field through the research and developments that could be conducted. One government agency that could greatly benefit from a HTRC is CAST, a Home Office (UK Government) department that provides expertise and advice on forensic science amongst other research areas related to crime prevention. Through the UKHTRC the agency would have access to current and relevant research related to murder enquiries that could inform and influence on going enquiries. Though a significant proportion of the research carried out would be related to

Post Mortem Intervals (PMI) and the UK decomposition process, it would facilitate the development of improved methodologies, protocols and technologies (Raymunt, 2010), which could then influence forensic investigations both at home and abroad.

UK with the potential to offer a practical service to countries when a disaster strikes (Armstrong, 2007), furthering any aid donations that are made. The opportunity to offer United Nations independent specialists to aid investigations into alleged human rights abuses is also a particular service that could be developed. It is in these investigations where Forensic Archaeology and Anthropology come into their own. Sites of mass graves are by no means an easy excavation process due to the array of methodologies and variables that affect deposition and decomposition; were the remains deposited complete or dismembered, clothed or unclothed, urban or rural deposition site (Hunter et al., 2001). Another consideration is whether the perpetrators have had time to disguise any crimes committed e.g. Treblinka (Sturdy-Colls, 2011) a common occurrence in human rights abuses. Sadly the prevalence of mass graves is high even since the events of the holocaust; examples of such include Libya (Coughlan, 2011), Iraq (Cordner & Coupland, 2003), Afghanistan (Rubenstein & Sirkin, 2002), Cambodia (Tyner, 2014) and Mexico (BBC NEWS, 2014). Even in America the recent discovery of an unmarked grave containing over a thousand patients from the Mississippi State Lunatic Asylum (Carter, 2014) has required specialists with knowledge of forensic archaeology and anthropology. The need for forensically aware practitioners is therefore higher than it has ever been, especially following on from the

6.9 Training

Training, teaching and research would be the essence of a UKHTRC; the research potential is exponential with the facility bearing significance to the full range of forensic domains. In particular, interdisciplinary research and specifically training within forensic fields particularly within forensic archaeology and anthropology was outlined by Hunter et al. (2001). Training within Forensic Taphonomy and the related fields has global implications owing to the skills that could be developed at a HTRC due to the universality of death. In particular investigations into human rights abuses and mass disasters both environmental and human caused could be and are advanced through the special skills possessed by forensic practitioners. In this wsecond decade of the 21st Century, UK forensic practitioners travel worldwide to aid in the process of human identification amongst other services each of which could be developed and passed on at a UKHTRC. In turn this would provide the

bloodiest century in human history (Lawler, A. 2012).

The opportunities for training are not limited to individuals within academia. A UKHTRC would allow for specialised training of Scene of Crime Officers (SOCO) in the location, recovery and identification of human remains in a variety of different scenarios from surface deposition to the recovery of submerged remains (Raymunt, 2010). The facilities also provide significant life experience for individuals helping them to determine if individuals can handle the traumatic nature of the role (Whitmire, 2006). Fire scene investigation is another field that would benefit greatly from a HTRC. This is one field in forensic science that is particularly subjective due to the premise that the events of a particular scene are interpreted by an investigator following the evidence and scene that he or she is presented with. This is particularly problematic within complex crime scenes where multiple sources of ignition have been implemented. In this situation the specialist facilities at a HTRC would allow for theorised scenarios to be tested providing empirical data that will either confirm or refute a particular scenario.

Training of cadaver dogs is also possible at a HTRC (Whitmire, 2006) using human remains that are in various stages of decomposition. Currently in the UK the dogs are trained using porcine cadavers or artificial scents

such as cadaverine, putrescine (both of which are produced during the natural decomposition process), Sigma Pseudo™ Corpse Scent Formulation I and Sigma Pseudo™ Corpse Scent Formulation II as recommended in Cadaver Dog Handbook: Forensic Training and Tactics for the Recovery of Human Remains (Rebmann, David & Sorg, 2000). Stadler et al. however criticised these specific artificial scents after comparing them to real cadaveric Volatile Organic Compound (VOC) using gas chromatography-time of flight mass spectrometry (GC x GC-TOFMS) concluding that the pseudo scents were not representative of the genuine cadaveric odour highlighting the need for a UKHTRC. In particular Global Rescue Services is one real world example of the need for a facility that can train cadaver dogs. They are a UK based charity that specialises in the search and detection of buried bodies using dogs (Global Rescue Services, 2014) in both the UK and Worldwide explicitly stating that they are "continually" trying to develop their abilities "as a matter of urgency".

6.10 Social implications

One aspect of the established facilities in America that will remain constant *wherever* that facility is located is the reaction of the local community and society regarding possible locations. As discussed within 6.3 the brief for a possible location for a UKHTRC is very detailed and dependant on multiple

variables. Public reaction, like location is another factor that can spell disaster for the development of a facility, as a result of the established facilities it has been found that complete honesty and transparency with the plans that the administration have for a facility is the most successful method (Cross et al, 2010; The Grand Junction Sentinel, 2010). Providing the opportunity for local residents to voice their opinions and ask questions has also proved to be a useful exercise (The Grand Junction Sentinel, 2010) and whilst there is an initial feeling of NIMBY (Armstrong, 2007; Witt, 2007; The Grand Junction Sentinel, 2010;) due to concerns such as the effect of odours, impact on house prices (The Grand Junction Sentinel, 2010), scavengers (Ramsland, n.d.) and increased insect activity (Witt, 2007), people have grown to be fond of facilities (FAC) and in most cases the facilities (FAC, WCHL, FARF) have not received a single complaint in their history from the local residents (The Grand Junction Sentinel, 2010). Specifically in relation to odours it has been found from the established facilities (FAC, WCHL) that the smell does not reach further than 10-20 feet outside the perimeter, equally if you consider the amount of decomposing material the frequents a land-fill facility, the amount contained within a HTRC does not even compare (The Grand Junction Sentinel, 2010; Cassella, 2013).

Another important variable that needs to

be portrayed to the public is the importance of the research that would be conducted at a HTRC, whilst simultaneously expressing the gratitude of the researchers, but also the respect and dignity that is afforded towards the donors for their generous gift (Christensen, 2006).

Similarly the education, understanding and intrigue of the general public is vast pertaining to the field of forensic science, following extensive media and Forensic dramas which are common place. The concept of a 'body farm' is also not that revolutionary through programmes such as the BBC's The Body Farm (2011) which actually depicts a fictional UKHTRC, it is obvious that it was felt that there was enough public interest in such a facility otherwise the show would never have come to fruition which is important in terms of the feasibility of developing one. There is however the potential for media sensualisation and as a result media management techniques would be employed such as those discussed in 6.4. Interestingly and crucially from the survey it was established that as individuals the sample felt that they would like to be informed about the development of a HTRC in their local area (69.9%) compared to 17% of the sample that would rather not. There was a general feeling of uneasiness (19.8%) about a HTRC being developed in their local area however only 5.7% would feel angry though the fact that there are established facilities in North America did make people more comfortable

(79.2%) with the idea. One particular important factor that was highlighted by the sample was that the prospect of job opportunities did raise the participant's opinions (90.5%) leading to a more positive reception of a UKHTRC. However from the survey it was ultimately determined that 92% believe the UK should have a HTRC, which would be received with interest (24.5%), enthusiasm (29.2%) and positivity (23.6%).

6.11 The Survey

The survey utilised was generated following the variables determined from academic journal and newspaper searches. In particular the discussions highlighted in Cassella (2011) and Cross et al. (2010) provided a significant insight into the topics that required investigation. The use of Likert scales was implemented due to their ability to quantify what would ordinarily be an unquantifiable construct (Attitudes), their simple structure ensured that the questions were easy and unequivocal for a broad sample as well as the choice that they would allow participants, in order that they generate responses that are representative of their true beliefs or feelings (Gliem & Gliem, 2003). Results from Likert scales do however need to be considered in terms of the context of when they are recorded (Ogden & Lo, 2012). The survey was therefore designed as an online survey, allowing individuals the opportunity to participate in the questionnaire in their own time in a location that was convenient and comfortable for them. This methodology

did result in a self-selecting sample however participants were more likely to provide honest opinions due to the circumstances when individuals completed the survey. Experimenter bias was reduced due to the absence of an experimenter or pressure placed by their presence to participate in the study. An online survey was also the best methodology in relation to attitude collection of the general public providing exposure to a large survey population through the use of social media (Facebook, Twitter) and e-mail allowing the for a much broader survey sample than could be achieved through its paper counterpart. This method also allowed for individuals from a broad range of backgrounds to be surveyed including academics, celebrities as well as the everyday members of the general public. Twitter in particular provided an exceptional tool in the distribution and awareness of the survey material. Automatic data entry was also an added benefit, saving time and avoiding the potential for human error, there was also an added environmental benefit through the lack of paper resources that were used.

It was determined that the ultimate question that required answering was, "what do the general public think about a HTRC?" particularly in regards to its location within the UK or Europe as public opposition would be one major issue in the development of a UKHTRC.

6.11.1 Data Analysis

Using IBM SPSS 21 statistical data package, the data was statistically analysed; the independent variables were age, ethnicity and gender with the Mean Taphonomy Survey Score (MTSS) as the dependant variable. A two-way ANOVA (Analysis of Variance) was conducted to investigate if the gender (Male/Female) and ethnicity (Group 1: Caucasian, Group 2: Asian, Group 3: Native American and Group 4: Other) of participants had a significant influence over MTSS. It was found that there was no statistically significant interaction between gender and ethnicity, $F(1,100) = .003, p = .958$. The main effect for Ethnicity ($F(3, 100) = 1.464, p = .229$) and Gender ($F(1, 100) = .002, p = .967$) also failed to reach statistical significance. The relationship between MTSS and Age was also investigated using a Pearson correlation coefficient there was found to be a non-significant less than weak positive correlation ($r = .068, N = 104, p = .496$) between the two variables.

As a result of the non-significant finding above each individual item on the scale was correlated with age using Kendall's Tau-B. From this, items on the survey that were found to be approaching significance determined that as individuals get older: the more they prefer for the facility to be government funded ($t = -.136, N = 104, p = .073$) and the happier they are for a family member to donate ($t = .143, N = 104, p = .058$). Simultaneously significant

relationships found that as individuals get older: the happier they are for a UK facility ($t = .197, N = 104, p = .013$), the happier they are for a local facility ($t = .149, N = 104, p = .05$), though there is a definitive sense of uneasiness ($t = .230, N = 104, p = .002$) however following the considerations made in Section 6.10 could address any of the local inhabitants concerns which in turn could settle participants concern of surface deposition ($t = .157, N = 104, p = .039$). As a result findings from the survey as demonstrated throughout the report there have been generally positive responses towards a UKHTRC.

6.11.2 About Qualtrics (Survey Software)

Qualtrics was selected as the survey software provider due to their professional approach towards online survey construction, range of customisation options, ease of use and compatibility with IBM SPSS 21 along with each of the benefits outlined within 6.11. Qualtrics is used extensively within academic research; with 1300 colleges and universities worldwide including every major university in North America (Qualtrics, 2014).

6.12 Limitations and Further Work in this area

Limitations of this study are that the survey and its population were relatively small with a significant gender and age skew. Even with this in mind, the data

still does indicate the general views and beliefs held by the general public that will likely be further defined through a larger sample. Misunderstanding of certain questions may have occurred such as in the case of the term "local" and the question on the media management where the terms used were perhaps not sufficiently clarified for the general public. Qualitative Interviews with employees of the established facilities in North America will in the future allow for greater understanding of some of the issues which have been encountered, that perhaps have not been explicitly published within the material available to the public.

7.0 Conclusion

In Conclusion, the research conducted has determined to a greater extent than not, that although there is a sense of uneasiness within the general public towards a local HTRC, the public would be 'happy' for a local facility to be created. Suggestions have been made following protocols implemented by the established facilities of how to manage the public concern. Equally the importance of a taphonomic facility has been recognised by the general public with 92% feeling that the UK needs HTRC for research and for practitioner purposes. The research has raised the awareness of the issue within the United Kingdom and improved the education of individuals as to exactly what a HTRC is. The feasibility of a UKHTRC has

therefore been dissected into its component parts, with no significant variable standing in the way of a UKHTRC. This has been furthered through the development of preliminary architectural designs from an architect with skills in designing facilities which have similar briefs (e.g for security) which have helped develop this project work from being simply a conceptual idea to a living and breathing structure which is able to show any failings as a table top exercise before a HTRC is created in the UK.

From the academic perspective, a number of extremely positive reasons have been cited by researchers for the creation of a HTRC in the industry - some of which include:

1. Creation of an International facility attracting all-comers and research funding across the fields of science, forensics and Policing
2. Creation of a state-of-the-art facility and equipment
3. Investment and growth potential for local economy near the facility
4. It has the support of national agencies [such as Human Tissue Authority] and national level organisations (Kenyons/Blakes) and many academics who conduct research in this area and peripherally
5. Ethical issues would be considered openly and monitored by external

organisations so all stakeholders could be confident of correct procedures adhered to robustly

6.Environmental issues would be considered as part of the development of the facility and so impact data on the environment would be available and helpful to all environmental and associated agencies

7.Large numbers of research subjects would be available in comparison to the current status quo and so would improve the statistical power of the data produced in the research

8.Proper control over experimental protocols would ensure trust and confidence in the public and all stakeholders

9.Paradigm, long-term projects looking at specific questions raised by the industry could be addressed

10.The facility would act as a nexus for meeting diverse groups of practitioners and agencies

11.Facilitates University research at all levels (UG, PG, academic)

12.Opportunity to attract Private finance initiatives to pump prime the facility

13.Create training and education aids such as short courses, videos, Conference proceedings (from an annual international conference held on site)

14.The Public are in favour of one and wish to donate their bodies

Providing that the establishment and planning of a UK facility is approached in a systematic, comprehensive manner and the issues highlighted within the discussion are addressed, then the establishment of a UKHTRC is not a question of feasibility but rather a question of when and where; though the development of at least one facility within Europe is not only a necessity but a priority.

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