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# Alkaline hydrolysis and its affordances

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## ABSTRACT

First introduced as a funerary option in the early twenty-first century but initially limited to North America, the reach of alkaline hydrolysis (AH) is now growing year on year, with the number of US states, Canadian provinces and other countries around the world introducing legislation to permit its use regularly increasing. While AH has largely been framed as an environmental alternative to cremation, the reasons for its appeal stretch far beyond this 'selling point'. Arguably more pertinent reasons for its appeal are grounded in the new ritual-symbolic opportunities that AH affords. Drawing on fieldwork conducted in the United States of America in 2022, this paper discusses some of the reasons why AH has been chosen and explores how the innovative possibilities it offers may bolster its appeal as its availability becomes more widespread. Amongst other reasons explored in this paper, my research found that the choice of AH has been driven by four key motivations, grounded in the perception of AH as an environmental, gentle, water-based and natural choice.

## KEYWORDS

Alkaline hydrolysis; human body disposal; funeral; ritual; United States of America; United Kingdom

## Introduction

First entering the funerary realm just after the turn of the twenty-first century, but initially limited to North America, the reach of alkaline hydrolysis (AH) is now growing steadily year on year. Notwithstanding, AH remains a relatively new funerary innovation, yet to be offered ubiquitously: so, why is it chosen where it is offered, and what does the choice afford? Drawing upon fieldwork conducted in Minnesota, USA, in April 2022,<sup>1</sup> this paper seeks to offer some answers to these questions and explore how the innovative ritual-symbolic possibilities AH offers may bolster its appeal. As with any funerary choice, AH is inevitably chosen for a diverse range of reasons. Nevertheless, this paper outlines four primary motivations that are influencing its choice. While these motivations were accounted for in one specific context, I argue that they are likely to resonate with individuals beyond the scope of my fieldwork data. The various characteristics of AH explored demonstrate the different ways in which AH has been perceived in the minds of individuals. Primarily, the 'four motivations' influencing the choice of AH are:

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- (i) The perception of AH as an environmental choice.
- (ii) The perception of AH as a gentle choice.
- (iii) The perception of AH as a water-based choice.
- (iv) The perception of AH as a natural choice.

The paper explores these four motivations, alongside other key ritual-symbolic opportunities afforded by the AH process, to shed light upon the reasons why AH has been chosen where it is offered. What follows is intended to be exploratory rather than prescriptive and seeks to contribute to wider scholarly and popular discussions surrounding contemporary funerary choices.

## What is alkaline hydrolysis?

AH is a reductive chemical process which reduces the body to its basic components, leaving behind the bones, a watery residue, and any inorganic materials. It involves placing the body in a pressurised<sup>2</sup> vessel which is then filled with a heated alkali–water based solution (95% water: 5% alkali,<sup>3</sup> heated to a maximum of 150°C). After around four to 6 hours (in high-temperature systems<sup>4</sup>) all liquid is drained from the vessel and the bones remain on a tray within the vessel. These are removed, dried, pulverised (as happens with cremation) and then returned to kin. The sterile liquid effluent – largely made up of amino acids, peptides, sugars, etc. – is usually either released into the municipal wastewater treatment system or retained as a fertiliser product for use on personal gardens and conservation land. At the conclusion of the process, in most AH systems, the pH value of the residual fluid and water used is assessed – and, if necessary, it is chemically treated with acid – to ensure the effluent is sterile and at the appropriate pH to enter the water system via the standard wastewater treatment systems. AH has largely been framed by its advocates in an environmental light, and its ecological ‘merits’ have been accounted for by several independent academic studies, showing it to be significantly better for the environment than conventional burial or cremation (Keijzer & Kok, 2011; Keijzer et al., 2014). Moreover, the efficiency of the technology and safety of its by-products have also been scientifically determined as sound (Lundy et al., 2019; Reinders & Spruijt, 2018). The ethical efficacy of the AH process for funerary use has been assessed by thinkers including Mirkes (2008) and Scarre (2024).

The AH process has its origins in agricultural and laboratory contexts: it was first patented in 1888 by British analytical chemist Amos Herbert Hobson and later developed by US scientists Gordon Kaye and Peter Weber at Albany Medical College (Olson, 2014; Robinson, 2021). Kaye and Weber were later instrumental in the development of AH for the funerary context in the 1990s and early 2000s, with the first ‘funerary-style’<sup>5</sup> AH vessel engineered by their company, WR<sup>2</sup>, in 2005 and commissioned at Mayo Clinic,<sup>6</sup> MN, USA in 2006 (Robinson, 2021). First introduced nearly two decades ago, AH was readily adopted at Mayo Clinic by prospective body donors and/or their kin despite the ‘newness’ and relatively ‘unknown’ nature of the technology, setting precedent for AH’s future uptake (Robinson, 2023a, p. 93). The use and experience of AH at Mayo Clinic is foundational to the contemporary use of AH in funerary settings, both in the USA and around the world. AH was first offered as a funerary option in the USA in 2011 and is now legal in more than half of the 50 states of America.<sup>7</sup> While AH’s development has a substantial

history, its popular uptake has taken a steady course over the last two decades. The global status of AH largely remains in its infancy, but momentum is building: in the last few years alone, popular attention of AH, legalisation efforts and the installation of AH facilities has rapidly increased in the USA, Canada, South Africa, Australia, New Zealand and Europe. The status of the technology is dynamic, with the number of US States legalising the process and European countries regularly expressing an interest in the technology on the rise. Indeed, even in Malta – a country which only legalised cremation in 2019 but has not yet made this option available – it is hoped that AH will be introduced at the same time as cremation (Cummings, 2024).

## Methodology

As already indicated, this paper draws on findings of fieldwork conducted in Minnesota in the USA, principally with funerary professionals who have been involved with the offering of AH. The purpose of the fieldwork was to establish how AH has been adopted and offered commercially in the US funeral industry, facilitating fundamental comparative analysis with the UK context. In terms of methodology, four key methods were used: (i) semi-structured interviews, which were recorded and later transcribed, averaging between an hour and 3 hours in length; (ii) unstructured conversations; (iii) observation, including site tours and witnessing AH systems in use; (iv) analysis of marketing materials. The fieldwork comprised five site visits (three funeral homes<sup>8</sup> and one medical facility<sup>9</sup> in Minnesota that offer AH, and one AH manufacturer's plant in Indiana), ten sets of interviews, and one written questionnaire response. Separate to the primary fieldwork, two further interviews were also conducted about AH in the US context. The funeral homes visited were Bradshaw Celebration of Life Center, Ballard-Sunder Funeral & Cremation Reflections Crematory and Metro First Call. Minnesota was chosen primarily because of the longevity of the practice of AH in the state and its early adopter status: Minnesota was the first state in the USA to formally legalise AH in 2003,<sup>10</sup> Mayo Clinic was the first institution in the world to perform funerary-style AH in 2006, and Bradshaw Funeral Services was one of the first funerary providers in the world to offer AH in 2012 (only two preceded in 2011). Nevertheless, it is worth noting that the fieldwork context also emphasised the contemporary nature of AH in the USA. Of the three funeral homes I visited, two had only begun offering AH within the last few years (Metro First Call in 2019 and Ballard-Sunder in 2020). Thus, while 'longevity' of practice and 'early adopter' status fit seamlessly with the experience of Bradshaw and Mayo, 'longevity' of practice did not apply to the broader context of Minnesota nor the USA at-large. Despite the fact that AH has been legalised in more than half of the 50 states of America, it is not yet commercially available in all those states. Indeed, Minnesota currently has one of, if not *the*, largest concentrations of AH systems in the USA.<sup>11</sup> The fieldwork therefore provided deep insight into how an innovation, which largely remains in an early adopter phase, is likely to grow in the USA and elsewhere in the near future. This context made the application of my analysis to the British context particularly nuanced since AH currently remains unavailable – but in a foetal status – in the UK.

Before delving into the findings of my research, it must be noted that the fieldwork was limited both in terms of duration and scope: this is partly because my doctoral research was self-funded (making far-reaching and longitudinal research in the UK and/or USA

logistically impossible), but more pertinent is the fact that AH's global availability is currently sporadic. While I was able to witness the AH process and engage with both funerary professionals and AH business executives over the course of 6 days, to meet with funeral consumers themselves and discuss their views on AH would have required significantly more time in the field and could be possible in future research. Since the data that follows are drawn from funeral arrangers who arguably have a 'stake' in the success of AH, readers may well question the validity of their claims. Nevertheless, my participants have some of the deepest contemporary understandings of AH technology and the reasons for its adoption: their insights draw upon vast first-hand experience of conducting both funeral planning meetings and funerals involving AH. Given the contemporary global status of AH, all participants were early adopters of AH but the cases of Bradshaw Funeral Services and Mayo Clinic are particularly unique as *the* earliest to introduce AH technology in the case of Mayo, and the first to commercially offer AH in Minnesota (and only third in the world) in the case of Bradshaw, with their insights drawing upon over a decade's worth of experience with AH. The fieldwork data therefore provide rich insights based on the anecdotal experiences of the 'experts' of offering AH, coupled with my own qualitative analysis of their accounts. I welcome future consumer-focused research to corroborate these findings. Furthermore, I must stress that 'hard' evidence for AH's adoption is near-impossible to obtain at present, but this does not diminish the value of the qualitative findings I present in this paper. The Cremation Association of North America (CANA) does not collect statistical data concerning the number of AH cycles per year. This is partly because the way that AH is legalised differs state-to-state, with some states defining AH as a *form* of cremation (meaning that an AH cycle would be documented *as* a cremation), while others distinctively define AH. As Barbara Kemmis (Executive Director, CANA) noted, of the states which had legalised AH as of mid-2022, only Washington state distinguished AH from cremation in its reporting. Hence, it is challenging to obtain accurate and nationally representative figures concerning AH's adoption. As Kemmis noted, 'anecdotally, media and consumer interest in AH is high and preneed sales are strong, but there is little data to describe growth' (personal communication). Nevertheless, CANA estimated that in 2022, there were 'roughly 40 AH practitioners in the US and Canada compared to nearly 4,000 crematories' and the 'number of bodies hydrolysed annually [was] likely less than a tenth of a percent'. This suggests that the adoption of AH has been relatively slow and may prompt some to respond with scepticism about AH's future. In response, I highlight two points for consideration: (i) the history of the adoption of cremation both in the USA and UK; and (ii) the rate of adoption of AH at the funeral homes where it is offered.

### ***The adoption of cremation***

When modern cremation was introduced in the late-nineteenth century, its reach was initially limited and the same is true for AH. In 1885 – when cremation was first formally legalised in the UK – 3 cremations took place. This increased to 10 the following year, growing incrementally year-on-year, before jumping to 107 in 1892 (Cremation Society of Great Britain, 2024). In the UK, the cremation rate then grew at a very steady pace, and the same was true in the USA.<sup>12</sup> Early adoption of cremation in the UK and the USA was therefore similar, but progress in the USA largely plateaued until the 1980s. By 1968, the

cremation rate in the UK was over 50%, while it remained at 4.35% in the USA (Cremation Association of North America, 2022).<sup>13</sup> In 2023, the UK had a cremation rate of nearly 80%, while the USA had a cremation rate of over 60%. Comparative analysis of the data indicates that the current rate of AH's growth is roughly equivalent to the progress of cremation within the first two decades of it being legalised in the UK, between the years of 1885 and 1904. Hence, while AH's contemporary growth may seem relatively slow, we must not forget that (i) widespread funerary change takes time to become actualised and (ii) the availability and accessibility (or lack) of AH systems may be a key reason for the steady growth, rather than a lack of appeal. Indeed, comparing the late-nineteenth and early-twentieth centuries with the twenty-first century is not infallible, but it acts as a helpful guide.

### ***AH's adoption where it is offered***

While nationally representative data on the AH rate are therefore currently unavailable, the experiences of the funeral homes I visited provide a helpful indication of AH's potential growth and appeal. In the cases of Bradshaw Funeral Services and Ballard-Sunder Funeral & Cremation, both have seen some 50% of their 'cremation families' opting for AH instead of cremation. What is particularly notable in these cases is that this adoption happened quickly: in the case of Bradshaw, this uptake occurred within 2 months of first offering AH in 2012. Adoption at Metro First Call was substantially slower, but as a B-to-B provider of funerary services, Koch (Owner and Funeral Director, Metro First Call) has no control over how – if at all – the funeral homes he serves market the availability of AH to their clients. This indicates that education and active offering of AH clearly makes a difference in its uptake. Koch corroborated this assumption as he explained that when the funeral homes he serves *do* actively offer AH, the uptake significantly increases. Clearly, AH must be available in order for it considered and subsequently adopted.

### **Four motivations for the choice of alkaline hydrolysis**

As with any funerary option, the reasons why an individual may choose AH are diverse. Nevertheless, my research found that the choice of AH has been driven by four key motivations, grounded in the perception of AH as an environmental, gentle, water-based and natural choice (Robinson, 2023a, p. 107). These four motivations are explored in turn in the following section, offering some insight into why AH has been chosen in the context of Minnesota, USA.

### ***AH as an environmental choice***

The 'environmental' appeal of AH is perhaps the least surprising motivation for it being chosen: indeed, as already indicated, AH is largely marketed as an eco-friendly funerary option and its environmental 'merits' compared with conventional burial and cremation have been highlighted by numerous life cycle assessments<sup>14</sup> (see, for example, Keijzer & Kok, 2011; Keijzer et al., 2014K: these findings have been corroborated by more recent LCAs but, unfortunately, they are not available in the public domain). In the case of my

fieldwork participants, they noted that the ‘environmental’ appeal of AH was often cited as a ‘pragmatic’ reason for its choice by their clients. For instance, Bradshaw (CEO and Funeral Director, Bradshaw Funeral Services) noted that ‘individuals will often at times cite, “Well, it just seems like it’s being more environmentally responsible”’. Likewise, Telford and DeRuiter (Funeral Directors, Ballard-Sunder Reflections Crematory) commented that for some, ‘the environmental factor was really important’ when making their decision. In the British context, it is anticipated that the environmental ‘selling point’ of AH will be a major reason for it gaining traction. The reason for this is twofold: principally, where AH’s environmental merits are coupled with its practical similarities with cremation. At any given time,<sup>15</sup> up to two in five Britons cite the environment as one of the top three issues facing the country (YouGov [n.d.](#)). Moreover, according to findings of the BEIS Public Attitudes Tracker Department for Business, Energy and Industrial Strategy (2023), 82% of Britons surveyed reported that they ‘were at least fairly concerned about climate change’ and 98% self-reported that they participate in activities to minimise waste, save energy, and travel more efficiently in their everyday lives. I argue that with sustainable living extending to all walks of life, its extension to funerary choices is somewhat inevitable. At the same time, I have stressed the importance of the need for ease when making ‘green’ choices, particularly in the funerary context (Robinson 2023a, p. 41) – if AH was extremely more expensive than cremation and not readily available, then individuals would have to make extensive efforts to choose it. However, if made widely available – and given its practical and economic<sup>16</sup> similarities with cremation – the choice of AH would be much easier. AH’s similarities with cremation for the ‘consumer’ are grounded in four key elements:

- (i) Choosing AH would not require any change to the desired funeral service (or lack of service) of the deceased.
- (ii) The kin receive ‘ashes’ following the AH process.
- (iii) The cost of AH is predicted to be approximately equal to, or less than, that of cremation.
- (iv) The AH process takes a similar length of time to complete as cremation.

With some 80% of Britons currently choosing cremation (Cremation Society of Great Britain, 2024), the premise of an environmentally sound alternative to cremation which does not require any changes to the experience of funerary practice for the bereaved, specifically AH, may appeal on these grounds as an environmental alternative to cremation. Consequently, despite their paradoxical nature, the use of terms such as ‘water cremation’ or ‘green cremation’ to describe AH may aid public understanding and subsequent interest in AH for those choosing between cremation and AH.

### ***AH as a gentle choice***

The use of water in the AH process has also played a major role in influencing its choice. My analysis of AH providers’ anecdotal accounts found that this appeal largely takes two forms: (i) love of water and/or (ii) water being perceived as gentler than fire. The former largely enables the alignment of life and death values (life- and ‘death-styles’ (Davies, 2015)), but the use of water in the process is also one reason for AH’s potential assimilation with



particular cultural-religious worldviews: I return to both of these aspects in the following section. The latter motivation is more heavily rooted in the symbolic understanding of water as a 'gentle' element – which one may associate with calming lakes, soothing spas and sustaining life – which has consequently spurred AH to be perceived by many as a 'gentle' choice. What I found particularly interesting about the framing of AH as a 'gentle' process is that this was not something that funeral directors were necessarily perpetuating themselves, rather this was a motivation for the choice that their clients described to them. However, it must also be noted that AH has been marketed by some AH providers in this way. Below are a few examples which detail how this motivation was manifested.

Returning to Bradshaw's comment surrounding the 'environmental' motivations for AH being a 'pragmatic' reason for its choice, he also spoke of more 'emotional' reasons for choosing AH. Bradshaw (CEO and Funeral Director, Bradshaw) explained that when a death has occurred and then funeral plans are subsequently established, 'people will account on it [AH] being a more gentle choice. You know, [they will say,] "I just liked the idea of that, as opposed to burning".' In a similar vein, Telford (Funeral Director, Ballard-Sunder) commented that 'if somebody has died in a traumatic way, [...] They pretty much always go with water cremation'. DeRuiter (Funeral Director, Ballard-Sunder) added that the 'gentler' aspect of AH 'can ease some [...] anxieties about this very permanent process'. The perception of AH as a 'gentle' choice was perhaps the most frequently cited motivation for the choice, with all fieldwork participants commenting on this factor. To further emphasise the commonality of this motivation, I provide one further example described by Koch (Owner and Funeral Director, Metro First Call), who recalled the experience of a family they had served, for whom the 'gentle' and 'water' aspect of AH was a strong motivating factor. Koch explained:

'[The family] had wanted cremation, but the person who had died, when they were a little boy, they were burned in a fire. And they still had the scars from that and were deathly afraid of fire. [So, the family asked] "What else can we do?" And the funeral home<sup>17</sup> brought up water cremation and problem solved, they were so relieved that they had another option, but still could get cremated remains back'.

Continuing with this theme, some have also reportedly chosen AH specifically because they perceive the process itself to be a 'gentle' means of handling the body. While some would contend that essentially dissolving the flesh from the bones is 'gentle', for others, the way that AH leaves the skeletal remains following the process – uncharred and with more remains produced than cremation – has motivated their decision to choose AH. This perception of AH's 'gentle' treatment of the body has been particularly important in the sensitive case of infant deaths. With the cremation of infants, bereaved parents must often prepare themselves for the possibility that, sadly, no remains will be returned to them (because of the heat of the cremation process). With AH, the likelihood of this unfortunate circumstance is reportedly diminished: I was recently told about a remarkable case of a small 100 ml urn containing the reduced remains of an 11-week-old baby being returned to their parents. In these circumstances, the 'gentle' nature of AH has been transformative for bereaved parents – this is seen further in the review of a bereaved parent who had chosen AH following the loss of a pregnancy late-term which is included in the penultimate section of this paper.



### ***AH as a water-based choice***

As already noted, the use of water in the AH process has been a significant motivation for its choice. This motivation was largely linked with the love of water-related activities in life (e.g. surfing, fishing, etc.), but the ability to ‘return’ to the elements through which our bodies are mostly composed of<sup>18</sup> was also emphasised. The former was especially notable in the context of Minnesota, where my fieldwork was conducted, as Telford (Funeral Director, Ballard-Sunder) commented, ‘We are in the land of ten thousand lakes, so people have a stern connection with water. That definitely motivates them’. Likewise, Ballard (Owner and Funeral Director, Ballard-Sunder) emphasised that some ‘choose it [AH] because they will live on a lake and they just like the idea of the water’.

With regard to the notion of ‘returning’ to the elements through the water-based process of AH, DeRuiter (Funeral Director, Ballard-Sunder) commented, ‘I think it’s kind of the motivation of that return to water’ that inspires some to choose AH. This has also been indicated as a culturally influential idiom in Hawaii, where AH was legalised in 2022 (though, it is not yet commercially available). For example, Aloha Mortuary – a Hawaiian funeral home, owned by Native Hawaiians, which is seeking investment to purchase an AH system following their successful efforts to legalise AH – draw upon this influence in an advert<sup>19</sup> about their prospective offering of AH. The short advert features Hawaiian actor Kekoa Kekumano and is an insightful example demonstrating the appeal of the use of water in the AH process, as Kekumano says:

I’m a Waterman, in real life, and on screen. I’m blown away by the beauty of the ocean. I love the idea that when our time on earth here is done, we can return to the waters from which life emerged. It’s awesome that Aloha Mortuary is working to bring water cremation to Hawaii. Preserving our culture’s traditions is important. And that’s why I trust Aloha Mortuary. You get the kind of send off that honours my culture. Aloha Mortuary. A story to tell. A life to celebrate.

In the section discussing how AH may be assimilated with certain cultural and religious worldviews, the Hawaiian context will be returned to. Additionally, with reference to this third motivation, I outline how the water-based nature of AH may aid its adoption by those with Christian worldviews.

### ***AH as a natural choice***

The fourth motivation driving the choice of AH was rooted in the way that it has been perceived as a ‘natural’ choice, mimicking the process of natural burial. This is because, theoretically speaking, the process of AH is what occurs underground during burial: the reduction of the body to skeletal remains. The perception of AH as a ‘natural’ choice was noted as being particularly influential for members of local farming communities in Minnesota. Telford (Funeral Director, Ballard-Sunder) noted that ‘when you tell people that water cremation essentially mimics natural burial in the earth, [...] the farmers [...] they really like that, and they [...] gravitate towards it then’. Bradshaw (CEO and Funeral Director, Bradshaw) commented that he has been able to connect with farming communities in a similar way to the funeral directors at Ballard-Sunder by describing the process of AH as comparative with burying an animal and placing lime in the grave to aid decomposition, as farmers in the USA often do. As Bradshaw explained,

'I do frame this a lot as rapid decomposition [...] when I say, "the natural choice". I mean, I think you could almost call this "natural cremation". Because, I mean, alkaline hydrolysis truly is'.

In a similar vein, Fisher (pioneer of AH at Mayo Clinic and UCLA, now commercial provider of AH) commented 'That's why I say, "natural water cremation", because in the long run, what you're using is naturally in the ground anyway'. Explaining this 'natural' element further, Fisher noted that the earth's crust contains 2.5% potassium and hence, he explained that he sees AH as taking a naturally occurring process and doubling its components to speed up the natural decomposition process. This allegory drawn by Fisher has been adopted in the narrative of other AH providers and has been persuasive. The 'naturalness' of AH has also played an influential role for some particular worldviews: for example, Telford (Funeral Director, Ballard-Sunder) commented that a local tribe – Mdewakanton Sioux – has shown an interest in AH *because* they feel that it mimics natural burial, enabling AH to 'align with their beliefs really well', including their heavy emphasis upon the importance of environmental stewardship.

### **Alkaline hydrolysis's assimilation with cultural and religious worldviews**

In addition to the four motivations discussed above and as alluded to throughout, the choice of AH also has the potential to assimilate with certain cultural and religious worldview perspectives. For the purposes of this paper, I explore four examples with focus upon Native Hawaiian, Christian, Buddhist and Hindu contexts. Some of the analysis that follows is naturally speculative in nature but is underpinned by theoretical understandings derived from my disciplinary background as a theology and religious studies scholar.

#### ***Native Hawaiian contexts***

Hawaii legalised AH in July 2022. Notably, the desire for AH in Hawaii was not only rooted in the appeal of a return to water, as previously discussed, but part of the drive for AH in Hawaii was also rooted in its ability to enable the reintroduction of traditional Native Hawaiian funerary rituals through the *adaptation* of traditional rituals. Native Hawaiian tradition teaches that the 'mana' – spiritual essence – is contained within the 'iwi' – bones. Accordingly, the bones are of central importance in Native Hawaiian funerary rituals. Traditionally, after death, the body would be placed in an underground oven – an 'imu' – near the sea to remove the flesh from the bones, and the bones would then be collected to be 'preserved, stored, and protected with reverence' (Aloha Mortuary, [n.d.](#)). This traditional practice is not a legal possibility in contemporary Hawaii, but AH offers the possibility to mimic this process: *because* the AH process reduces the body to bones, it enables the opportunity for the intact (unpulverised) bones to be collected and then buried according to traditional Native Hawaiian funerary ritual practices. This proposed use of AH is elusive of Hertz's exploration of the 'wet' and 'dry' phases of double burial (Davies, 2000; Hertz, 1960). Significantly, the opportunity for AH to facilitate adapted Native Hawaiian funerary rituals – including through how the body is treated in the process – was cited as

a reason for implementing the legislation in the Bill, alongside the process's environmental benefits, as Section 1 of the Bill (H. S. Legislature, 2022) reads:

The legislature finds that there has been a recent increase of interest in traditional Native Hawaiian practices for burials amongst Native Hawaiians and non-Native Hawaiians. [...] Traditional Native Hawaiian burials include the practices for treatment of human remains, which involve reducing remains to skeletal components and interring the iwi in a kapa or lauhala container. [...] The legislature also finds that a process called water cremation, technically known as alkaline hydrolysis, provides a more eco-friendly, cleaner, and gentler alternative to flame cremation for the treatment of remains. [...] The alternative water cremation process benefits both practitioners of traditional Native Hawaiian burial techniques and individuals who want an environmentally friendly cremation option for themselves or their loved ones. [...] Accordingly, the purpose of this Act is to accommodate the use of both traditional Native Hawaiian burial practices and environmentally-friendly burial practices by including water cremation in the treatment and disposal of human remains. (H. S. Legislature, 2022)

### **Christian contexts**

AH also potentially offers ritual-symbolic opportunities within Christian worldview perspectives. While there is denominational and cultural variation, broadly speaking, those identifying with a Christian worldview may now choose to be buried or cremated in keeping with their personal preference. For those with a preference for burial, however, Burnham (Church of England Reader) believes that the AH process is consistent with Christian teachings and argues that the use of 'appropriate Christian symbolism would retain the integrity of the individual by avoiding pulverisation and scattering after water cremation and burying the remains in a container in consecrated ground' (Burnham, 2019). In the British context, with diminishing land space for future burials persisting as a contemporary issue (Robinson, 2023b), if AH is perceived as consistent with the decomposition of the body underground into skeletal remains and Christian associations with that process, AH could enable a new form of 'Christian' burial. Similarly, in accordance with Catholic teachings regarding cremation (Holy Office, 1963), AH could furthermore suffice theologically in that cremated remains are permitted to be interred within consecrated burial grounds. Interestingly, though perhaps not surprisingly given the opportunity for symbolic expression offered by AH, Bradshaw (CEO and Funeral Director, Bradshaw) reported that a few local pastors have commented to him that they perceive that the AH process resembles the sacrament of baptism because 'Christians baptise with water, and with AH, you can be cremated with water'. Bradshaw commented that some would argue that AH is 'certainly not baptism'; nevertheless, it is important to note the significance of symbolism in ritual practice and the *potential* for added symbolic value. Fisher (previously Mayo Clinic and UCLA, now AH commercial provider) also commented that he has invited priests to bless the water before the AH process begins and the AH system itself, he explained: 'I said they were baptised into water when they began, and now bless the water that they're going to end their life in also' ... 'It's a water process. Now it's a blessed water process'. It is notable that, historically, the Church of England simply 'developed slight changes to burial rites to accommodate cremation' (Davies, 2017, p. 160) and the same is likely to be true for the adoption of AH, with consistency in the committal 'earth to earth, ashes to ashes, dust to dust' documented in

the 1662 *Book of Common Prayer*, and the possibility to incorporate symbolic references to baptism liturgy. Hence, the ritual-symbolic possibilities for AH could be indicative of its future appeal, particularly with its resonances with Christian symbolism relating to baptism. Indeed, the symbolic comparison of AH with baptism has already been drawn upon by Church of England clergy members. Moreover, the continuity in engagement with the elements – earth in burial, fire in cremation and water in AH – may be of symbolic significance.

### **Buddhist contexts**

The variety of what may be termed ‘Buddhisms’ means there is also considerable variation of ‘Buddhist’ funerary customs, largely determined by cultural-geographical location and the type of Buddhist tradition followed. Nevertheless, for some Buddhist communities, the ritual process of bone picking is important: Koch (Owner and Funeral Director, Metro) noted that Metro First Call has been better able to facilitate this ritual practice for those within their local Buddhist community through the offering of AH. This is because, with cremation – which would normatively be chosen – Koch advised that there is only a 50% chance that it will be possible to retrieve the hyoid bone (which is ritually significant), whereas with AH, it is essentially guaranteed. Koch similarly recalled the example of some who have chosen AH because they wanted the teeth of the deceased to be returned, which AH practically facilitates, whereas there is no guarantee that the teeth will survive the cremation process. The adoption of AH by some members of this community is notable, given that a decade ago when Olson (2014) conducted interviews with Anderson McQueen Funeral Home and Bradshaw Funeral Services, he found that neither funeral home had encountered interest for AH from the Hindu and Buddhist communities who employed them to perform cremations.

### **Hindu contexts**

Elsewhere, I have discussed the possible theological alignment of AH with Hindu world-views (Robinson, 2021). Hindu tradition prescribes the practice of cremation, ideally using an open-air pyre, as the process of burning the body through cremation aids the release of the *ātman* (spirit or soul) from the body. While there is no ‘release’ into the air with AH in the way that there is through the process of cremation, AH could enable consistency in the Hindu ritual practice of depositing the ashes following cremation in the Ganga or the Yamuna (or local river or sea) which symbolises ‘the final departure or “seeing off” of the *ātman* on its journey to the next life’ (Firth, 1997, p. 90). In a similar way to the depositing of cremated remains in flowing water, which would also be possible following AH, I have previously proposed that the release of the watery residues of AH could also have theological significance with regard to the journey of the *ātman* (Robinson, 2021).

### **Other ritual-symbolic opportunities**

Taking this discussion a step further, I have also explored possible ritual-symbolic opportunities associated with the funerary ‘waste’ products – ‘necro-waste’<sup>20</sup> (Olson, 2016; Troyer, 2016) – that result from AH and may enable one to ‘give

back' or positively benefit the environment through the process, 'dispersing' the dead (H. Rumble et al., 2014). Although it is not yet clear how this possibility will shape up in the UK, some AH providers in the USA offer their clients the return of both the reduced bone remains and a fertiliser product. The production of fertiliser via the AH process lends itself to the adoption of Rumble's (2010) analysis concerning the reason that some individuals seek the choice of natural-woodland burial to allow the individual to 'return to nature' in death. Just as in natural-woodland burial where the body may be conceptualised as 'feeding the earth', the fertiliser by-product of AH enables a similar 'return to nature' because the necro-waste, which may be conceptualised as organic 'residues' from the body, can be used to nourish plant and soil life.

Be a Tree Cremation (Denver, CO, USA) is one example of an AH provider which offers the return of a fertiliser product to kin – indeed, Be a Tree Cremation does not release any of the AH effluent to the wastewater treatment system, rather it is all turned into fertiliser (personal communication with Nelson, Founder and CEO, Be a Tree Cremation). Be a Tree Cremation calls this fertiliser product 'Tree Tea™' and claims that it is 'high in nitrogen (nearly three times as high as Miracle-Gro), yet lower in phosphorus'. Nelson explained that 'folks are very receptive to it and love the idea', with some 70% of clients taking 'some amount' of the Tree Tea™ away with them. The opportunity to 'give something back' to nature seems to be a significant pull for some when choosing AH as a means of body disposal. Touching on this aspect, Nelson referred to a conversation that she had had with a member of her own family before she established Be a Tree Cremation. She explained that her family member had told her that they 'want to be a tree' when they die, and so she responded by asking if that meant that they wanted to opt for natural-woodland burial, but her family member said 'No, no, no, I want to be cremated'. Inspired by this idea, Nelson subsequently reported 'discovering' that 'the water at the end [of AH] can actually be really good for the earth and good for the soil' and so she felt that this desire to 'become a tree' could truly be facilitated by the AH process, in a way that cremation cannot because of the make-up of cremated remains. Hence, Nelson felt that this characteristic of AH enables Be a Tree Cremation to 'really connect those dots' for those who 'want to be eco-conscious, and are also wanting to go back to nature' but want 'the simplicity of a cremation'. The significance of the appeal of this notion for those opting for AH is further evidenced in the content of public reviews on Be a Tree Cremation's website, in which the opportunity to 'give back' and 'become one' with nature are dominant themes. Numerous reviews allude to the notion of the fertiliser option as enabling the deceased's essence to 'live on' beyond death. This is achieved by the dead being conceptualised as 'becoming a tree' or 'nourishing' and 'feeding' the soil, plants and trees, 'nurturing' the environment rather than 'polluting it'. The reviews shed light on the appeal of this service and highlights that the use of this necro-waste facilitates a further opportunity for memorialisation. Two reviews<sup>21</sup> of Be a Tree Cremation's services particularly stand out for this reason:

Jack T – August 2, 2021: ‘My wife and I were heartbroken to lose a pregnancy late term, but wanted to honor and remember our daughter. [...] We now have ashes and Tree Tea from our daughter, which we’ll use to help plants grow throughout the house’.

Jackie W – January 3, 2022: ‘I feel that this was the best possible choice for my son [...] there is a sense of solace in knowing that he is providing nutrients to the soil and gardens via his “Jordan Juice”’.

## Conclusion

Hence, the significance of the symbolic meaning-making created *through* funerary activities must not be understated and is particularly noteworthy because of the *opportunity* for the development of new and/or *adapted* rituals made possible via the AH process. What is clear is that individuals have found a variety of ways to create meaning *through* the choice of AH and while the ‘four motivations’ discussed in this paper were the most frequently mentioned motivations for its choice, the creative possibilities associated with AH remain open-ended. The ‘four motivations’ and other ritual-symbolic opportunities explored are not mutually exclusive nor are they intended to be prescriptive, rather I present them as possible affordances of AH. In sketched form, this paper has therefore sought to illustrate some of the affordances offered by the AH process which may explain why AH has been, continues to be, and may be adopted in specific contexts. My fieldwork was limited to the US state of Minnesota and while the innovation of AH is undoubtedly growing in the USA, it remains small enough that the CANA does not publish statistics regarding the AH rate in the USA. Nevertheless, comparing the estimated progress of AH with the historical progress of cremation, it appears that AH is in a paralleled position with cremation in the late-nineteenth and early-twentieth centuries. Accordingly, while there are some limitations to the research presented in this paper, it provides a unique insight into this early phase of AH’s adoption which may be indicative of its potential for the future as AH is made available in all areas where it is legal. As AH continues to become more widely accessible, it will therefore be important to trace whether these proposed appeals of AH continue to be seen in practice particularly because, as Arnold et al. (2023) argue, AH ‘has the potential to take a significant share of the market for the final disposition of the human body away from burial and cremation’.

## Notes

1. Ethical approval for the fieldwork was granted by the Department of Theology and Religion Ethics Committee at the University of Durham before it commenced (reference: THEO-2021-12-08T16\_54\_08-vknp78).
2. There are some AH systems which operate at atmospheric pressure including, for example, Bio-Response Solutions low-temperature system. This process takes significantly longer to complete than in high-temperature systems, usually taking around 16 hours to complete rather than four.
3. Resomators (AH systems engineered by Resomation Limited) use liquid potassium hydroxide, with automated chemical delivery from external tanks into the Resomator. Bio-Response units use either liquid or dry chemical delivery. Some Bio-Response units use only potassium hydroxide, while others use a mixture of potassium hydroxide and sodium hydroxide. The

volume of chemical used is calculated in accordance with the weight, sex and other parameters associated with the body.

4. These figures are accurate for AH systems engineered by UK-based Resomation Limited (<https://www.resomation.com/>) and US-based Bio-Response Solutions (<https://www.biore sponsesolutions.com/>), the two world-leading manufacturers of AH technology.
5. The use of the term 'funerary-style' is to distinguish single-body AH systems from those designed for collective disposal associated with agricultural contexts. Shands Hospital at the University of Florida, FL, USA was the first institution in the world to use AH for human body disposal in 1995, however, I argue that this machine was not designed nor operated in a funerary style because it was used to simultaneously dispose of the body parts of multiple individuals (see Robinson, 2023a for details).
6. As part of the Anatomical Bequest Program at Mayo Clinic, final disposition is provided free of charge for full body donors. It is also possible to request to make private arrangements for final disposition, such as burial or cremation, following the conclusion of Mayo Clinic's use of the donor body. Prior to the installation of the AH system at Mayo Clinic, the Program had been using local funeral homes and crematories to provide final disposition for body donors via cremation. The ashes would be returned to Mayo Clinic, and then either personally returned to kin or placed in the Mayo Clinic vault at Oakwood Cemetery. Burial at Oakwood Cemetery was previously used as the method of final disposition at Mayo Clinic, before the offered service became cremation. Since 2006, the offered service has been AH.
7. To establish the legal position of AH throughout the USA, the author analysed the funerary laws of every state in the USA. In the USA, the legal system is separated into federal and state law. Laws concerning the funeral industry are handled at state level; thus, every state has its own laws concerning the disposal of the body after death. Consequently, while AH is legal in multiple states in the USA, the precise legal position differs state to state. AH is typically defined into USA law in one of two ways: either (i) the cremation definition is expanded or includes reference to 'thermal' or 'chemical' means of reducing the body; or (ii) alkaline hydrolysis is explicitly defined within the legal statute. As of February 2023, AH was legal in 26 states: Alabama, Arizona, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Idaho, Illinois, Kansas, Maine, Maryland, Minnesota, Missouri, Nevada, North Carolina, Oklahoma, Oregon, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia and Wyoming.
8. The funeral homes visited were: (1) Bradshaw Celebration of Life Center, Stillwater, MN – Bradshaw began offering AH in 2012; (2) Ballard-Sunder Funeral & Cremation Reflections Crematory, Jordan, MN – Ballard-Sunder began offering AH in 2020; (3) Metro First Call, Savage, MN – Metro began offering AH in 2019. NB: I visited three of the four funeral home AH installations in Minnesota – time restraints and locality of the fieldwork meant that I was unable to visit LaCanne Family Celebration of Life Center, Windom, MN, where an AH system was installed in 2015.
9. Mayo Clinic, Rochester, MN – AH was introduced at Mayo in 2006.
10. Minnesota legalised AH in 2003 under Minnesota §149.02A (M. S. Legislature, 2003). AH was initially equated with cremation, but the legislation was revised in 2013 to distinguish AH from cremation in the state's licencing for funerary activities to 'truly' accommodate AH.
11. AH systems are installed at Ballard-Sunder Funeral & Cremation, Bradshaw Funeral Services, LaCanne Funeral Home, Metro First Call and Mayo Clinic.
12. The percentage of cremations conducted year-by-year in the USA are not available until 1958.
13. The USA reached a 50% cremation rate in 2016.
14. A life cycle assessment (LCA) is a methodology used to measure the environmental impact of a product, process, or service, throughout its life cycle.
15. The author has longitudinally analysed this data since October 2020.
16. At the funeral homes I visited, AH was offered at the same price as cremation; some funeral homes in the USA offer AH at a premium cost compared with cremation but still significantly cheaper than burial. In the long-term, AH could (and arguably should) be cheaper than cremation since AH cycles are cheaper to run than cremations; however, initial capital investments in AH equipment by those offering AH may delay this becoming actualised.



17. Metro First Call is a B-to-B funeral service provider, offering services on behalf of other funeral homes: as such, the staff at Metro First Call are not actively involved in the conversations with those planning a funeral.
18. The human body is composed of some 60% water.
19. This advert is no longer available to watch online, but it was previously available at the following link: [https://www.youtube.com/watch?v=jj\\_KZERlfl](https://www.youtube.com/watch?v=jj_KZERlfl).
20. The concept of 'necro-waste' is derived from the Greek 'nekrós' (νεκρός) meaning 'dead'; one can therefore propose that 'necro-waste' is 'dead-waste' or waste from the dead.
21. See: 'What families are saying' on <https://www.beatreecremation.com/>.

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## Disclosure statement

No potential conflict of interest was reported by the author(s).

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