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The Mortuary Science of Alkaline Hydrolysis

Is It Ethical?

Sr. Renée Mirkes, O.S.F.

The Catholic Church has sound theological reasons for its unswerving promotion of burial as the normative practice for bodily disposition. Burying the deceased highlights important truths. Just as faithful Catholics have shared in Christ's life, death, and burial, so, at the end of time, each of their bodies will be reunited with its soul to share in an eternal, resurrected life with the risen Lord.¹

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¹According to St. Thomas Aquinas, the soul retains a transcendental relation to its body even after it is separated from it by death. At the resurrection the soul will regain a body which will be the same body as the one it had in life, not by reason of some *former* matter, but simply by the fact that it is again the form of *some* matter, since it is the soul that gives identity to the matter, not the matter to itself. *Summa contra gentiles* II, c 79. The symbolic presence of the whole body during the funeral Mass reminds mourners of the living person and his earthly pilgrimage back to God. The community is helped to recall that this disciple, whose body now lies in state, was baptized into, nourished by, and conformed to the bodily Person of Christ. Establishing solidarity beyond the grave, the presence of the deceased body strengthens the living to persevere in pursuing their common end of eternal beatitude and communion with the saints. "Thinking about the Body," by Leon R. Kass, is a masterful article investigating, while respecting the mystery of, the anthropological and theological issues one is forced to think about when one encounters the dead human body. *Hastings Center Report* 15.1 (February 1985): 20–30.

On the other hand, the Church's consistently proscriptive discipline regarding an alternative to burial—specifically, cremation—began to show some “subtle shifts” in the 1960s.² Two developments were responsible for the moderated position. First was an abatement of the nineteenth-century threat from Freemasons, who had advocated cremation over burial as a way of rejecting Catholic dogma.³ Second, it was clear that those requesting cremation in the mid twentieth century were doing so for sound reasons, with motives that comported with belief in the resurrection of the body.⁴

Thus, on May 8, 1963, in the instruction *Piam et constantem*, Pope Paul VI lifted the penalties previously connected to cremation, reiterated the Church's position that cremation is not an intrinsically evil act, i.e., it does not “in itself include an objective denial of the dogmas,” and approved cremation by the faithful when they are “forced to do so by necessity.”⁵ In short, the Church was declaring that as long as faithful Catholics request cremation for valid reasons, i.e., reasons that arise from the exigencies of their situation but have nothing to do with denying the immortality of the soul or the resurrection of the body, it is a morally acceptable alternative to burial.⁶

²John Newton, “Cremation, Death and Roman Catholicism,” in *Encyclopedia of Cremation*, ed. Douglas J. Davies and Lewis H. Mates (Aldershot, England: Ashgate, 2006), 107–109.

³The instruction *Piam et constantem* (May 8, 1963) explicates the Church's moderated position, pointing out that former sanctions against cremation were precipitated by “hate-inspired assaults against Christian practices and traditions by those who, imbued with the animosity of their secret societies, sought to replace burial by cremation. This practice was meant to be a symbol of their antagonistic denial of Christian dogma, above all of the resurrection of the dead and the immortality of the soul” (introduction). In International Commission on English in the Liturgy, *Documents on the Liturgy, 1963–1979: Conciliar, Papal, and Curial Texts* (Collegeville, MN: Liturgical Press, 1982), 1066–1067. See also Newton, “Cremation, Death and Roman Catholicism,” 108; R. Rutherford, “Cremation,” in *New Catholic Encyclopedia*, ed. Berard L. Marthaler (Washington, D.C.: Catholic University of America Press, 2002), 359.

⁴“There has been a change for the better in attitudes and in recent years more frequent and clearer situations impeding the practice of burial have developed. Consequently, the Holy See is receiving repeated requests for a relaxation of Church discipline relative to cremation. The procedure is clearly being advocated today, not out of hatred of the Church or Christian customs, but rather for reasons of health, economics, or other reasons involving private or public order.” *Piam et constantem*, introduction.

⁵Ibid., introduction and n. 1. The instruction also states that cremation “is not therefore an intrinsically evil act, opposed *per se* to the Christian religion . . . In certain situations where it was or is clear that there is an upright motive for cremation, based on serious reasons, especially of public order, the Church did not and does not object to it” (introduction).

⁶*Piam et constantem*, however, underscores the greater didactic value of burial over cremation: (1) cremation, as the exceptional or extraordinary method of disposing of human bodies—i.e., chosen only under force of necessity arising from “reasons of health, economics, or [those of] public or private order” (introduction)—does not possess the clarity of

Recently, a newer method of human bodily disposition called alkaline hydrolysis, or resomation, has caught public attention.⁷ European and American medical schools, morticians, funeral directors, state legislators, and Catholic bishops have examined alkaline hydrolysis from their various perspectives.⁸ Given its environmental, geographical, and public health advantages, predictions are that requests for alkaline hydrolysis, once the process is legalized, will rival and perhaps even exceed current U.S. requests for cremation.⁹

With this in mind, I think it is imperative to explore the process of alkaline hydrolysis—as well as the purposes for which it could be chosen—in order to answer one question: Like cremation, would alkaline hydrolysis qualify “in cases of necessity” as a moral alternative to Christian burial? That is, could alkaline hydrolysis be chosen for a good end, thereby respecting the meaning and symbolism of the dead human body as well as confessing the revealed truth of its future resurrection?

I answer these questions here with a triple analysis: first, comparing the technical dimensions, by-products, costs, and environmental impacts of cremation and alkaline hydrolysis, respectively, with those of the natural decomposition process ensuing after burial; second, evincing the moral character of alkaline hydrolysis when judged against the same ethical principles pertinent to burial, cremation, or any other method of final disposition; and third, evaluating some common moral objections brought against alkaline hydrolysis.

theological demonstration that is emblematic of burial and, therefore, (2) despite the morality of cremation in certain situations, “all necessary measures” must be taken to preserve the custom of burial as the normative means of final disposition (n.1).

⁷“Resomation” is a trademarked term for the mortuary science of alkaline hydrolysis. Thomas A. Parmalee, “Resomation: Green Hype or the Next Big Thing?” *American Funeral Director* (April 2008): 44–50.

⁸The issue of alkaline hydrolysis was brought to the attention of the New York State Catholic Conference when a bill to legalize the process for the disposition of human corpses was introduced into the NY state legislature. The NYSCC argued against NY assembly bill A08766A (May 30, 2007), which would have amended public health law to allow for the chemical digestion of human remains by the process of alkaline hydrolysis, especially in medical research facilities and their donor cadaver programs. The conference argued that alkaline hydrolysis was neither a compassionate nor a dignified way of treating human remains. Further, the bill failed “to provide for stringent chain of custody and identification procedures in place for human bodies.” NYSCC, Memorandum of Opposition Re: S.4831 Hannon / A.8766 Bing (In Relation to Chemical Digestion of Human Remains), July 15, 2008. In New Hampshire, a 2006 bill legalizing alkaline hydrolysis (as a form of cremation) was recently repealed. The Diocese of Manchester was instrumental in helping pass NH senate bill 332 (effective June 26, 2008), which prohibits alkaline hydrolysis as a technique of final disposition in that state. Objections of the Manchester diocese to the process are similar to those of the NYSCC: alkaline hydrolysis does not treat the human corpse with respect, and the proper regulatory and oversight measures for the process were not in place.

⁹In the United States, alkaline hydrolysis is legal for the disposition of human remains only in the state of Minnesota.

Cremation and Alkaline Hydrolysis: A Technical Perspective

Cremation

Modern cremation is a method of accelerated decomposition of the dead human body.¹⁰ The body is placed into the retort of a cremation furnace and incinerated, in a span of three to five hours, by the intense heat of fire (1600°–2400° F). During incineration, the heat oxidizes and vaporizes a large portion of the cremated body—specifically, the blood and soft tissues (skin, muscles, tendons, blood vessels, and solid organs)—and the gases thus formed are released into the atmosphere.

It is important to note that the vaporized material eventually condenses and returns to the earth's soil and water resources in rain. This material is not limited to nontoxic elements: it may also include mercury from dental amalgam fillings, radioactive particles, prions, and carbons and fluorocarbons, which may pose potentially serious public health and environmental hazards.¹¹

¹⁰The information on cremation presented here was obtained from phone conversations with morticians who do cremations.

¹¹The most worrisome environmental concern with both cremation and burial are the *mercury emissions* associated with dental amalgam fillings. Some European countries and some states in the United States are requiring crematoria morticians to pull teeth before a body is cremated or place a costly filtration system on crematoria smokestacks to efficiently capture mercury emissions from cremated bodies. The solution of choice, of course, is for dentists to use a mercury-free dental amalgam, so that in fifteen years or so, mercury emissions from fillings will be greatly reduced. But in the interim, the problem of mercury emissions persists. See John Reindl, "Summary of References on Mercury Emissions from Crematoria," Dane County Wisconsin Department of Public Works, January 23, 2007, <http://www.ejnet.org/crematoria/reindl.pdf>. *Radioactive material* may enter the body through radiation therapy to treat cancer, although at low-enough levels it will not pose an environmental problem after the body is cremated. Radioactive contamination may also result from a radiation catastrophe or accident, after which greater amounts of radioactive material are likely to be retained by the body and, after death, may pose significant hazards both to persons handling the body and to the environment. Cremation does not destroy radioactive material and, in fact, increases contamination risk through the smoke and pulverized ash. See, for example, Charles A. Wood, Frank DePaolo, and R. Doggett Whitaker, "Guidelines for Handling Decedents Contaminated with Radioactive Materials," U.S. Department of Health and Human Services, Radiation Event Medical Management, April 26, 2007, <http://www.remm.nlm.gov/radiation-decedent-guidelines.pdf>. A *prion* is an abnormal protein segment, i.e., a protein-based molecule with no RNA or DNA. When prions accumulate in the brain cells of human beings, they can cause a lethal disease known as Creutzfeldt-Jakob disease, one of a family of transmissible spongiform encephalopathies (TSEs). There is no diagnostic test, no vaccine, no cure, and no treatment for CJD, and no one is sure how most cases of CJD are contracted. The disease is infectious and always fatal, and neither cremation fire nor formaldehyde (used in embalming) destroys prions. A new variant of CJD (nvCJD) afflicts younger patients. Other human prion diseases include kuru and Gerstmann-Straussler-Scheinker syndrome. A patient with CJD ultimately loses all physical and mental functions, falls into a coma, and dies, usually from pneumonia precipitated

The high heat of the cremation fire reduces the skeletal parts of the corpse to boney fragments. These are collected from the retort, and pulverized into a powdery substance (the cremains) which, by family request, may be placed in an urn and buried in a columbarium or mausoleum. Unfortunately, since there is no way to "rake" all the finer bone ash from the retort, cross-contamination of bodily remains between cremations is unavoidable.¹²

The cost of cremation is approximately 10 to 20 percent of the cost of traditional burial, and the space needed to store an urn of cremated remains is less than 1 percent of that needed for burial of a casketed body.

Alkaline Hydrolysis

Alkaline hydrolysis is a process that, like cremation, also achieves accelerated decomposition of the human body.¹³ Used for the disposition of research cadavers at two medical centers in the United States—specifically, the Mayo Clinic College of Medicine and the University of Florida College of Medicine at Gainesville—this five- to seven-hour technique "is an accelerated version of the natural process of tissue hydrolysis—driven decomposition after burial. ... Bodies that are buried in the earth are degraded by alkaline hydrolysis expedited by the soil bacteria. This is

by the bedridden, unconscious state. With the unanswered questions about the etiology of CJD and related TSEs and the fact that neither embalming or cremation destroys prions, the release of prions into the environment via natural decomposition or cremation is a legitimate concern. See Curtis D. Rostad, "Creutzfeldt-Jakob Disease: A Report to Embalmers [and] Preparation Guidelines," Wyoming Funeral Directors Association, 2000, <http://www.wyfda.org/member/cj.html>. Fluorocarbons are chemical compounds that contain carbon-fluorine bonds, which break down in the environment very slowly. They are considered persistent organic pollutants that could destroy the earth's ozone layer. Fluorocarbons are found in refrigerants, propellants, anesthetics, solvents, and water-repellant and stain-repellant products. During cremation, fluorocarbons are released into the environment as by-products of the burning of some plastic body containers and containment products.

¹²In the traditional cremation process, the remains (bones) are swept out of the retort after each burn cycle. The sides of the retort are fire bricks with ledges, nooks, and crannies. There is simply no way that cremation technicians, as diligent as they may be, are able to remove 100 percent of a person's remains before the next cycle.

¹³Information on alkaline hydrolysis is available at the Web sites of Resomation Ltd., Glasgow, Scotland, <http://www.resomation.com/index.html>, and BioSAFE Engineering, Brownsburg, Indiana, <http://biosafeengineering.com/waterresolution/index.html>; in Norma Love, "New Idea in Mortuary Science: Dissolving Human Body with Lye," *ABC News*, May 8, 2008, <http://abcnews.go.com/Health/WireStory?id=4814394&page=1>; and in Dean R. Fisher and Terry D. Regnier, "Using Alkaline Hydrolysis as a Form of Final Disposition in Anatomical Bequest Programs," poster presentation, 24th Annual Meeting of the American Association of Clinical Anatomists, June 16–20, 2007, Henderson, Nevada, abstract at <http://www.clinicalanatomy.org/pdfs/Las%20Vegas%20Final.pdf>, 61. Additional details were obtained by the author from phone conversations and e-mail correspondence with Terry Regnier, director of anatomical services at the Mayo Clinic College of Medicine in Rochester, Minnesota, who also heads the alkaline hydrolysis program there.

a very slow process. . . . Alkaline hydrolysis uses strong alkali (pH 14) to solubilize and hydrolyze tissue, expedited by heat at 150°C in a pressurized vessel.”¹⁴

The body is placed in a stainless steel cylinder, where it is dissolved by dual forces: ninety-two gallons of water mixed with four gallons of potash lye (potassium hydroxide) heated to 150°C, and sixty pounds of pressure per square inch of body. “The operator simply presses a single button on the touch screen to begin the fully automated process [monitored by means of computerized programs]. The integral load cells weigh the body, and the appropriate amount of water and alkali are added automatically to the vessel. The vessel is quickly heated via steam to around 150°C.”¹⁵

The process reduces the corpse to two by-products. The first is a sterile, nontoxic fluid, or effluent, made up of organic elements—salts, sugars, peptides, and amino acids—which is a thousand times less alkaline than the potash lye.¹⁶ This aqueous by-product is emptied into a specially designated drain and is eventually absorbed into the ground via the waste treatment system. The second by-product is bone “shadows,” calcium phosphate remains of the body’s bones. These are collected and pulverized and like cremation remains can be placed in an urn and returned to the family for burial. The alkaline hydrolysis unit is completely cleaned between cycles, so there is no cross-contamination of one body’s remains with another.¹⁷

It has been reported that the carbon footprint of alkaline hydrolysis is twenty times less than that of cremation and also, perhaps most importantly, that the process is free of mercury emissions.¹⁸ Since it is easy to see teeth among the bone shadows, a person monitoring the process can remove dental amalgam, the major source of mercury emissions, and dispose of it appropriately. Moreover, alkaline hydrolysis destroys radioactive particles and prions that might have been present in the corpse.¹⁹ It is precisely these environmental and public health advantages that convinced the medical college of Mayo Clinic that the decision to offer alkaline hydrolysis for the disposition of donor corpses was sound.²⁰

¹⁴ BioSAFE Engineering, “Water Resolution: Frequently Asked Questions,” <http://www.biosafeengineering.com/waterresolution/faq.html>.

¹⁵ BioSAFE Engineering, “Water Resolution: How Does the Process Work,” <http://www.biosafeengineering.com/waterresolution/process.html>.

¹⁶ Resomation Ltd., “What Is Resomation,” <http://www.resomation.com/>.

¹⁷ Information provided by Terry Regnier during the author’s on-site visit to the Mayo Clinic resomation center.

¹⁸ BioSafe Engineering, “Benefits of Water Resolution,” <http://biosafeengineering.com/waterresolution/benefits.html>. See also Fisher and Regnier, “Using Alkaline Hydrolysis.”

¹⁹ Fisher and Regnier, “Using Alkaline Hydrolysis.”

²⁰ At the Mayo Clinic, the medical students and staff invite families to attend an annual memorial service, titled “Convocation of Thanks,” for loved ones who donated their bodies to medical education and science. The students use various readings, music, poems, and personal reflections to honor the profound altruism of the donors. This service is held annually on the first Saturday in May. In 2009, the memorial ceremony will celebrate the twenty-fifth anniversary of the Mayo Clinic’s donor cadaver program.

The cost of alkaline hydrolysis for a human corpse is similar to that of cremation and 80 to 90 percent less than the cost of traditional burial.²¹ As with cremation, the space needed for an urn of ashes is less than 1 percent of the space needed for burial of a casketed body.

Burial

In the United States, burial of a human body involves lowering a fully clothed corpse, usually embalmed and lying in a casket, into a vault that is then itself lowered into a six-foot-deep grave.²² Depending on the amount and kind of fluid used in the embalming, the beginnings of natural decomposition may be more or less temporarily delayed. Once decomposition begins, however, the body's bacteria and cellular and digestive enzymes begin to consume the corpse, eventually reducing its soft tissue to liquid and its skeleton to ash. The length of time from the start of the decomposition process to its completion varies, depending on the body mass, body contents, strength of embalming fluids, and quality of the casket and vault materials. By morticians' best estimates, it could take up to one hundred years to reduce a whole casketed body to ashes.

The fluid portion of the remains may seep through the casket and vault, depending on their permeability. During natural decomposition, this seepage has the potential to cause environmental damage due to embalming fluids (including formaldehyde), chemotherapeutic drugs, and prions that were contained in the body's tissue.²³

In the United States, the consumer cost of traditional burial is between \$3,000 and \$6,000.

²¹The per-cycle cost of resomation is much less than cremation, but the initial purchase of a resomator is much more costly than that of a cremation furnace. Some predict that the costs of alkaline hydrolysis to consumers will initially be the same as for cremation but will decrease over time, owing to less maintenance, lower per-cycle expenses, and cost savings from not needing mercury-abatement equipment. See Parmalee, "Resomation," 49.

²²The information on burial presented here was gathered by the author during phone interviews with morticians and funeral directors.

²³Embalming preserves the dead body by removing body fluids and replacing them with chemicals. Embalming fluids consist of formaldehyde, methyl alcohol, and other solvents. When handling these fluids, which are highly toxic, embalmers are required to wear protective clothing that leaves no skin exposed, including surgical masks and, in areas of high airborne formaldehyde concentration, respirators. Before a body is embalmed, blood and body fluids are removed and flushed into the sewer. Embalming fluids are then injected directly into the arteries and into organ cavities. The effluent from embalming tables is highly toxic, and its disposal raises environmental concerns. The fluid remaining in the embalmed body is also toxic and poses an environmental threat after burial. Robert G. Mayer, *Embalming: History, Theory, and Practice*, 4th ed. (New York: McGraw-Hill, 2006), 27, 56, 57–58, 120. See also the National Funeral Directors, "Help with POTW Wastewater Discharge," factsheet, August 2004, http://www.nfda.org/files/2003FaxBackPDFs/Compliance/2013_EPA_POTWwastewaterDischarge.pdf.

Comparison of Cremation, Alkaline Hydrolysis, and Burial

First, the by-products of alkaline hydrolysis, cremation, and burial are grossly similar: the body's blood and soft tissue are reduced to liquid, and the skeleton is reduced to ashes. Second, in all three methods of final disposition, the aqueous portion of the remains becomes, ultimately, a part of our soil and water ecosystem—in burial through seepage, in cremation by way of rain, and in alkaline hydrolysis through waste-treatment processing.

Third, of the three methods of final disposition, alkaline hydrolysis appears to have the least negative environmental impact overall. In traditional burial with a vault made of porous material (like concrete), there is a real possibility that embalming fluid, mercury, and other toxins will seep into the ground. Arguably, this type of burial raises more environmental concerns than cremation. On the other hand, burial in a vault made of impermeable materials (like brass, copper, stainless steel, or cultured marble) raises fewer concerns, but because of its expense is infrequently used.²⁴ Both cremation and burial raise more environmental concerns than alkaline hydrolysis.²⁵

Fourth, since approximately one hundred urns of cremated or hydrolyzed remains could be buried in the space required for a single casketed body, the considerable conservation of burial ground with cremation and alkaline hydrolysis is obvious. Fifth, cremation and alkaline hydrolysis are dramatically less costly than burial. We will sort through the moral implications of these comparative conclusions in the following sections.

Assessing the Morality of Methods of Final Disposition for Human Bodies

The following objective truths and principles explain the nature of human bodily remains; they help us understand what it means to treat the human corpse with respect:

- Human bodily remains have no moral value as such. The human corpse is a collection of chemicals that has only finite worth.
- Nevertheless, since a dead body was once alive—that is, since the cadaver was once a human body animated by an immortal soul (and, if the body of a Christian, also once a member of Christ²⁶)—a human corpse possesses a relative (rather than absolute) dignity.

²⁴In light of the superior environmental safety of impermeable vaults, the promotion of so-called “green burials”—simple burials in wooden caskets without concrete vaults, so that the body can return to the earth as quickly and naturally as possible—seems environmentally disingenuous.

²⁵For comparisons of environmental impacts, see Love, “New Idea in Mortuary Science”; Regnier, “Using Alkaline Hydrolysis”, and the tables presented by Biosafe Engineering and Resomation Ltd. at <http://www.biosafeengineering.com/waterresolution/checklist.html> and <http://www.resomation.com/id7.html>, respectively.

²⁶“The bodies of the dead must be treated with respect and charity, in faith and hope of the Resurrection. The burial of the dead is a corporal work of mercy; it honors the children

From these premises, we deduce the norm, or moral ruler, against which we are able to judge whether alternatives to burial—specifically, cremation and alkaline hydrolysis—are moral ways of disposing of the human body:

- No method used to dispose of the human corpse is intrinsically evil, since the dead human body will decompose no matter how we care for it at the time of death. Hence, the way we dispose of a human corpse takes its essential moral character from the motive or intention for which the particular dispositional method is chosen.

Hence, if alkaline hydrolysis were chosen for good reasons (environmental, economic, financial, or psychological) and in a manner that comports with the resurrection of the body, it would be a moral means of final disposition.²⁷ It is important to point out that, if John Doe chooses alkaline hydrolysis for a serious motive (one that arises from the necessity of his particular situation), his choice does not mean that he considers the good of showing respect for his body by the more ceremonious treatment of burial as unimportant or as somehow not worth both effort and expense. It merely means that, given the particular necessity of his circumstances—living in an already environmentally compromised area, being financially constrained, living on an island or in a small country with limited burial space, or living in the midst of an epidemic—burying his body is a less important good than preserving the environment, conserving land, avoiding financial jeopardy, or preventing the spread of infectious disease.

The norm just proposed has clearly been operative in the Church's official position on cremation. Despite the fact that she forbade the practice, on and off, for over nineteen and a half centuries, the Church never condemned cremation on the grounds that it was intrinsically evil.²⁸ Rather, Catholics were forbidden to be cremated or to formally participate in cremating the bodies of others because this method of final disposition was being chosen or executed for immoral purposes. So, for example, in nineteenth-century Italy, with the concerted efforts of Freemasons to legislate cremation for all Italian citizens as a challenge to the doctrine of bodily resurrection and as a “public profession of irreligion and materiality,”²⁹ the Congregation of the Inquisition under Pope Leo XIII condemned cremation, not because it was evil *in se*, but by virtue of the bad motives for which it was being proposed.³⁰

of God, who are temples of the Holy Spirit.” *Catechism of the Catholic Church*, n. 2300.

²⁷James O'Connor, S.J., for example, sheds light on various serious motives for which someone might request cremation “for hygienic, economic or other reasons of a public or private nature. Some examples would be transfer of remains to a distant place, possible avoidance of considerable expense, national tradition or custom, *a severe psychological or pathological fear of burial in the ground or tomb, etc.*” (emphasis added). *Canon Law Digest*, vol. 9, *Officially Published Documents Affecting the Code of Canon Law 1978–1981*, ed. T. Lincoln Bouscaren and James I. O’Connor (Milwaukee: Bruce Publishing, 1982), 698.

²⁸*Canon Law Digest*, vol. 8, 858.

²⁹Newton, “Cremation, Death and Roman Catholicism,” 108.

³⁰Freemasons presumed that legislating cremation in place of burial would make it impossible for God to resurrect dead bodies destroyed by fire. Obviously, they were ignorant

Similarly, the Church demonstrated the intrinsic moral neutrality of cremation by allowing it in exceptional cases. Thus, in 1884, a missionary priest working in India queried the Society for Propaganda whether it was appropriate to baptize Indians who converted on their deathbed when, predictably, pagan relatives would request that the bodies be cremated according to national customs.³¹ The Church replied that these converts should be baptized and that cremation of their bodies should be allowed, as long as the missionary and Indian converts eschewed the pagan rituals and beliefs surrounding cremation. The answer underscores the moral liceity of material cooperation in cremation. When the newly baptized converts rejected the pagan views surrounding their national custom of cremation and professed, instead, their belief in bodily resurrection, their choice of cremation constituted legitimate material cooperation (i.e., cooperation in the physical act of cremation only) and, because of their good motives, constituted a moral means of disposing of their bodies.

And, of course, the Church sanctioned the cremation of bodies in times of plague, since the motive for permitting it—preventing the spread of a deadly disease—was for the public (and private) good.³²

of the cogent argument of Minucius Felix, a theologian of the third century: no matter how we destroy the human corpse, be it by fire or any other element, the God who created the human being from nothing will also be perfectly capable of raising the human body—from burnt ashes or otherwise—at the end of time. “Every body,” he wrote, “whether it is dried up into dust, or is dissolved into moisture, or is compressed into ashes, or is attenuated into smoke, is withdrawn from us, but it is *reserved for God in the custody of the elements*” (emphasis added). “The Octavius of Minucius Felix,” in *Ante-Nicene Fathers: The Writings of the Fathers Down to A.D. 325*, vol. 4, *Fathers of the Third Century*, ed. A. Cleveland Coxe (Grand Rapids, Michigan: Eerdmans, n.d.), 1825, <http://www.ccel.org/ccel/schaff/anf04.txt>. Newton notes that “the Church earnestly recommends that the pious custom of burying the bodies of the dead be observed; it does not, however, forbid cremation unless it has been chosen for reasons which are contrary to Christian teaching.” “Cremation, Death and Roman Catholicism,” 108. Unfortunately, contemporary newspaper reports failed to make these same moral distinctions in respect to Leo XIII’s statement on cremation. The *New York Times* account at the time of the 1886 decree, for example, neglected to connect the “abominable abuse of cremating human remains” with the vicious motives of contemporary Freemasonry. The article also notes that Catholics were forbidden to become members of societies that propose cremation over burial, but does not explain why. “Denouncing Cremation,” *New York Times*, August 3, 1886, 8, <http://query.nytimes.com/gst/abstract.html?res=9E0CE7D71030E533A25750C0A96E9C94679FD7CF>. The Congregation of the Inquisition is now known as the Congregation for the Doctrine of Faith.

³¹Newton, “Cremation, Death and Roman Catholicism,” 108.

³²A fourteenth-century European victim of the black or bubonic plague would never have dreamed that a flea bite was the source of his death. “Fleas generally catch plague from infected rats. Plague bacillus [multiplies] so rapidly in a flea’s digestive tract that it chokes,” and the next time the infected flea “feeds upon a host, the dam of swarming bacillus creates a backwash of regurgitated blood, in effect injecting plague like a hypodermic. . . . [In Europe in the 1340s,] entire cities fell ill and died, pyres burned without ceasing, wagons piled with swollen bodies creaked through narrow streets, and the cry of ‘Bring out your dead!’ echoed through the night.” Some conjecture that the line “Ashes, ashes, we all fall down” in the nursery

Adjudicating the Moral Validity of Persistent Objections to Alkaline Hydrolysis

Below are some common objections to the use of alkaline hydrolysis, followed by my critiques:

1. *Alkaline hydrolysis was first developed for the disposal of large animal carcasses and is, therefore, an undignified (unethical) way to dispose of the human body.*

Animal bodies are also cremated. Nevertheless, the Church has approved cremation and never argued, to my knowledge, that the practice should be prohibited because of this association.

2. *Even though the natural decomposition process turns the body's tissues into a liquid which could then seep into the ground, occurrence of a similar breakdown with alkaline hydrolysis takes on a negative moral significance because an external agent—the person conducting the alkaline hydrolysis—accelerates this process and then pours the liquid bodily by-product down the drain.*

When done for a sufficiently good reason, it is not wrong for an external agent to hasten the process of decomposition or to pour the body's liquid remains into the ground.

3. *The process of alkaline hydrolysis is heaping indignity on the human corpse because it is tantamount to boiling the dead body.*

It is incorrect to say that alkaline hydrolysis boils the body, for the pressure in the vessel is too high for boiling. But if a human corpse were boiled for good reason—specifically, for example, to save living human beings from starvation—boiling, too, could be allowed.³³

rhyme “Ring around the Rosy” refers to the mass burning of corpses in the plague-ridden cities. Burl Burlingame, “Plague on Our Shores I: Dark Days,” *Honolulu Star Bulletin*, January 24, 2000, <http://archives.starbulletin.com/2000/01/24/features/story1.html>.

³³Take, for example, the case of stranded Uruguayan rugby players, friends, and family who, to keep themselves alive in the Andes after a plane crash in 1972, consumed flesh from the bodies of deceased crash victims. Of forty passengers and five crew members on the plane, only twenty-seven people survived more than two days after the crash. Eventually, rather than starve, some survivors reluctantly ate flesh from the bodies of those who had died; others who refused later died of starvation. Sixteen survivors were rescued ten weeks after the crash. Tim Taylor, “Unpalatable But True,” *Telegraph* (U.K.), October 15, 2003, <http://www.telegraph.co.uk/connected/main.jhtml?xml=/connected/2003/10/15/ecfcann14.xml>. Rather than heaping an indignity on human corpses, eating the dead bodies in these extraordinary circumstances put the corpses at the service of the living and, in this sense, can be considered respectful treatment in a manner consistent with their dignity. Thus, even consumption of a human corpse—an indignity under ordinary circumstances—is not so when, under necessity, there is a good reason to dispose of the body in this manner. Monsignor Andrés Rubio, then Auxiliary Bishop of Montevideo, emphasized that “you cannot condemn what [the survivors] did . . . when it was the only possibility of survival.” Piers Paul Read, *Alive: The Story of the Andes Survivors* (New York: Avon Books, 1974), 308.

4. *The sort of indignity associated with alkaline hydrolysis—especially pouring the liquid remains down the drain and, eventually, into the ground—differs, in kind, from that of cremation. Therefore, to argue that alkaline hydrolysis should be approved just because it resembles cremation in other respects does not follow.*

A careful examination of the human body's natural decomposition process after burial and the bodily decomposition involved in cremation reveals that the flashpoint of indignity with alkaline hydrolysis—specifically, pouring the liquid remains down a drain—is found in a similar form in the seepage after burial and in cremation through rain. Also, in the embalming process that precedes traditional burial, the blood and body fluids that are drained from the body are flushed into the sewer. Yet the Church does not forbid embalming. Furthermore, is burning a dead human body any less aggressive and, at first blush, any less offensive or violent, than the process of alkaline hydrolysis? And yet the Church allows cremation. Or, when we understand the slow, relentlessly destructive disintegration process within the buried body, is natural decomposition really any less offensive or repulsive than that which happens in alkaline hydrolysis? Yet, we began by recalling that the Church holds up burial (with its natural process of bodily decomposition) as the normative means of disposing of human bodies.

Thus, when it comes to perceived indignities toward the human corpse, we ought to focus on three facts. First, there is an essential difference between the living body and the dead body or corpse. Second, we should not be offended by any method of disposing of the human corpse when used for good reason, since it merely accomplishes what God has ordained as the penultimate, decomposed state of our finite bodies. Just as, in the beginning, God created the human bodily person from dust, so at the end of time will He complete the redemption of our bodies by raising them up from dust.

Third, when we thoroughly understand what occurs in the embalming process, in the natural decomposition process following burial, and in the cremation process—all methods of treating the dead human body that are approved by the Church—we might well re-evaluate those aspects of alkaline hydrolysis that we initially considered distasteful or gruesome. Dissection of the human body is also distasteful, and no reasonable person really likes to cut into the body. But distaste for surgery or embalming, or for burning or chemically dissolving a corpse, does not make the procedure immoral.

5. *Although alkaline hydrolysis in itself is morally neutral, there are pastoral (prudential) reasons why the Bishop, say, of one diocese might allow it and the Ordinary of another might not.*

In making a decision about alkaline hydrolysis in his diocese, the local Ordinary will need to weigh pertinent pastoral questions. Will allowing alkaline hydrolysis in the diocese contribute to a coarsening of respect for living human beings? Or will allowing alkaline hydrolysis in the diocese tempt the Catholic faithful to take the road of least resistance in fulfilling the duty of mourning for and burying their dead?

In the final analysis, I would argue that a bishop should use the announcement of his prudential decision about alkaline hydrolysis as a “teaching moment.” He should make it clear to his Catholic faithful—however he comes down on the issue—that alkaline hydrolysis is not intrinsically evil and that, in cases of necessity, could be chosen for legitimate environmental, economic, or personal motives. Then, if the Bishop were to prohibit the practice, he should further explain his prudential reasons for doing so, such as that in his best judgment, allowing the practice of alkaline hydrolysis might lead to other, perhaps unintended and unexpected, negative consequences for the spiritual health of the diocese that collectively could compromise its genuine respect for life.

Aside from the practical complications that might arise from opposite decisions on alkaline hydrolysis for dioceses within close proximity of one another, I think this objection is valid.

A Morally Neutral Action

The process of alkaline hydrolysis is, in and of itself, a morally neutral action. When chosen for serious reasons, that is, out of necessity and in a way that confesses belief in the resurrection of the body, alkaline hydrolysis is a moral means of final bodily disposition. In exceptional cases, then, hydrolyzed remains could, like cremains, be integrated into a Catholic funeral wake and Mass so long as conditions for their respectful treatment were observed. Specifically, the remains would need to be placed in a suitable urn, transported to and from the Church respectfully, buried in a columbarium or mausoleum, and appropriately marked so that survivors could offer prayers for the deceased at the burial site.³⁴

Nevertheless, because of the current tenor of moral and cultural attitudes and practices in his diocese, a local Ordinary could prudentially decide not to allow the mortuary practice of alkaline hydrolysis in his jurisdiction, or could decide to allow it on a case-by-case basis only after official diocesan review.

³⁴Order of Christian Funerals (Collegeville, MN: Liturgical Press, 1997), appendix 2.