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Head First into the Future: Ethical Considerations of Neuropreservation

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Introduction

In winter of 1967, Dr. James H. Bedford, a former University of California psychology professor, underwent the first full body cryopreservation protocol shortly after his legal death [1,2]. Nearly half a century later, he still awaits his resurrection in Scottsdale, Arizona at the Alcor Life Extension Foundation [1]. Although human cryopreservation may sound preposterous to some, it certainly has gained popularity worldwide. In fact, as of November 30th, 2015, the Alcor Life Extension Foundation has 1,046 living members awaiting full body or neuropreservation upon death and 141 patients currently in cryopreservation [3]. The term cryonics has been coined to describe human cryopreservation–that is, low-temperature preservation of humans who cannot be kept alive today by contemporary medicine, with the hope that restoration and resurrection may be plausible in the near or distant future [4]. In principle, the protocol of full body cryopreservation entails cooling the body to -196 degrees Celsius while utilizing several cryopreservants to prevent cellular injury of the preservation process [5]. Neuropreservation is a second option whereby the head is removed from the body prior to the preservation protocol [5]. This editorial will consider the ethics of cryonics, with particular attention given to neuropreservation and brain reanimation.

The phenomenon of death is difficult to define. According to the Uniform Determination of Death Act, death is defined as an individual who either exhibits irreversible cessation of circulatory and respiratory function, or irreversible cessation of entire brain function [6]. Accordingly, all currently cryopreserved patients' brains fit the later criteria in terms of science's present inability to restore the neural capacity of an inactive brain. However, if cryonics manages successful reanimation of neuronal circuitry then such an instance would yield a disorienting definition of death. In fact, by definition, cryopreserved brains could no longer be deemed as dead; rather, a new legal definition of death would have to be adapted. This argument establishes the first ethical concern of neuropreservation: altering the definition of brain death. Perhaps our stagnant understanding of death is still elementary and should be subject to change with future technological advancements; nevertheless, transforming the concept of death will have profound implications on medicine, law, and philosophy.

Intrinsic to a definitional modification of death is the capacity of an individual to opt for early cryopreservation via active euthanasia, physician-assisted suicide, or independently committed suicide–a second ethical concern of both full body and neuropreservation. Such a procedure may be prematurely considered primarily for two reasons: to end human suffering (e.g., Alzheimer's disease) or for curiosity purposes (e.g., pseudo-time travel into the future). The first reason may be logically validated as such: an individual suffering from a terminal prognosis actively chooses to prematurely 'end their life' in order to cease their current state of suffering with the hope of restoration upon a future awakening. However, if we consider the ramifications of a modified definition of death then the patient is not 'ending their life' per say; rather, the patient would only be putting their life on hold until future technology can relieve the present pathology and restore organismal homeostasis. Furthermore, the terms euthanasia and suicide would no longer be valid, as 'death' is never truly achieved with a successful patient resurrection. The second reason for choosing early cryopreservation, for curiosity purposes, may not be ethically valid; however, who is to say that an individual cannot 'put their life on hold' for an extended period of time?.

According to the Alcor Life Extension Foundation, "the goal of neuropreservation is to restore the patient to health by regrowing a new body around the brain using future tissue regeneration technology" [7]. Although such a quantum leap in tissue engineering may sound promising, ethical pitfalls surround this 'theoretical reanimation hypotheses. First, what use will neuropreservation be if the individual 'died' from brain pathology such as Creutzfeldt-Jakob disease? Certainly, regrowing a new body around the brain will be of no use if the pathology is intrinsic to the brain parenchyma. This concern can be overcome by waiting to resurrect neuropreserved patients until technology has advanced to heal the specific brain pathology that caused their untimely deaths.

A second ethical concern of the theoretical reanimation hypothesis is redefining what it means to be human. The protocol of neuropreservation entails resecting the head from the body at the level of the sixth cervical vertebra such that all body parts (including the spinal cord) distal to the site of incision are sacrificed [7]. Thus, the brain of a patient will require extensive tissue regeneration such that the patient will become mostly artificialized. This begs the question: will these individuals still exhibit true humanity? Perhaps the term posthuman will be a more suitable descriptor for these individuals; nonetheless, neuropreservation calls into question the very essence of what it means to be 'you.' Similar to our current description of death, maybe our present definition of human should also be allowed to evolve with future technology. Surely, evolutionary biology tells us that human change is inevitable; however, who will be the first to transcend current human limitation – molecular evolution or humans?.

A third ethical concern of reanimation is that the hypothesis dangerously predisposes that brain-body innervation architecture can be deduced via genetics. As described previously, the neuropreservation procedure requires sacrificing the body including the spinal cord and peripheral nerves [7]. Although regeneration of the spinal cord may be conceivable in the future, topographical mapping of spinal, sympathetic, and parasympathetic innervation, distal to the site of incision, may be permanently lost. Thus, loss of brain-body innervation architecture may subject the patient to a perpetual state of paralysis despite future tissue regeneration technology. Although such

technology may heal severed spinal cords, regrow lost limbs, and regenerate new organs, the plausibility of computationally deriving an individual's brain-body innervation architecture based on a patient's genetics seems improbable. Therefore, the ethicality of resurrecting a cryopreserved brain only to subject them to a state of indefinite paralysis should be considered. If neuropreservation-induced paralysis cannot be overcome with future technologies then whole brain emulation (i.e., uploading the mind onto a computer) could be considered as a potential alternative for patients currently neuro preserved.

Neuro preservation-induced paralysis brings about another ethical concern regarding theoretical reanimation–that is, if the reanimation hypothesis fails to heal paralysis induced by head resection then who is to determine if these patients should be resurrected and subject to a paralyzed state? Assuredly, the patient cannot make such a decision under neuropreservation. Family members and friends would mostly likely have died by the time this technology becomes feasible (assuming they did not opt for full body cryopreservation and become reanimated prior to the neuropreserved family member). If we find that full body cryopreservation is successful, then the definition of death will have changed such that these neuropreserved patients will be considered to be alive. Therefore, someone needs to decide whether to subject these patients to a state of paralysis prior to awakening them or if the plug should be pulled. Utilitarian ethics may suggest the later; however, one plausible alternative is to include such a premise in neuro preservation contracts for future neuro preserved patients such that an 'alive' individual can determine what they would want done if such a circumstance arises.

Although there are many ethical objections to neuropreservation, most can be rationally overcome with the first demonstration of a successful patient reanimation. However, the technology for the first awakening may require decades or even centuries to develop such that an argument in favor of neuropreservation is currently necessary. The strongest argument in favor of full body and neuropreservation may actually be quite simple. If we equate death to eternal extinction, then the slightest possibility of more life via a successful reanimation is practically interminably better than a state of everlasting nothingness. The resurrected patient would experience more life and perhaps even achieve immortality with tomorrow's scientific innovations and advancements. Indeed, the potential of neuropreservation to provide more life is infinitely greater than today's common practice of burying or cremating an individual when they pass away.

Many of the ethical concerns regarding neuropreservation, such as redefining death or encouraging euthanasia, may resolve on their own with the first successful patient reanimation; however, the argument of possibly granting more life versus eternal extinction triumphs many of the ethical concerns stated in prior. Certainly, the ethicality of this procedure is difficult to ponder; yet, engaging in active discussion amongst the medical community may increase awareness as well as provoke further ethical and moral implications of neuropreservation. Our understanding of death and humanity may very well be subject to change in the near future. Although he has spent nearly 50 years in cryopreservation, Dr. James H. Bedford may just be currently 'resting in peace' for the time being. Perhaps, one day he will resume his position at the University of California and begin to teach a common subject of the future-ethics of cryopreservation.

References

1. http://www.alcor.org/cases.html
2. Mental Floss: The Quick 8 (2009) Eight People Who Have Been Cryonically Preserved.
3. http://www.alcor.org/AboutAlcor/membershipstats.html
4. Moen OM (2015) The case for cryonics. J Med Ethics 41: 677-681.
5. http://www.alcor.org/procedures.html
6. The National Conference of Commissioners on Uniform State Laws Website (1980) Determination of Death Act Summary.
7. http://www.alcor.org/Library/html/neuropreservationfaq.html