A

Seminar report

On

Cryogenics

Submitted in partial fulfillment of the requirement for the award of degree
Of ECE

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Preface

I have made this report file on the topic **Cryogenics;** I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to …………..who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

Introduction

Life can be stopped and restarted if its basic structure is preserved. There are many diseases which are dangerous enough to kill a person, some of them may not have a ready cure, and future medical science may repair and revive the person. If we could carry the person forward through time, for however many decades or centuries might be necessary, until the preservation process could be reversed and the person restored to full health. The emerging science of nanotechnology will eventually lead to the devices capable of preserving the bodies at temperature that could stop heart, brain and other organs from functioning and recovering any preserved person in which the basic brain structures encoding memory and personality remain intact.

Cryonics, a derivative of nanotechnology is the speculative practice of using cold to preserve the life of person who can no longer be supported by ordinary medicine. Using cryonics seriously ill patients are frozen until they could be treated. For preservation freezing and reanimating of tissues or entire organisms is done. The increasing number of cryonic patients i.e. the patients who are frozen to death with a hope of life extension itself shows the importance of cryonics.

WHY CRYONICS?

There are various modern preservative procedures available which are collectively called Cryonics. People die of diseases and other conditions that sometime in the future might be easily curable. Cryonics allows carrying out a suspension before a declaration of death, preserving the maximum amount of neural information. The future with cryonics is hoped to be an amazing utopian futuristic existence where the sorts of things people died of these days (2004) can easily be cured.

WHAT IS CRYONICS?

Cryonics is the process of using ultra cold temperature (using liquid Nitrogen; -196° C) to preserve a person who has been declared legally dead, in the hope that future medical technology can repair and revive the person. CRYO means ‘cold’. Cryonics is often considered as a subject of science fiction. Cryonics is assumed to be good enough to bring back to life people who have been frozen solid in liquid nitrogen for centuries!

HOW IS CRYONICS PERFORMED?

If a person has to be preserved using cryonics the heart of the person should stop beating and the person should be pronounced "legally dead". The team of cryonicists stabilizes the body, supplying the brain with enough oxygen and blood to preserve minimal function until it can be transported to the suspension facility. Then body is packed in ice and injected with heparin (an anticoagulant) to prevent blood from clotting.

After this the actual freezing begins. The patients can't be simply put into a vat of liquid nitrogen, because the water inside their cells would freeze. When water freezes, it expands, this would cause the cells to simply shatter. So we have to remove water from the cells and replace it with a glycerol based chemical mixture called a Cryoprotectant – a sort of human antifreeze.

Parts of body protected with Cryoprotectant and frozen

The goal is to protect the organs and tissues from forming ice crystals at extremely low temperatures. This process is called Vitrification (deep cooling without freezing) puts the cells into a state of suspended animation.

Once the water in the body is replaced with the Cryoprotectant, the body is cooled on a bed of dry ice until it reaches -130 C (-202 F), completing the vitrification process. The next step is to insert body into an individual container that is then placed into a large metal tank filled with liquid nitrogen at a temperature of around -196 degrees Celsius (-320 degrees Fahrenheit). The body is stored head down, so if there were ever a leak in the tank; brain would stay immersed in the freezing liquid.

Following vitrification, patients are placed in individual aluminum containers**.**

Each aluminum container is placed in a "neuropod" or "wholebody pod" that is then immersed in liquid nitrogen. This neuropod is being lowered into position among four wholebody pods in a storage tank.

This container is designed to hold four wholebody patients and six neuropatients immersed in liquid nitrogen at -196 degrees Celsius. Liquid nitrogen is added periodically to replace the small amount that evaporates.

THE HISTORY OF CRYONICS

The first person to be cryogenically frozen was a 73-year-old psychologist, Dr. James Bedford, who was suspended in **1967**. His body is reportedly still in good condition at Alcor Life Extension Foundation. The idea that a person could be frozen and then brought back to life when the technology had evolved far enough originated with the book "The Prospect of Immortality," written by physics teacher. Robert Ettinger in 1964. The word "cryonics" is derived from the Greek term for "cold."

By the late 1970s, there were about six cryonics companies in the United States. But to preserve and then maintain each body indefinitely was so expensive, many of these companies wound up closing shop by the following decade. Today, only a handful of companies offer full cryosuspension services, including Alcor Life Extension Foundation in Arizona and the Cryonics Institute in Michigan. In early 2004, Alcor had more than 650 members and 59 patients in cryopreservation.

CASE STUDY – TED WILLIAMS:

Dozens of people are being stored in cryonic facilities. Probably the most famous of them is baseball legend Ted Williams. But no one has actually been revived, because the technology to do so still does not exist.

Since his death in 2002, baseball legend Ted Williams has been stored in a 10-foot-tall, stainless steel container at Alcor Life Extension Foundation in Arizona, the world's largest cryonics facility. His head is reportedly being stored in a separate container. After his death, the famous slugger became embroiled in a rather bizarre custody battle. His daughter, Bobby-Jo Williams Ferrell, fought in court to get her father's body back so that she could have him cremated and his ashes sprinkled over the Florida Keys, which she claims was his wish.

THINGS THAT MAY GO WRONG:

Critics say companies that perform cryonics are simply bilking people out of their money with the promise of an immortality they cannot deliver. Even scientists who perform cryonics say they haven't successfully revived anyone – and don't expect to be able to do so in the near future. One of the problems is that, if the warming process isn't done at exactly the right speed, the cells could turn to ice and shatter. Even if information theoretic has not occurred, a frozen brain is not a healthy structure.

The main issue is cell death and tissue damage. The Cryoprotectant decreases it, but cannot remove all. A badly performed suspension or reanimation can kill so many cells that the patient thaws in a critical condition or cannot be reanimated at all. Cracking is a big worry especially in spaceflight, and one reason for the Cryoprotectant gel (which becomes a tough padding). This mishap can be detected before reanimation, and treatment pre-planned.

People are also worried about the effects on the brain. Short term memories from the period just prior to suspension are always lost (cryo-amnesia), but damage to synapses and dendrites can also affect memory and personality. The effects are usually too small to be noticed, but there have been cases where memory loss or dementia has resulted from suspensions.

ADVANTAGES

- Cryogenics can produce large quantities of high purity (parts per billion contaminations) nitrogen. Some processes like the humid-air expansion process have a yield of about 40%-60% per pass, which allows you produce large quantities of nitrogen efficiently.
- Other processes, like the waste expansion, have a yield of about 25-40% per pass.
- Cryogenic processes do not have economics of scale, i.e., expansion or reduction of product quantity requirements generally does not necessitate new equipment.

DISADVANTAGES

- Cryogenic processes in general have very large capital cost, due mostly to the cost of compressors and turbines.
- The high pressure requirements and the recovery of refrigeration energy explain the need for this equipment. Cryogenic separation requires the use of not only the compressors and turbines, but also numerous heat exchangers, insulators, and a distillation column; all of which add to the high costs of the process.

CONCLUSION

Cryonics can transport a terminally ill patient to future medical technology. The damage done by current freezing methods is likely to be reversible at some point in the future. In general, for cryonics to fail, one of the following "failure criteria" must be met:

- Pre-suspension and suspension injury would have to be sufficient to cause information theoretic death. In the case of the human brain, the damage would have to obliterate the structures encoding human memory and personality beyond recognition.
- Repair technologies that are clearly feasible in principle based on our current understanding of physics and chemistry would have to remain undeveloped in practice, even after several centuries.

An examination of potential future technologies supports the argument that unprecedented capabilities are likely to be developed. Restoration of the brain down to the molecular level should eventually prove technically feasible. Off- board repair utilizing divide-and-conquer is a particularly simple and powerful method which illustrates some of the principles that can be used by future technologies to restore tissue. Calculations support the idea that this method, if implemented, would be able to repair the human brain within about three years. For several reasons, better methods are likely to be developed and used in practice.

REFERENCE

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