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RESEARCH ARTICLE

THE JOURNEY FROM HYPOTHERMIA TO CRYONICS: LATEST BODY PRESERVATION TECHNIQUE

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ABSTRACT

The art of preservation of bodies is very old dating back to centuries. But in recent times the motive for Preserving the human bodies has Changed. Advancements in Science and Technology combined with advancements in Biotechnology and Nanotachnology have been combined in the Latest Techniques of Cryopreservation of human bodies referred to as Cryonics The art of Preservation of Dead Bodies has progressed to preservation of bodies by freezing or cryopreserving. The Purpose is basically to preserve life. It can be used to freeze bodies for times until the time the cure for their cause of death is available. Advanced nanorobots will keep all human body cells in perfect repair, preventing disease Lately the Cryopreservation techniques are being adapted with the purpose of preserving people’s bodies after death in hope that in the future, medicine will be able to revive them.

INTRODUCTION

The Advent of Cryonic Preservation has found many Resraerch options and functional utilities. The Routine use of hypothermia as has been advocated for use in traumatic brain injury, stroke, cardiac arrest–induced encephalopathy, neonatal hypoxic-ischemic encephalopathy, hepatic encephalopathy, and spinal cord injury and seeing the beneficial effects have been extended to preservation of Bodies with a complex array of Procedural Technique in Cryonics which can serve as a storage pool for future use. The article describes the various perspectives of Cryonic Preservation.

DISCUSSION

Hypothermia is defined as a core body temperature <35°C. Sustained Hypothermia was seen to have disastrous effects on body .Hypothermia affects almost every organ and every body system due to generalized effects on the body. Patients suffering from hypothermia were found to have slowing of enzymatic activity, peripheral vasoconstriction, and uncoupling of oxygen-dependent metabolism. Later, negative inotropic and chronotropic effects of hypothermia and decreased effective blood volume cause diminished cardiac output and tissue perfusion. Alterations in cardiovascular physiology include an early catecholamine-mediated increase in heart rate, cardiac output, and mean arterial pressure. Due to enzyme damage, renal concentrating ability is lost, resulting in very dilute (cold diuresis) urine and systemic hyperosmolarity. Later, with decreased perfusion, acute tubular necrosis may develop. Laboratory abnormalities include metabolic acidosis, hyperkalemia, hyponatremia, hyperglycemia, and hyperphosphatemia. Complications of hypothermia also include rhabdomyolysis, gastric dilatation, ileus, upper gastrointestinal bleeding, acute pancreatitis, and severe hepatic dysfunction. Hematologic alterations include hemoconcentration, increased blood viscosity, thrombocytopenia, granulocytopenia, and consumptive coagulopathy. Infection is a frequent sequela of hypothermia. But the beneficial effects of mild Hypothermia were evaluated and The beneficial effects of mild hypothermia include amelioration of apoptosis, decreased loss of high-energy phosphates, reduced oxygen consumption, reduced release of nitric oxide, glutamate, free radicals and excitatory amino acid neurotransmitters, and the induction of genes that reduce neuronal death (Ferriero 2004; Jacobs *et al.*, 2007; Wilkinson *et al.*, 2007). Additional effects seen are maintaining integrity of membranes, preserve ion homeostasis, decreased oxygen consumption, suppression of free radicals. These effects were taken a good advantage of in Neurosurgery as well as Cardiac surgery especially post cardiac arrest patients (Dina Seif and Sean O. Henderson 2011). The technique of inducing Hypothermia is used for cardiac anesthesia as well (Nair and Justin B. Lundbye 2011). Induced hypothermia has been reported to provide neuroprotection against traumatic brain injury as well as for treating intracranial tension in traumatic brain injury. The effects are neuroprotective as far as Cerebral perfusion pressure and ICP are concerned (Guo Wei 2011; Kees H. Polderman 2008). Therapeutic moderate hypothermia has been advocated for use in traumatic brain injury, stroke, cardiac arrest–-induced encephalopathy, neonatal hypoxic-ischemic encephalopathy,

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hepatic encephalopathy, and spinal cord injury, and as an adjunct to aneurysm surgery (Donald Marion and M. Ross Bullock 2009). Even beneficial effects have been extended to treating epilepsies (Alexander B. Kowski *et al.,* 2012). Operations are performed on cardiopulmonary bypass with moderate systemic hypothermia (Ross Bullock *et al.,* 2013). and using cardioplegic solutions administered both in the ascending aorta (antegrade) and in the coronary sinus (retrograde) to render the heart totally flaccid and motionless, markedly reducing myocardial energy requirements while performing these precise anastomoses. Hemodilution and other blood salvage techniques to minimize blood loss and avoid blood transfusions are extensively used. It has been observed beyond any doubt that Very low temperatures tend to create circumstances that can preserve tissues for centuries through a process called vitrification. Vitrification solutions were explored for the cryopreservation of tissue-engineered bone constructs using differential scanning calorimetry, visual inspection, toxicity and viability assays (Liu and J. McGrath 2004). Brain tissue can be cooled to cryogenic temperatures without ice formation (Benjamin 2012). Scientists have gone a step further and found that specialization and imporvization in hypothermia induction can be used to freeze bodies for times until the time the cure for their cause of death is available. Advanced techniques in nanorobots will be targeted and aimed at to keep all human body cells in perfect repair, preventing disease Lately the Cryopreservation techniques are being adapted with the purpose of preserving people’s bodies after death in hope that in the future, medicine will be able to revive them.

Technique of Cryonics

When the heart stops beating or a person is legally dead, an emergency response team from the Cryonic facility from the facility springs into action. The team stabilizes the body, supplying the brain with enough oxygen and blood to preserve minimal function until the person can be transported to the suspension facility. The body is packed in ice and injected with heparin (an anticoagulant) to prevent the blood from clotting during the trip. The cooling process is critical for the cryopreservation of human hematopoietic stem cells, brain cells, cardiac myocytes, hepatic cells (Xiaoming Zhou *et al.,* 2009). After transferring the person to cryonics facility, the actual "freezing" begins. The Expert Cryonics team first removes the water from the cells and replaces it with a special chemical which is a glycerol-based chemical mixture called a cryoprotectant with properties similar to antifreeze. The goal is to protect the organs and tissues from forming ice crystals at extremely low temperatures. This process, 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 the 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. Following vitrification, patients are placed in individual aluminum containers.

Conclusion

The Technique has already been utilized for Preserving bodies throughout the World and Cryonic centres have been established. Prominent persons interested in preservation of their bodies have already applied and the future use can be extended to the rarest of rare possibilities.

REFERENCES

Cryopreservation of Peripheral Blood Stem Cells Xiaoming Zhou, Xianjiang Kang, Zhiquan Shu, Hsiuhung Chen, Weiping Ding, Pingan Du, David Yadock, Carolyn Chi Liu, Jae-Hyn Chung, Shelly Heimfeld, and Dayong Gao. Biopreservation and Biobanking. June 2009, 7(2): 107-114.

Current and Future Role of Therapeutic Hypothermia .Donald Marion and M. Ross Bullock. *Journal of Neurotrauma*. March 2009, 26(3): 455-467.

Deep hypothermia terminates status epilepticus — an experimental study Alexander B. Kowski, Hassan Kanaan, Friedhelm C. Schmitt, Martin Holtkamp. *Brain Research*. Mar 2012, Vol. 1446: 119-126

Ferriero DM. Neonatal brain injury. *N Engl J Med* 2004; 351:1985-95.

Intraoperative Temperature Management.Moderator: M. Ross Bullock, Participants: Arie Blitz, Gary Allen, Ali Malek Therapeutic Hypothermia and Temperature Management. Jun 2013, Vol. 3, No. 2: 46-51

Jacobs S, Hunt R, Tarnow-Mordi W, Inder T, Davis P. Cooling for newborns with hypoxic ischemic encephalopathy. Cochrane Database Syst Rev 2007; (4):CD003311.

Kees H. Polderman, David K. Menon, Armand R. J. Girbes Intensive Care Medicine. Sep 2008, Vol. 34, No. 9: 1738-1739

Neuroprotection of Selective Brain Cooling After Penetrating Ballistic-like Brain Injury in Rats Guo Wei, Xi-Chun M. Lu, Deborah A. Shear, Xiaofang Yang, and Frank C. Tortella. Therapeutic Hypothermia and Temperature Management. 2011, 1(1): 33-42.

The Impact of Brain Temperature and Core Temperature on Intracranial Pressure and Cerebral Perfusion Pressure. *Laura Mcilvoy Journal of Neuroscience Nursing*. Dec 2007, Vol. 39, No. 6: 324-331

Therapeutic Hypothermia and Temperature Management Sanjeev U. Nair and Justin B. Lundbye. Therapeutic Hypothermia and Temperature Management. 2011, 1(1): 9-21. doi:10.1089/ther.2010.0002.

Treating intracranial hypertension in traumatic brain injury: keep it cool!

Use of Therapeutic Hypothermia in Postcardiac Arrest Patients by Emergency Departments.Dina Seif, Sean O. Henderson. Therapeutic Hypothermia and Temperature Management. 2011: 23-27.

Vascular and Neuronal Ischemic Damage in Cryonics Patients. Benjamin P. Best.Rejuvenation Research. Apr 2012, Vol. 15, No. 2: 165-169

Vitrification Solutions for the Cryopreservation of Tissue-Engineered Bone .B.L. Liu and J. McGrath. Cell Preservation Technology. June 2004, 2(2): 133-143.

Wilkinson DJ, Casalaz D, Watkins A, Andersen CC, Duke T. Hypothermia: A neuroprotective therapy for neonatal hypoxicischemic encephalopathy. Pediatrics 2007; 119:422-3.

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