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The Alliance
LEADERSHIP IN ORGAN DONATION AND TRANSPLANTATION

EDUCATION CORNER

Developing Advances in Organ Transplantation: Organ Banking – What is it?

A New World?

Imagine a world where no one who needs an organ transplant has to wait for an organ to become available. A transplant in this new world would be a scheduled surgery. Families who want the donation process to occur quickly could easily be accommodated, as the organs can be recovered and banked until the right recipient has been matched. Patients needing transplants wouldn't need to wait for their second chance at life and live in fear that an organ might not become available in time. Surgeons and healthcare teams could schedule and perform transplants at their peak performance time. These are some examples of the benefits this new world of organ banking could bring.

The Time Factor

As the heart stops beating and the blood stops flowing, the clock is ticking. As time passes, the tissues of an organ begin to deteriorate. Despite current cooling methods, the organs have a limited life-span outside of the human body devoid of blood flow, carrying oxygen and nutrients to the tissue cells. Some organs have to be transplanted within four to six hours from time of recovery and others, such as the kidneys, could potentially be viable up to 36-72 hours. Each organ is unique and time is never guaranteed.

The lack of time causes multiple hurdles that limit organ donation and transplantation. Examples are, it limits the time to repair less-than-optimal organs for transplant through the use of bioengineering techniques, and it does not allow for the optimization of the recipient's immune system, which could increase the success of transplant and reduce the chances of rejection.

How does Organ Banking Work?

The concept of organ banking utilizes preservation techniques to "house" organs until they are needed. Research has proven that biological systems can be stored at low temperatures with minimal to no tissue deterioration over months and years. Biological time can be controlled through cryopreservation of the tissues.

However, cryopreservation brings its own challenges. Specifically, how to prevent injury to the tissues as temperatures are migrated from body temperature to storage temperature, and back again. The six major challenges to overcome with cryopreservation at this time are:

1) Control of excessive ice formation
2) Above-threshold level of cryoprotectant and/or osmotic toxicity
3) Limiting disproportionate mechanical/thermodynamic stress
4) Control of excessive chilling injury
5) Avoidance of unacceptable levels of ischemic injury
6) Development of methods for revival, repair, and functional assessment

Current Status

At present, the practice of organ banking is limited by shortages of donor organs and tissues, difficulties with intermediate- and long-term storage, exorbitant costs, and complications due to sub-optimal matching and necessary immunosuppression. There are other factors to address as this practice nears reality as well, including organ allocation practices, and ethical considerations. Scientists and researchers are committed to the future of organ bioengineering and banking, knowing that if they can crack the code, many more lives could be saved.

References:

https://www.wired.com/2015/06/organ-banking-impossible-slightly-less-impossible/

Beta Roadmap Report: Solving Organ Shortage Through Organ Banking And Bioengineering. (from the December 2014 – July 2015 Roadmapping Process including the NSF-Funded Washington D.C. Workshop and White House Roundtable)

This inservice is also available on The Alliance blog: http://organdonationalliance.org/education-corner-advances-organ-banking/

Written by Hedi Aguiar RN, MSN, CCRN-K, Senior Director of Programs, The Alliance

Editor: Corey Bryant BA, Communications Manager, The Alliance, cbryant@odt-alliance.org.

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