

# Organ Care System

Presentation by: Whitney Capwell 02-05-06

About 2,200 patients in the United States receive heart transplants each year. This number has remained relatively constant since 1990. However, more than 2,800 people are waiting for heart transplants and 411 patients died while on the waiting list for an organ last year.

TransMedics, Inc. of Andover has developed a method to keep the donor heart warm, beating, and viable for much longer than traditional methods. The heart is placed in a chamber that is capable of mimicking the physiological conditions of the human chest cavity. Being able to drastically increase the amount of available time for the organ and the condition in which it is presented to the recipient would do wonder for the organ transplant community.

Ordinarily, after the heart has been removed from the donor, the blood is replaced with a salt-water solution and placed on ice. The ice slows the activity of heart cells, preserving the organ for about four hours. However, the cells still consume energy. This weakens the heart and without new blood, some of the cells die, leaving behind damaged tissue. This makes a successful transplant more difficult. TransMedics, Inc. has developed a device that connects the transplantable heart with plastic tubes at its aorta, pulmonary artery, and left atrium. The device continually delivers nutrient-rich blood to the organ. As soon as the heart receives the flow of fresh warm blood, the muscle resumes its normal cycle of contraction and relaxation. A computerized control system monitors the heart's metabolism, blood pressure, and electrical state while connected to the machine.

The whole apparatus can fit on a cart able to be wheeled into the operating room or stowed on an airplane.

The goal would be to keep the heart viable for as long as 18 hours. This would give doctors the time needed to match the donor's

tissue to that of an intended recipient and would allow more time for transport, therefore expanding the search area for a possible recipient.

Besides keeping hearts undamaged for a longer amount of time, the device could potentially revive organs that were otherwise too damaged for transplant. The TransMedics instrument has had no technical problems in trials so far, which gives the surgical community great hope for the future.

This preservation technique has been clinically shown to improve the length of time that a heart can be preserved ex-vivo. A computer simulation using Finite-Element analysis was performed in order to show how well the TransMedics device oxygenates the organ compared to traditional ice immersion method. It was shown that the TransMedics machine could keep the concentration of oxygen at optimum levels indefinitely while the immersion technique could only keep the concentrations at about healthy levels for 5.5 hours. Also, the TransMedics device is ideal at normal body temperature (37 degrees Celsius) while the ice method is effective at 4 degrees Celsius.

TransMedics, Inc. is hoping to get approval from the U.S. FDA in order to begin clinical trials in the states. The organ care system is now undergoing clinical trials in England and Germany and has been successful in seven transplants so far.

## Works Cited

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