allied academies

International Conference on

Toxicology and Pharmacology

November 01-02, 2017 | Toronto, Canada

Comparative performance of Sprague-Dawley rat hearts using DMSO and DMF as cryoprotectants

Jones Ozokwere, Lynton Hazelhurst, Eugene Olivier and **Maupi Letsoalo**
Tshwane University of Technology, South Africa

Purpose: Heart transplantation is one of the most effective treatment options for congestive heart failure. Current organ storage methods can preserve the human heart for only about four to six hours. The organ donor pool could be dramatically increased if the preservation time could be lengthened and hearts stored for weeks or even months prior to transplantation. This study describes the performance characteristics of explanted Sprague-Dawley rat hearts before and after cryopreservation using 10% dimethylsulphoxide (DMSO) and 30% dimethylformamide (DMF) in Tyrode solution.

Methods: A modified Morgan perfusion model was used for this study. Male Sprague- Dawley (ethical approval AREC/2009/09/002) hearts were harvested and arrested in a cold (<10°C) Tyrode solution (pH 7.4) for 5 minutes. The hearts were mounted on the aorta and vena cava to allow reperfusion in a doubled walled water jacket at 37 °C for baseline performance studies. The hearts (n=3) were cooled to 4, -20, -80 and -196°C (liquid nitrogen), and stored for 6 hours. This study was extended to 48 hours and 7 days at -196 °C (n=6). Cardiac output (aortic and coronary) and an electrocardiogram were obtained during baseline studies, followed by cryopreservation and after thawing at times T0, 10, 20, 40, 60, 120 min, 6, 8, 12 and 24 hours. Reperfused hearts were monitored for as long as possible. Ethical approval (AREC/2009/09/002) for the use of laboratory animals was obtained from the Tshwane University of Technology, Ethics Committee and the Animal Ethics committee before experimental work commenced.

Discussion: The average heart rate of the Sprague-Dawley rats reduced from 396 beats/minutes to 184 beats/minutes after anaesthesia. The average survival time of the hearts under the experimental conditions were seven hours 32 minutes with an average aortic output at 8 hours of 0.62 ml and 0.52 ml at 12 hours for DMF and 0.61 ml for 8 hours and 0.35 ml for DMSO at average survival time of 9 hours 44 minutes. A 100 % recovery after cryopreservation with DMSO and DMF was achieved after storage for 6 hours, 48 hours and 7 days in liquid nitrogen. DMSO and DMF were equally effective cryoprotectants in this study.

Conclusion: It was possible to preserve the hearts outside the body longer than eight hours as previously studied to 168 hour (7days) at –196°C with 100% recovery using both DMSO and DMF as cryoprotectant.

e: jocs_scoj@yahoo.com