Abstract: External Volume Expansion (EVE) Increases Vascularization of Subcutaneous Scaffolds

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University of Wisconsin (UW) solution for 3 hours prior to transplant. Experimental group (n=24) flaps were perfused with MP/HBOC for 17 hours at a subnormothermic temperature of 21°C. Flaps were monitored daily for clinical evidence of viability and biopsied per protocol with an end point of 17 hours for ex vivo only, 14 days for autotransplants and 60 days for allotransplants. The allotransplanted animals were placed on systemic triple immune suppression and maintained at therapeutic levels for the duration of the study. Histologic analysis was blinded and reviewed by an expert veterinarian pathologist at conclusion of the study.

RESULTS: Twenty-four porcine myocutaneous flaps are designated to experimental groups and 24 to the control group. We anticipate results will be similar to previous porcine myocutaneous flaps exposed to 14 hours of CSP (n=4) or MP/HBOC (n=4). Results indicated significantly attenuated markers of IRI, significant apoptosis on TUNEL staining, and endothelial damage in the CSP group when compared to subnormothermic MP/HBOC.

CONCLUSION: If VCA can be preserved for up to 17 hours or more and be protected from ischemic damage following allotransplantation, the achievement will have a profound clinical application in VCA as well as solid organ transplantation. Based on promising preliminary data, we believe efficient tissue oxygenation promoted by subnormothermic (21°C) MP/HBOC in VCA will (1) extend graft preservation times and improve donor access across geographic spans, (2) enable increased efficacy of ex-vivo targeted graft manipulation and (3) ensure graft quality and viability prior to transplantation.

INTRODUCTION: External Volume Expansion (EVE) has been shown to promote angiogenesis, adipogenesis and expansion of subcutaneous tissue in skin. In this study we evaluate the effects of EVE on an acellular scaffold implanted subcutaneously to investigate whether EVE promotes revascularization and recellularization of the scaffold.

METHODS: 36 wild-type mice (n = 18 per group) underwent either EVE through a previously optimized protocol or no EVE (control) for five days before receiving a subcutaneous graft of an acellular matrix (0.5cc). Grafts were collected at 6 weeks (n = 8 per group), and 12 weeks (n = 10 per group) after surgery and analyzed through histology (H&E and CD 31 staining).

RESULTS: At macroscopic observation grafts placed in an site previously stimulated with EVE showed a better preserved morphology. Recipient site preparation with EVE significantly improved vascularization of the acellular grafts compared to controls (+60%, p<0.05) and significantly enhanced proliferation/migration of adipocytes inside the graft.

CONCLUSION: EVE can be effectively used to improve vascularization and recellularization of subcutaneous acellular grafts. Further research in this field might lead to innovative reconstructive therapies that do not rely on autologous tissue (fat).

Directional Freezing and Vitrification of Whole Limbs for Future Transplantation and Organ Banking

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INTRODUCTION: According to the World Health Organisation, less than 10% of humanities needs for transplantable organs are being met. No data is available for vascularized composite tissue allotransplantations (VCA), yet these cases are further complicated by the need for an instantly available and compatible recipient. VCA containing skin, fat, blood vessels, bone, bone marrow and nerve are the ultimate tool available to date in reconstructive surgery. Widespread use of this tool