Evaluation of Ventilation at 10°C as the Optimal Storage Condition for Donor Lungs in a Murine Transplant Model

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INTRODUCTION: Cold static preservation at 4°C remains the clinical standard of donor organ preservation for lung transplantation. However, preservation time with this method is limited to a maximum of 6 to 8 hours. Previous studies have suggested static 10°C storage can extend ischemia times and improve recovered lung health. We believe the addition of ventilation to stored lungs will further extend ischemia times by allowing for cellular aerobic metabolism. We therefore established an experimental model for ventilating murine lungs and conducted studies investigating cellular viability and inflammatory markers in lungs exposed to different temperatures during mechanical ventilation to test the hypothesis that ventilation at 10°C will result in healthier and more functional lungs.
METHODS: Lungs were procured from C57Bl/6 mice in standard fashion. The lungs were then stored for 24h with ventilation at 10°C(n=3) or stored statically at 4°C(n=3) or 10°C(n=3). Lung mechanics were evaluated using a FlexiVent system. Cellular viability was assessed via flow cytometry. Complement shedding was assessed by enzyme-linked immunosorbent assay.
RESULTS: Lungs ventilated at 10°C demonstrated less hysteresis, suggesting improved respiratory mechanics(Fig. 1A). A trend towards increased cellular viability was observed in lungs ventilated at 10°C versus lungs stored statically at 4°C or 10°C(Fig. 1B). There was a significant decrease in complement shedding in lungs ventilated at 10°C suggesting decreased inflammation in ventilated lungs(Fig. 1B).
CONCLUSIONS: Ventilating lungs at 10°C rather than 4°C static storage appears to result in healthier and more functional lung tissue and may extend preservation times of donor organs for lung transplantation.

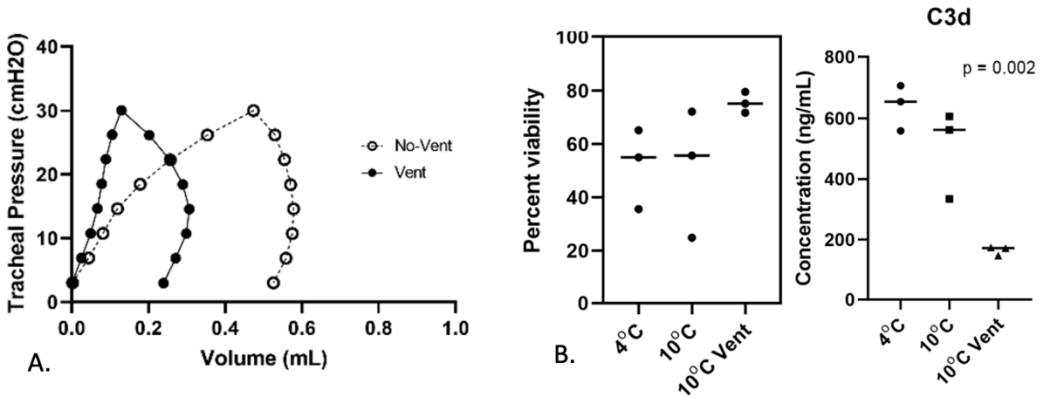

Figure 1. A. Ventilated lungs (black line) demonstrate smaller area P-V loops compared to unventilated lungs (dashed line) **B.** Cell viability is increased and complement shedding decreased at 10C with ventilation.