

# ELSA Publication Brief: (ELS10230ASaid)

## Precision and Accuracy of the New Transonic ELSA Monitor to Quantify Oxygenator Blood Volume (*in-vivo* and *in-vitro* studies)

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### BACKGROUND

Major complications of ECMO are bleeding and clotting in the circuit. The challenge of heparin therapy during ECMO is to keep the ECMO circuits (mostly the oxygenator) from clotting while preventing patient bleeding. Recently, the ELSA monitor (Transonic Systems Inc. Ithaca NY) was introduced that measures clot formation in the oxygenator by recording oxygenator blood volume (OXBV) using a dilution method.

### OBJECTIVE

The purpose of the study was to evaluate the reproducibility (*in-vivo*) and absolute accuracy (*in-vitro*) of ELSA Monitor OXBV measurements.

### METHOD

- During VV ECMO, OXBV was measured in seven newborn lambs (1- 5 days old, wghts. 4.2+0.5 kg).
- The ECMO circuit included a Jostra Rotoflow centrifugal pump and Quadrox-iD pediatric oxygenator with the circuits primed with heparinized ovine blood.
- ELSA flow-dilution sensors were attached to the blood lines.
- Isotonic saline was injected to measure OXBV.
- After completion of the animal experiments of each ECMO run, the lamb was removed from circuit.
- The circuit was transitioned to a recirculating loop and fixed volumes of Vaseline were injected into the oxygenators to mimic clot formation of varying size.

### RESULTS

- A total of 88 OXBV measurements were taken.
- The coefficient of variation( $1.49\pm 1.12\%$ ) demonstrated high precision.
- OXBV measured at different pump flows (200-600 mL/min) showed a variation of  $0.11\pm 2.86\%$  from the mean flow of 400mL/min.
- The *in vitro* arm of the study showed a strong inverse relationship ( $R^2= 0.85$ ) between the volume of Vaseline injected into the oxygenators, and the percent decrease in oxygenator blood volume (Figure 1).

### CONCLUSION

- The ELSA Monitor demonstrated high precision in measuring decrease in oxygenator volume in the ECMO circuit using the injection of a small volume of saline.
- The ELSA monitor would be a valuable tool to identify early clot formation in ECMO circuits and allow device change outs before they become a clinically emergent.

### REFERENCE

Said MM, Mikesell GT, Rivera O, Khodayar Rais-Bahrami K, "Precision and Accuracy of the New Transonic ELSA Monitor to Quantify Oxygenator Blood Volume (*in-vivo* and *in-vitro* studies)." 2015 PAS Annual Meeting and Eastern SPR Annual Meeting (Transonic Reference: ELS10230V)

