DIALYSIS FLUID FOR ADDITIONAL GAS EXCHANGE IN A DEVICE FOR SIMULTANOEUS RESPIRATORY AND RENAL SUPPORT: AN EXPERIMENTAL STUDY

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1. Introduction

Acute kidney injury (AKI) commonly occurs in individuals relying on membrane oxygenators for lung support. Consequently, a membrane-based lung and kidney assist device (i.e. the RenOx) is in its development stage. This system would allow dialysis fibers to be utilized for supplementary gas exchange in subjects provisionally not necessitating renal therapy.

2. Objectives

This research aims to evaluate the possibility of obtaining gas exchange as a result of the recirculation of oxygenated and decarboxylated dialysate in the dialysis fibers of the RenOx device over the course of ex-vivo blood experiments.

3. Methods

Standardized venous blood and oxygenated (and decarboxylated) dialysis fluid were supplied in counter-current to a dialyzer with an area of 0.6 m², reproducing the extension of dialysis mats in the RenOx. CO_2 and O_2 exchanges were assessed using blood flows of 200 and 300 mL/min and blood/dialysate flow rate fractions of 1, 3, 6.

4. Results

On average, CO_2 clearance between 10 and 37 mL/L_{blood flow} was measured, varying with the blood/dialysate flow rate fraction tested. The results also indicated an oxygen transfer of at most 15 mL/L_{blood flow}.

5. Conclusion

This methodology could be relevant for compensating for reductions in CO_2 clearance in the RenOx, occurring when substituting 25% of gas exchange fiber layers with dialysis fiber mats [1]. In addition, the tested configuration could find clinical applications for treatments requiring supplemental CO_2 removal and/or O_2 supply.

6. References

[1] A. Martins Costa et al, J. Membr. Sci, 680, 2023.