# RENOX: COMBINED RESPIRATORY AND RENAL SUPPORT IN A SINGLE EXTRACORPOREAL DEVICE

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## 1. Introduction

Combined lung and kidney diseases are frequent in patients with severe respiratory failure including those who need an artificial lung. Their majority requires treatment with an extracorporeal membrane oxygenator (ECMO) and a dialysis machine for continuous renal replacement therapy. This exposes patients to higher risks such as infection, blood coagulation, and bleeding.

## 2. Objectives

A novel artificial lung with integrated kidney support (RenOx) is developed to reduce current risks. This work describes the RenOx development process and initial validation.

## 3. Methods

Clinical requirements for RenOx were gathered such as target's patient size, and level of support. These needs and previous research on the combination of gas exchange fibers and dialysis fibers in a combined membrane bundle guided device designed. RenOx' blood flow path was optimized by numerical simulation. Third, first prototypes were manufactured and functionally was tested in-vitro.

## 4. Results

RenOx was manufactured for the treatment of small adult patients (30 - 40 kg). Combined respiratory and renal support is provided by an integrated membrane bundle comprising 0.9 m<sup>2</sup> of gas exchange fibers and 0.3 m<sup>2</sup> of dialysis fibers. Numerical simulation shows our device's blood flow path minimized blood stagnation areas (relative volume < 0.0004%). RenOx housing consisting of six symmetric parts reduced manufacturing costs and allowed easy device disassemble.

# 5. Conclusion

The design, production, and initial validation of a novel device combining lung and kidney support contributes to safer treatment for ECMO patients with underlying acute kidney injury (AKI).