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Tuesday, October 28, 2008

10:30 AM - 12:00 PM

RESPIRATORY DIALYSIS: A NEW THERAPY FOR CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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PURPOSE:Chronic Obstructive Pulmonary Disease (COPD) is predicted to be the third leading cause of death in the United States by 2020. Approximately 125,000 people die yearly from acute exacerbations of the disease. Once intubation and mechanical ventilation become necessary the death rate increases. To avoid the need for ventilator use we have developed a new device (the Hemolung), which is an integrated pump/oxygenator that functions at low blood flow rates (300–500 mL/min) equivalent to those used in hemodialysis. The small priming volume (190 ml), reduced membrane surface area (0.5 m²), and use of a percutaneously inserted dual lumen venous catheter (15 Fr) to provide blood inflow and outflow make the system suitable for repetitive use in patients with hypercapnic acute respiratory failure. We report here 7-day animal data stressing the hemocompatibility and gas exchange capabilities of the device.

METHODS:The venous catheter was inserted into the jugular vein of 7 adult sheep and connected to the Hemolung circuit. Animals were minimally anticoagulated with heparin (ACT 150). Blood flow, CO₂ exchange, blood gases and key hematological parameters were measured over 7 days. Necropsy was performed on termination.

RESULTS:Removal of CO₂ remained steady over 7 days averaging 66 ± 13 mL/min at blood flows of 350 - 450 ml/min. One animal was terminated after 3 days due to accidental disconnection of a blood tube. No plasma wetting was noted over the 7 days. Two devices were replaced after 4 days due to bearing malfunction, however, the animals suffered no permanent effects from this intervention. No blood products

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were required. Initial platelet counts dropped to 241,000/uL \pm 84,000 by the second day, but recovered to baseline on day 4 and remained stable. Necropsy showed no signs of thromboembolism or organ damage.

CONCLUSION:A simple alternative to mechanical ventilation for patients with COPD and hypercapnic respiratory failure has been successfully tested in animals.

CLINICAL IMPLICATIONS:Human trials are planned for 2008 to determine what role "respiratory dialysis" will have in this patient population.

DISCLOSURE:Andriy Batchinsky, Employee Scott Morley is an employee of ALung Technologies, Inc.; Product/procedure/technique that is considered research and is NOT yet approved for any purpose. The Hemolung Respiratory Assist system has NOT been approved by any regulatory body (including the FDA) for human use. Thus, the abstract presents the results of animal studies conducted to support the use of the system in a human clinical trial.