

**Surfactant Foam Therapy For Severe Covid-19 Patients With Acute Respiratory Distress Syndrome (ARDS)**

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The SARS-CoV-2 virus enters primarily through the respiratory tract and penetrates epithelial cells. In severe cases, the disease deteriorates to a form of acute respiratory distress syndrome (ARDS) and is accountable for most deaths. To date, there is no effective pharmacological treatment in ARDS in adults with mortality rates around 40%. One of the hallmarks of ARDS is damage to pulmonary surfactant. Although COVID-19 pathophysiology is not thoroughly understood, the virus kills surfactant secreting alveolar cells. Surfactant Replacement Therapy (SRT) is a life-saving clinical procedure in treating preterm neonates, whose immature lungs lack pulmonary surfactant. SRT is based on endotracheal administration of liquid surfactant instillations. Due to differences in lung size, this strategy is ineffective in adults. Instillations are strongly affected by gravity drowning some lung regions while leaving others untreated. We present a novel method to improve alveolar availability by foaming surfactant prior to intratracheal administration. Unlike liquid, foam “defies gravity” and distributes homogeneously with doses >100 ml to each lung. Homogenous distribution of LIFT was demonstrated *ex vivo* in porcine lungs with striking quantitative differences between liquid instillations and LIFT. Next, we tested the safety and efficacy of foamed calf lung extracted surfactant (Infasurf) in an *in vivo* rat model of ARDS induced by repeated whole lung lavage. Following such preclinical experiments, we have developed a functional prototype of the delivery device and are conducting *in vivo* experiments in models of ARDS in adult pigs. Successful results in pigs will fast-track the chances of deploying LIFT towards phase I clinical trials in severe COVID-19 patients.