UC RIVERSIDE UNIVERSITY OF CALIFORNIA | Mechanical Engineering

The Department of Mechanical Engineering Presents

Carrie Perlman, Ph.D.

Associate Professor of Biomedical Engineering
School of Engineering and Science
Stevens Institute of Technology

Title: Surface tension and ventilation induced lung injury

Abstract: Our group is investigating the effect of surface tension on ventilation induced lung injury (VILIL) and a newly identified pharmacologic therapy for lowering surface tension and reducing VILI. In the acute respiratory distress syndrome (ARDS), inflammation increases vascular permeability. Plasma leaks into the alveoli, causing edema and impairing gas exchange. Treatment with mechanical ventilation supports gas exchange but often causes an additional over-distension injury of the lungs – VILI – that can prevent recovery. The mortality rate for ARDS/VILI exceeds 35%. We study the micromechanics of flooded alveoli. We identified anatomical sites of stress concentration that are likely sites of VILI. We showed that the degree of stress concentration is proportional to surface tension at the air-liquid interface. Subsequently, we developed the first means of determining surface tension in flooded alveoli in situ in the lungs. With this new method, we identified a compound that, through a novel mechanism, lowers surface tension in the lungs. We are testing the compound for the ability to reduce VILI and improve survival in ARDS.

About the Speaker: Carrie E. Perlman combines mechanics and physiology to understand and develop treatments for pulmonary edema. Dr. Perlman received her undergraduate degree in mechanical engineering from MIT and her doctorate in biomedical engineering from Northwestern University. As a doctoral student she helped test a pumpless artificial lung. Her role was to study right ventricle mechanics, ensuring that artificial lung use would not cause right heart failure. She completed her training as a postdoctoral fellow in a pulmonary physiology laboratory at Columbia University. Dr. Perlman also worked as a design engineer on development of a needleless injector at Human Factors Industrial Design, Inc. Dr. Perlman is currently an associate professor in Biomedical Engineering, and chair of the BME Ph.D. program, at Stevens Institute of Technology.

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THURSDAY, NOVEMBER, 4, 2021
11:00AM-11:50AM