Objective
Further define the limits of extracorporeal CO₂ removal through hemodynamic augmentation and evaluation peak end expiratory pressure (PEEP).

Study Design
Animal trial.

Study Population
8 adult sheep (Suffolk ewes).

Methods
Evaluate the effects of an alpha agonist (phenylephrine) and a beta agonist (isoproterenol) on shunt blood flow, MAP, HR and cardiac output over 48 hours of arteriovenous pumpless CO₂ removal (n = 5 animals and the effect of PEEP on these variables (n = 3 animals).

Results
Phenylephrine increased MAP from 2.4 % to 94.4 % of baseline without significant compromise in cardiac output (9.4 % of baseline at 95 % increase in MAP). Shunt flow through lung assist device increased up to 67 % of baseline.
Isoproterenol infusion increased cardiac output 33–146 % of baseline but decreased MAP 9-54 % and shunt flow through lung assist device (11–42 %).
CO₂ removal remained constant throughout the study.
At PEEP levels of 5, 10, 15, and 20 cm H₂O shunt flow was never decreased more than 2.7 % from baseline at zero PEEP.

Commentary
Extracorporeal CO₂ removal is dependent upon circuit blood flow. Pressure is essential in maintaining the driving force for blood through the gas exchange circuit. The alpha agonist is more efficient in maintaining MAP and augmenting shunt flow.