# PERFORMANCE OF LUNG RECRUITMENT MODEL IN HEALTHY ANESTHETISED PIGS

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Introduction: Patients with acute respiratory failure are given mechanical ventilation (MV) for treatment and breathing support. During MV, positive end-expiratory pressure (PEEP) is applied to recruit collapsed alveoli and maximized oxygenation. However, there are no well-established methods for quantifying alveoli recruitment with PEEP increase.

Materials and methods: 7 anesthetised pigs weighting 22.9±4.1$kg$ underwent a protocolised recruitment manoeuvre with PEEP increase of 5$cmH_2O$ until 20$cmH_2O$. The subjects were ventilated under volume control using Engström CareStation (Datex, General Electric, Finland). Pressure, flow profile and functional residual capacity (FRC) were recorded. The data were analysed with a Recruitment Model (Sundaresan et al., 2009), which models the lung as a collection of lung units, that each lung unit, is either open or close. The threshold opening pressure (TOP) and threshold closing pressure (TCP) of the lung units, total lung capacity (TLC) of the subject were estimated. The trial and use of data were approved by the Ethics Committee of the Medical Faculty of the University of Liege, Belgium.

Results and discussion: The model percentage fitting error during inflation is 6.14% [IQR: 4.87-8.40] and deflation is 3.45% [IQR: 3.27-4.52] across all subjects, indicating that the model is capable of capturing the fundamental lung mechanics in different PEEP levels. The estimated TLC is 1477$ml$ [IQR; 1450-1674] with FRC at 824$ml$ [IQR: 800-873]. It is found that TOP is 42.4$cmH_2O$ [IQR: 37.7-43.6] at 5$cmH_2O$ PEEP, and decreased with PEEP increased, 25.0$cmH_2O$ [IQR: 20.3-27.1] at 20$cmH_2O$. On the contrary, TCP sees a reverse trend, increasing from 10.2$cmH_2O$ [IQR: 9.1-10.3] to 19.6cmH2O [IQR: 18.9-19.7]. Both decrease in TOP and increase TCP suggested that PEEP increase, will open more alveoli and prevent them from collapsing.

The recruitment model estimates the TLC, TOP and TCP of the lung, thus provides a unique and physiologically relevant metric to identify subject fundamental lung mechanic without disrupting MV therapy.