Introduction:
The optimal mechanical ventilation in the different phases in the LTX DCD (Lung Transplantation Donation after Cardiac-circulatory Determination of Death) donation (in vivo, post mortem and ex vivo) is on debate. Monitoring airways none invasive online analysing different particle flow from the airways is never done before. In the present study we use a new technology for airway monitoring using mass spectrometric analysis of particle flow and their size distribution (PExA Particles in Expired Air). The exhaled particles are collected onto a substrate and possible for subsequent chemical analysis for biomarkers. Our hypothesis was that by analysing the particle flow online, we could optimise the mechanical ventilation. Our hypothesis was that a small particle flow would probably be more gentle for the lung than a large particle flow when the lung is squeezed out and the majority of all small airways are open.

Methods:
In the present study we analyse the particle flow from the airways in vivo, post mortem and during ex vivo lung perfusion using different ventilation modes; Volume Controlled Ventilation (VCV) and Pressure Controlled Ventilation (PCV) comparing small tidal volumes(1) versus big tidal volumes(2) at different PEEP (Positive End-Expiratory Pressure) and after distribution of different drugs in six domestic pigs.

Results:
We found that VCV resulted in a significant lower particle flow than PCV in vivo but in ex vivo settings the opposite was found. In both in vivo and ex vivo settings we found that big tidal volume resulted in a larger particle flow than small tidal volumes.

Conclusion:
The opening and the closure of the small airways reflect the particle flow from the airways. We found that different ventilation modes resulted in different particle flow from the airways. We believe this technology will be useful for monitoring mechanical ventilated patients to optimise ventilation and preserve the lung quality and has a high potential to detect new biomarkers in exhaled air.
A) In Vivo B) Ex Vivo Lung Perfusion (EVLP) at different pulmonary flow with constant ventilation (VCV1) (EVLP) D) EVLP exposure to different drugs. VCV1 = volume controlled ventilation with small tidal volume and PEEP at 1,
VCV2 = volume controlled ventilation with big tidal volumes and PEEP at 2, PCV1 = pressure controlled ventilation with small tidal volume and PEEP at 2, PCV2 = pressure controlled ventilation with big tidal volume and PEEP at 2.
In Vivo: the accumulated particle mass in VCV1 was significantly lower than VCV2 (p = 0.0186), and the accumulated particle mass in VCV1 was significantly higher than PCV1 (p = 0.0322). Ex Vivo: the accumulated particle mass was significantly higher in PCV2 than in the PCV1 (p = 0.0127).

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