

A quantitative analysis of CO₂ stores in the body

Dott. LORENZO GIOSA (1), Dott. MATTIA BUSANA (1), Dott. MATTEO BONIFAZI (1), Dott. MATTEO MARIA MACRÌ (1), Dott. IACOPO PASTICCI (1), Dott. FRANCESCO VASSALLI (1), Dott. FEDERICA ROMITTI (1), Dott. MICHAEL QUINTEL (1), Dott. LUCIANO GATTINONI (1)

(1) University of Göttingen, Department of Anaesthesiology and Critical Care, Robert-Koch-Straße 40, 37075, Göttingen, Germany.

Argomento: Altro

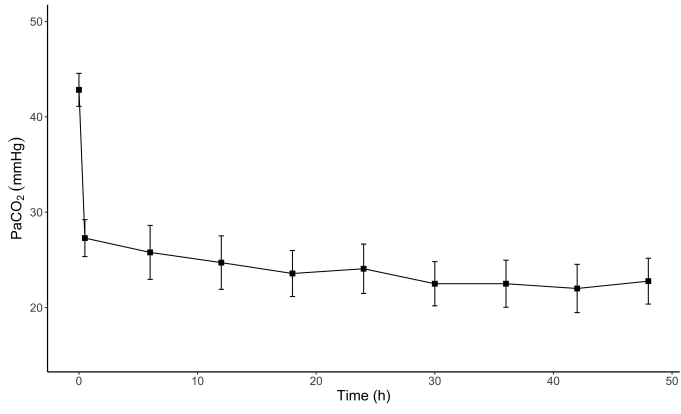
Background: The presence of CO₂ stores in the body has already been discussed in the past, but a quantitative analysis of their amount and of the kinetics of their unloading is lacking in literature. We supposed that lowering PaCO₂ by acutely raising alveolar ventilation would set the equilibrium between the plasma and the CO₂ stores to a new level that would force the stores to unload to an extent which is measurable via the VCO₂.

Methods: 14 healthy piglets (24.1±1.8 Kg) were sedated and mechanically ventilated with the following baseline values: alveolar ventilation 2.08±0.53 L/min, PaCO₂ 44.4±4.65 mmHg and VCO₂ 126±27.9 ml/min. Alveolar ventilation was then acutely raised up to 4.24±0.19 L/min and kept constant for 48 hours. PaCO₂ and VCO₂ were recorded after 30 minutes and then every 6 hours for 48 hours.

Results: PaCO₂ rapidly decreased to 27.3±3.36 mmHg and reached a plateau of 22.5±4.01 mmHg after 30 hours (Figure 1) while VCO₂ rapidly increased to 158±32.4 ml/min and then slowly resettled to the baseline value in 48 hours. Plotting VCO₂ over time and calculating the area under this curve we found that the total amount of CO₂ removed by the ventilation in 48 hours was 18.63 mols. We subtracted to this value the CO₂ produced by the metabolism (which we calculated from the baseline VCO₂ assuming a constant VO₂) and we obtained a difference of 2.48 mols (Figure 2). This non-metabolic VCO₂ can be ascribed to the CO₂ released by the stores during the equilibration with the new PaCO₂.

Conclusions: A large amount of CO₂ is removed from the stores when PaCO₂ is acutely lowered. This method of quantification could be of interest when applied to clinical settings such as the extracorporeal CO₂ removal in COPD patients.

PaCO₂ during hyperventilation



VCO₂ during hyperventilation

