Intensive Care Med (2017) 43:597
DOI 10.1007/s00134-017-4697-0

CORRESPONDENCE

Comments on Teboul and Scheeren: understanding the Haldane effect

Stephan M. Jakob* and Jukka Takala

Dear Editor,

We read with interest the article recently published in *Intensive Care Medicine* by Teboul and Scheeren [1]. In this article, the authors describe the effects of oxygen extraction on the relationship between pCO_2 and CO_2 content as an explanation of altered interrelation between changes in flow and v–a pCO_2 gradients. We and others strove to understand and quantify this effect using data from critically ill patients and animal models many years ago, resulting in several publications not mentioned in the article by Teboul and Scheeren [2–4]. Teboul and Scheeren also failed to address the effect of hemoglobin on the pCO_2/CO_2 content relationship (CO_2 binding capacity decreases in anemia), which is relevant at extreme values not uncommon in the critically ill [2, 4]. Finally, a recent article highlighted the effects of increasing FiO_2 in shock states on venous–arterial pCO_2 gradients and the ratio between pCO_2 gradient and arterial–venous O_2 content difference (both increasing) [5]. We believe that much of the Haldane effect is already understood—but too often overlooked.

Accepted: 25 January 2017
Published online: 16 February 2017

References

1. Teboul JL, Scheeren T (2017) Understanding the Haldane effect. Intensive Care Med 43:91–93. doi:10.1007/s00134-016-4261-3
2. Jakob SM, Kosonen P, Ruokonen E, Parviainen I, Takala J (1999) The Haldane effect—an alternative explanation for increasing gastric mucosal pCO2 gradients? Br J Anaesth 83:740–746
3. Martikainen TJ, Tenhunen JJ, Giovannini I, Uusaro A, Ruokonen E (2005) Epinephrine induces tissue perfusion deficit in porcine endotoxin shock: evaluation by regional CO_2 content gradients and lactate-to-pyruvate ratios. Am J Physiol Gastrointest Liver Physiol 288:G586–G592
4. Chiarla C, Giovannini I, Giuliante F, Vellone M, Ardito F, Tenhunen J, Nuzzo G (2010) Significance of hemoglobin concentration in determining blood CO_2 binding capacity in critical illness. Respir Physiol Neurobiol 172:32–36
5. Saludes P, Proença L, Gruartmoner G, Enseñat L, Pérez-Madrigal A, Espinal C, Mesquida J (2016) Central venous-to-arterial carbon dioxide difference and the effect of venous hyperoxia: a limiting factor, or an additional marker of severity in shock? J Clin Monit Comput. doi:10.1007/s10877-016-9954-1

*Correspondence: Stephan.Jakob@insel.ch
Department of Intensive Care Medicine, University Hospital (Inselspital), University of Bern, 3010 Bern, Switzerland