The $TLNO/TLCO$ ratio in pulmonary function test interpretation

To the Editor:

HUGHES and VAN DER LEE [1] provide an excellent review of transfer factor of the lung for nitric oxide ($TLNO$)/transfer factor of the lung for carbon monoxide ($TLCO$) and highlight this ratio as a new lung function test in its own right. Perhaps we “ $TLNO$ enthusiasts” have overplayed $TLNO$ as a route to DM (membrane diffusing capacity) and to V_c (lung capillary volume) over the past three decades rather than thinking of it as a part of this ratio. HUGHES and VAN DER LEE [1] have rightly argued that $TLNO/TLCO$ reflects DM/V_c and α , the ratio of nitric oxide/carbon monoxide diffusivity.

Because $TLCO$ is oxygen tension (PO_2) dependent and $TLNO$ is not, I would also emphasise the importance of alveolar PO_2 as a potential determinant of $TLNO/TLCO$ in some of the studies they quote.

We found that $TLNO/TLCO$ decreased from 4.5 to 3.8 in 10 healthy volunteers as alveolar oxygen per cent was decreased from 20 to 12% [2]. This is entirely predictable from the review by HUGHES and VAN DER LEE [1] since specific conductance of blood for carbon monoxide (Θ_{blCO}) increases with hypoxia, as they predicted (equation 8).

$$TLNO/TLCO = \alpha(1 + DMCO/\Theta_{blCO} \cdot V_c)$$

Thus, in a healthy individual as breath hold time increases alveolar oxygen tension and, hence, $TLNO/TLCO$ should fall. Again, on exercise, where most participants have used single breath or rebreathing methods, oxygen consumption rises with increasing workload, mean sampled alveolar PO_2 falls steeply and hence $TLNO/TLCO$ should fall. In disease we might expect lung units of high DM/V_c to also have high alveolar ventilation V'_A /perfusion (Q') and, therefore, high PO_2 . $TLNO/TLCO$ will then increase as Θ_{CO} falls. This could contribute, along with increased DM/V_c to increased $TLNO/TLCO$ observed in heavy smokers, certain diffuse pulmonary diseases, pulmonary hypertension and pulmonary artery hypertension. This argument always supposes that it is units of high V'_A/Q' that are being sampled. Conversely reduced lung expansion in restriction or in the obese would give low V'_A/Q' and hence low $TLNO/TLCO$.

One final comment is that they state on a number of occasions that $TLNO$ is independent of haemoglobin. This is correct in the strictest sense: theoretically and in clinical practice lung nitric oxide transfer does not vary with the haematocrits routinely encountered [3, 4]. However, if seriously low haemoglobin concentrations ($<8 \text{ g} \cdot \text{dL}^{-1}$) are generated in the laboratory this can be shown to reduce the blood nitric oxide conductance [5].

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The importance of alveolar oxygen tension as a potential determinant of $TLNO/TLCO$ should be emphasised <http://ow.ly/nZ67X>

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