Airway resistance: synonyms, surrogates, and precision

Zoltán Hantos,1 Jason H. T. Bates,2 Charles G. Irvin,2 Lennart K. A. Lundblad,2 and Peter D. Sly3
1Department of Medical Physics and Informatics, University of Szeged, Szeged, Hungary; 2Department of Medicine, University of Vermont, Burlington, Vermont; 3Queensland Children’s Medical Research Institute, University of Queensland, Brisbane, Queensland, Australia

TO THE EDITOR: The continued use of and reports on “unrestrained plethysmography” (5), which is an attractively convenient and hence popular and easy-to-use method of respiratory monitoring, have evoked a vigorous negative response from the respiratory physiology community. Efforts have been made by groups of lung function experts to point out the flaws inherent in this technique. First, the measurement of a single quantity (the pressure in a body box containing a freely moving, not instrumented animal) cannot, on theoretical grounds, produce a surrogate measure of airway resistance (7, 11). Second, a number of experimental studies on different respiratory pathologies have demonstrated that a shape factor of the plethysmograph pressure, the “enhanced pause” (Penh), simply does not correlate with direct measures of airway, lung, or total respiratory resistance (4, 12). A number of communications have been published in leading respiratory journals (1, 3, 6, 8, 10, 13) to the effect that Penh can be used at most for screening purposes and should always be accompanied by reports of direct estimates of resistance. We note that a very recent and thorough report involving 29 inbred mouse strains (2) even concluded that the use of Penh as an indicator for function changes in high-throughput genetic studies (i.e., genomewide association studies or quantitative trait locus studies) measures something fundamentally different from airway resistance.

In light of the above, we would like to register our concern about an article published recently in this journal by Mehra et al. (9). This article reports values of invasive lung resistance, but important details about these calculations are missing. This has been strongly recommended to accompany (if not replace) measurements of Penh in any study that purports to elucidate the nature of lung function. Our specific concerns are as follows.

1) The method of calculation of pulmonary resistance (R_{L}) is missing, no reference is given, and it is unclear which “peak values” of pressure, flow, and volume were used for the calculation of R_{L} after each challenge (page L190, right column, paragraph 1).

2) The term “airway hyperresponsiveness” is used interchangeably with “Penh” throughout the paper, yet these are two completely different quantities.

3) R_{L} reappears in the RESULTS but again no quantitative data are given, with the exception of P values (page L192, middle of left column), yet the text refers to these values as if they are plotted in Fig. 6. In fact, they are not, as the ordinate is labeled “Airway Resistance,” with no dimensions, whereas the figure legend identifies the ordinate as Penh.

We respectfully request that the authors of this article be asked for clarification of the above points.

REFERENCES


Address for reprint requests and other correspondence: Z. Hantos, Dept. of Medical Physics and Informatics, Univ. of Szeged, 9 Korányi fasor, H-6720 Szeged, Hungary (e-mail: hantos@dmi.u-szeged.hu).