

source and nature of exhaled breath condensate acidification remain controversial [9, 10]. The use of gas standardisation allows us to differentiate the probable contribution of CO₂ and that of other, as yet unknown, acids to exhaled breath condensate pH.

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From the authors:

We appreciate the opportunity to reply to the letter by Z.L. Borrill and coworkers regarding the European Respiratory Society (ERS)/American Thoracic Society (ATS) exhaled breath condensate (EBC) Task Force report. EBC pH measurement is indeed a rapidly growing field of research with the promise of providing previously unknown information about the airways. The measurement is simple, can be performed sample by sample and there is no problem with the detection limit. EBC,

however, is a diluted fluid with a low buffering capacity, which makes its pH value sensitive to changes in CO₂ content. Although the CO₂ concentration of fresh EBC samples is probably similar to that found in the airway lining fluid, this CO₂ concentration will change spontaneously due to the rapid interaction with environmental air after sampling. That is the main reason why deaeration of EBC samples is recommended to decrease the level of uncertainty when measuring EBC pH and to obtain more standardised readings. All of this appears to be so simple that, until recently, nobody dared to measure EBC partial pressure of carbon dioxide (PCO₂) or at least to publish data on it.

It is interesting to observe the indirect approach that Z.L. Borrill and coworkers use to estimate the CO₂ content of the EBC and its relative contribution to EBC pH by analysing the relationship between baseline pH values and pH changes caused by deaeration.

To prove the above concept (deaeration results in EBC pH change by causing a decrease in PCO₂ of the samples), there is a simply direct way, *i.e.* by measuring EBC pH together with CO₂ concentration in the samples. Therefore, we collected EBC samples from 17 healthy subjects (10 male; mean age 25 yrs; lung function values and exhaled nitric oxide concentration in normal range; all never-smokers) and performed measurements of pH and PCO₂ by a blood gas analyser directly after sampling (within 30 min) and after 10 min of deaeration using argon. Data are hereby given as mean \pm SD. The pre-deaeration pH was 6.70 ± 0.24 with a PCO₂ of 2.11 ± 0.92 kPa. Argon deaeration caused a decrease in EBC PCO₂ to 0.33 ± 0.09 kPa but never to 0 kPa ($p < 0.0001$ compared with pre-argon value), and a significant increase of the pH to 7.67 ± 0.20 ($p < 0.0001$; figs 1 and 2). There was a significant relationship between the changes in EBC PCO₂ and that of pH. Furthermore, in line with the observation by Z.L. Borrill and coworkers, there was a relationship between baseline EBC pH and the observed pH increase ($r^2 = 0.53$; $p = 0.001$). The observed increase in pH (mean increase of 0.97) in our healthy subjects was similar to that observed by Z.L. Borrill and coworkers in asthmatic and

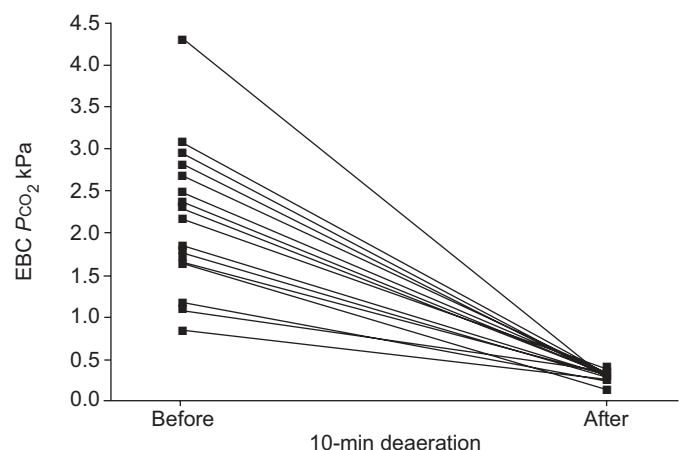


FIGURE 1. The effect of gas standardisation on exhaled breath condensate (EBC) partial pressure of carbon dioxide (PCO₂).

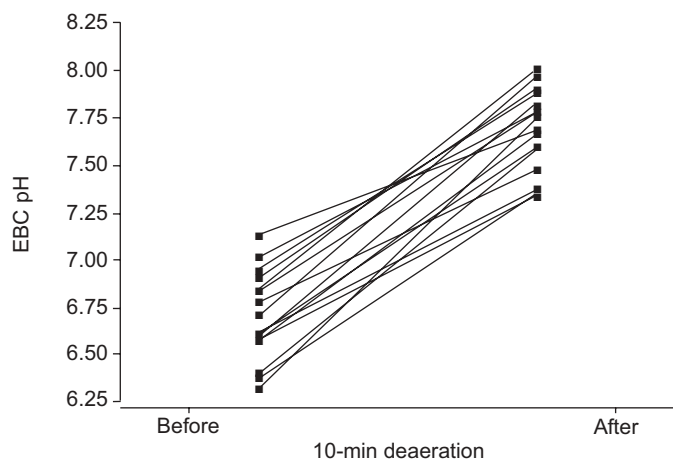


FIGURE 2. The effect of gas standardisation on exhaled breath condensate (EBC) pH.

COPD patients. Our data are also in agreement with the suggestion by Z.L. Borrill and coworkers that a deaeration-caused pH change is a surrogate for CO₂ concentration to some

extent; however, a simple pH measurement cannot give an estimate of the remaining CO₂ content that may still influence the pH reading.

In summary, argon deaeration decreases the concentration and the variability of exhaled breath condensate partial pressure of CO₂, but there is always some remaining CO₂ that may still be a confounding factor in pH assessment. CO₂ content has a marked influence on exhaled breath condensate pH and, since exhaled breath condensate partial pressure of CO₂ varies even after deaeration, it leaves some uncertainty in the exhaled breath condensate pH reading even after deaeration. It seems worthwhile to carry out some more research to define other potential modes of standardisation of this measurement, to learn more about the different factors that may influence exhaled breath condensate pH and the relationship between the pH of exhaled breath condensate and that of the airways.

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A physiological–social score for triaging of pandemic influenza patients

To the Editors:

We read with interest the endorsement of “barefoot medicine” by EWIG *et al.* [1] in a recent issue of the *European Respiratory Journal*. As with NIEDERMAN *et al.* [2], we recognise the limitations of CURB-65 (confusion, urea >7 mmol·L⁻¹, respiratory rate ≥30·min⁻¹, low blood pressure, and aged ≥65 yrs) scoring but the importance of its simplicity and ease of use. As part of the planning for a potential H5N1 influenza pandemic, using Dept of Health and Health Protection Agency projections [3], we have been forced to acknowledge that our urban emergency department, which normally sees ~250 patients·day⁻¹, will see 450 excess attenders·day⁻¹ with influenza symptoms at a pandemic peak. We aimed to develop a rapidly applicable, purely clinical scoring system for use in primary and secondary care, to identify those in need of hospital admission and to reassure those fit for discharge. We suggest that the ideal score should reflect acute physiological derangement, as well as accommodating age, comorbidities and social factors, and could be used to triage and track for admission, intensive care unit (ICU) treatment and mortality. We believe that our proposed system has gone some way towards addressing this.

We modified our hospital pandemic medical early warning score (PMEWS) [4] to include transcutaneous oxygen saturation. We also concur with EWIG *et al.* [1] and NIEDERMAN *et al.*

[2] that comorbidities and social factors have to be taken into account when making admission and discharge decisions, and our score incorporates an extra point for being aged ≥65 yrs and another single point for any of the following: 1) social isolation (defined as living alone or having no fixed abode); 2) chronic disease (respiratory, cardiac, renal, diabetes mellitus or immunosuppression of any cause); or 3) performance status of limited activity or worse (modified Karnofsky >2 [5]).

The validation of 195 adult patients (101 aged <65 yrs) with a diagnosis of lower respiratory tract infection presenting to our emergency department (South Manchester University Hospitals Trust, Manchester, UK) between February and December 2005 showed good discrimination for the physiological section of the score, which was further improved by the addition of age and social factors. We retrospectively calculated PMEWS, CURB-65 and CRB-65 scores from emergency department medical and nursing notes, and constructed receiver-operating characteristics (ROC) curves for the prediction of admission (fig. 1). PMEWS without the transcutaneous oxygen saturation component is shown as we recognise that not all primary care providers will have access to a pulse oximeter.

We extended this to assess the value of the PMEWS score in predicting requirements for higher levels of care. Figure 2 shows the ROC curves for discrimination of need for high