

PostScript

LETTERS

Response to: Bacterial co-infection and the interpretation of immunological data from BAL fluid specimens in severe RSV bronchiolitis (*Thorax* 2006;61:1098)

Eisenhut expresses a valid consideration that pertains to many of the studies investigating inflammatory mediators in respiratory syncytial virus (RSV) bronchiolitis. Many RSV immunopathogenesis studies presume a pure RSV aetiology. Co-infection (viral and/or bacterial) in severe bronchiolitis is not uncommon.¹⁻³ A phagocytic (neutrophils and macrophages) and natural kill cell response is common to both viral and bacterial lower respiratory infections.^{4,5}

Analysis of the blood differential leucocyte counts in our study group failed to discriminate between the RSV-only and bacterial co-infection groups (Mann-Whitney-Wilcoxon test: neutrophils $p = 0.2$; lymphocytes $p = 0.2$; monocytes $p = 0.9$), as did the C-reactive protein ($p = 0.9$).³ However, we only evaluated total number of leucocytes/white cells, bacterial growth density and microorganism species in the broncho-alveolar lavages, and not white cell type. Therefore we are unable to comment on potential differences in concentrations of lower respiratory tract neutrophils and alveolar macrophages between the groups.

The interaction between the phagocytic effector cells, the pathogen and endogenous immune molecules orchestrate the inflammatory response.⁵ Cytokine and chemokine reactions can therefore be customised by the triggering pathogen(s).⁶ Consequently it is vital to identify the correct perpetrator when assigning responsibility for these inflammatory effects.

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Assessing fitness to fly in young infants and children

Commercial aircrafts cruise between 9150 and 13000 m above sea level, with a cabin pressure equivalent to 1530-2440 m at which passengers breathe the equivalent of 15-17% of fractional inspired oxygen (FiO₂) at sea level.

British Thoracic Society recommendations for passengers with chronic respiratory disorders planning air travel¹ suggest that infants and young children unable to perform spirometry, with a history of neonatal respiratory disease consult a paediatrician and a hypoxia test be considered. The recommended hypoxia test method in young children is to place the child in a body plethysmograph while seated on the parent's lap and introduce nitrogen until FiO₂ equals 15%. This method relies on equipment not readily available outside the tertiary hospital setting. We have reported a review of hypoxia testing in infants and young children with a history of neonatal lung disease.²

In our study, the hypoxia test was performed by exposing the children to high flow (15 l/min) 14% oxygen in nitrogen (Air Liquide, Perth, Western Australia, Australia), via a mask, for 20 min. Here we report the validation of this hypoxia test method in a group of infants and young children.

Seven children aged 2-51 months (3 boys) underwent a hypoxia test as described earlier. In addition, a gas sampling line was fixed under the nares of the child, permitting real-time recording of respired gas concentrations (Sensormedics Spectra V.12.3; Viasys, Yorba Linda, California, USA). A two-point calibration procedure encompassing the respirable range was performed before testing and accepted at an accuracy of 0.05%. Once the hypoxia test commenced, two separate periods of 30 s of quiet breathing were recorded and results saved for retrospective analysis. The median FiO₂ for each inspiration was obtained and median FiO₂ for all breaths calculated for each child. Table 1 shows the anthropometric and FiO₂ data. The study was approved by the

Princess Margaret Hospital ethics committee and parental written consent obtained.

Group median FiO₂ is comparable to the 15-17% encountered at cruising altitudes. Several factors may have influenced our median FiO₂ values. The mask applied to the infant does not provide a tight-fitting seal, and room air entrainment, proportional to inspiratory flow, may result in increased FiO₂. We attempted to account for this influence by using a challenge gas of 14% O₂, a gas concentration lower than recommended, and a high delivery flow of 15 l/min. Two infants had low median FiO₂, with values of about 13%. After the investigation of these children, it was noted the median FiO₂ was 13.5% (standard deviation 0.2%), giving a potential lower limit of 13.3%. Follow-up with the gas supplier showed that the normal titration procedure used during cylinder filling has an error of 0.5%, with the final concentration confirmed with an error of 0.2%. Despite these variations in FiO₂, the median FiO₂ of 15.1% equates well to the upper limit of cruising altitude. Although the confirmation that hypoxia challenge tests mimic the hypobaric conditions experienced during flight has been reported in adults,³ a study on adolescent children with cystic fibrosis found that the hypoxia test only poorly predicted subsequent in-flight oxygen requirements.⁴ Hypoxia tests on infants and young children have yet to be validated as reliably reproducing the hypobaric conditions experienced during air travel, and further work in this discipline is urgently required.

In summary, we present a simple, easily-applied hypoxia test method for use in infants and young children, which produces a median FiO₂ similar to that encountered during flight.

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References

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Table 1 Anthropometric and fractional inspired oxygen concentrations

Participant	Age (months)	Sex	History	FiO ₂ (%)*
1	51	F	ILD	15.7 (12.87-16.58)
2	41	M	H	15.04 (13.19-17.08)
3	4	F	H	13.42 (12.98-13.71)
4	10	F	H	13.14 (11.96-14.55)
5	2	M	H	15.66 (12.79-16.59)
6	11	M	BPD	16.05 (14.44-16.58)
7	3	F	H	15.08 (12.73-16.59)
Group	10 (2.2-49.0)			15.08 (13.19-15.98)

BPD, bronchopulmonary dysplasia; F, female; FiO₂, fractional inspired oxygen concentration; H, healthy; ILD, interstitial lung disease; M, male.

*Continuous data are expressed as median (10th-90th centiles).