

Letters to the Editor

Bronchial hyperresponsiveness, spirometry and diving

Dear Editor,

As a respiratory physiologist in the lung function laboratory of a major teaching hospital I have been impressed in the last 10 years by the number of young people, with a past history of asthma and normal spirometry who have moderate to severe bronchial hyperresponsiveness (BHR) to hyperosmolar (4.5%) sodium chloride or hyperpnea with dry air. Some of these data were summarised in our earlier paper in this journal.¹ These stimuli act indirectly by releasing inflammatory mediators to cause contraction of bronchial smooth muscle and the airways to narrow. BHR to 'indirect' stimuli is consistent with currently active asthma and this type of BHR responds to treatment with inhaled steroids. BHR to 'indirect' stimuli is particularly relevant to the activities associated with diving such as exercise and accidental aspiration of salt water.

We have reported BHR, within the asthmatic range, to bronchial provocation with a hyperosmolar aerosol (4.5% saline) in 17% of 180 potential scuba divers who had a past history of asthma, no current symptoms, and normal spirometry and had been declared fit to dive following a medical examination.² Many of those subjects recognised their positive response as a symptom of their previous asthma, and stated they would cease their intention to dive with scuba and would seek treatment as a result of the test. Following this report sports doctors appeared to change their practice and referred people with a past history of asthma for testing *before* rather than *after* a full medical was performed. The findings of that report remain important because the change in referral practice means we will not have the opportunity again to evaluate BHR in people with a past history of asthma found otherwise medically fit to dive. It is of interest that exercise-induced asthma (EIA) has also been shown to be frequent in defence force recruits with a history of childhood asthma and no symptoms.³

We also reported BHR to both dry air and to the hyperosmolar aerosol mannitol in a group of elite athletes unselected for respiratory symptoms and with excellent lung function.⁴ Importantly in this same cohort there was a low sensitivity (36%) to detect BHR using provocation with the pharmacological stimulus methacholine, which acts directly on smooth muscle receptors to cause contraction.⁵ This apparent paradox (pharmacological agents are widely thought to be more sensitive than other stimuli in identification of BHR) has also been reported in school children with EIA and normal spirometry but negative to provocation with histamine.⁶ The difference in sensitivity to the stimuli may relate to the higher potency of the mediators released in response to exercise and hyperosmolar aerosols compared with histamine and methacholine. Thus only one

hundredth of the concentration of the prostaglandin D₂ and one thousandth of the concentration of leukotriene E₄ is required to provoke the same degree of airway narrowing as histamine and methacholine. Of interest was that 40% of the children with EIA did not have a clinical diagnosis of asthma suggesting responsiveness to exercise is an early sign and may precede symptomatic asthma.⁶

What can we learn from these findings? First, there is a high percentage of people with a past history of asthma, no current symptoms or current use of medication and with normal spirometry, who have BHR to hyperosmolar aerosols and dry air hyperpnea. Second, normal values for spirometry neither predict nor exclude bronchial hyperresponsiveness to these stimuli. Third, a normal response to bronchial provocation with a pharmacological agent neither predicts nor excludes BHR to hyperosmolar aerosols or dry air. Fourth, there are people with airway narrowing provoked by exercise who do not have other symptoms of asthma. Finally, we have learnt that many people with mild asthma and few symptoms or those well controlled on treatment do not demonstrate BHR to these stimuli.⁷

If there is a move towards assessment of risk of problems with diving for those with a current or past history of asthma then it would seem sensible to exclude BHR to the stimuli the diver will encounter. In cases where a person does not have normal spirometry an acute response (12% increase in FEV₁) to a bronchodilator can reveal BHR consistent with asthma. For those with normal spirometry medical practitioners in Australia now have available to them a bronchial provocation test kit that uses a dry powder of mannitol and has regulatory approval (Aridol™, Pharmaxis Ltd, Frenchs Forest NSW).⁷ The mannitol test has been under development for more than a decade and can be used to identify BHR to exercise, dry air and hypertonic saline.

References

- 1 Anderson SD, Wong R, Bennett M, Beckert L. Summary of knowledge and thinking about asthma and diving since 1993. *Diving and Hyperbaric Medicine*. 2006; 36: 12-22.
- 2 Anderson SD, Brannan J, Trevillion L, Young IH. Lung function and bronchial provocation tests for intending divers with a history of asthma. *SPUMS J*. 1995; 25: 233-48.
- 3 Sinclair DG, Sims MM, Hoad NA, Winfield CR. Exercise-induced airway narrowing in army recruits with a history of childhood asthma. *Eur Respir J*. 1995; 8: 1314-7.
- 4 Holzer K, Anderson SD, Chan H-K, Douglass J. Mannitol as a challenge test to identify exercise-induced bronchoconstriction in elite athletes. *Am J Respir Crit Care Med*. 2003; 167: 534-47.
- 5 Holzer K, Anderson SD, Douglass J. Exercise in elite summer athletes: challenges for diagnosis. *J Allergy Clin Immunol*. 2002; 110: 374-80.
- 6 Haby MM, Anderson SD, Peat JK, Mellis CM, Toelle

BG, Woolcock AJ. An exercise challenge protocol for epidemiological studies of asthma in children: comparison with histamine challenge. *Eur Respir J*. 1994; 7: 43-9.

- 7 Brannan JD, Anderson SD, Perry CP, Freed-Martens R, Lassig AR, Charlton B. The safety and efficacy of inhaled dry powder mannitol as a bronchial provocation test for airway hyperresponsiveness: a phase 3 comparison study with hypertonic (4.5%) saline. *Respiratory Research*. 2005; 6: No.144.

Conflict of interest

Dr Anderson is the inventor named on the patent that covers the mannitol test. The patent is owned by her employer, the Central Sydney Area Health Service, who has licensed the commercial rights to Pharmaxis Ltd. Dr Anderson owns shares (but no options) in Pharmaxis Ltd that she purchased herself and, in the future, would benefit from royalties paid to her employer.

Sandra D Anderson PhD, DSc, Principal Hospital Scientist, Department of Respiratory Medicine, Royal Prince Alfred Hospital, Sydney, Australia

E-mail: <sandya@med.usyd.edu.au>

Key words

Letters (to the Editor), fitness to dive, respiratory, asthma, pulmonary function

A successor for Project Stickybeak

Dear Editor,

You appear to be unaware that I have been trying to obtain someone to help run Project Stickybeak and ultimately take over – but without success. The only two candidates John Lippmann could suggest soon lost interest, possibly when they realised the amount of work involved, especially the problems of finessing coroners and other government agencies into giving support.

There has never been active interest and involvement in the collection of ‘fatality information’ from members of the SPUMS Committee, although you have continued to publish the provisional reports and ‘advertised’ the project in the Journal.

You should be aware that I have many easily accessible data on file that are not included in the provisional reports. Also, basic data are available to anyone interested at the National Library.

Had anyone been interested they would logically have contacted me. However, I have created, and continue to add to, this database, regardless of the present lack of interest by diving authorities (lay and medical) in this ‘rough trade’ type of research into the improvement of diver safety.

You will recollect that some time ago I contacted you concerning a plan to hold a workshop to discuss the influence of health factors on diver safety. If you intend to proceed with this idea you will find my databank makes it easy to identify such cases in the fatalities report files. You may even manage to extract data from others.

Douglas Walker
Project Stickybeak

Key words

Letters (to the Editor), diving accidents, diving deaths, research

Editor’s comment:

Since 1972, Dr Walker has created a huge database of case histories of diving fatalities, the most recent report for which appears in this issue. Despite his comments above, the Society strongly supports this work, and greatly appreciates Douglas’s tenacity and hard work.

To ensure that Project Stickybeak continues, a long-term commitment from a member or members of the Society to take up the reins from Douglas, possibly with the aid of DAN-SEAP, is required.

It has been suggested that there should be a medical practitioner who can establish a close working relationship with the Police and Coroners in each coastal State of Australia to collect and collate the information for that State and forward these data to an overall coordinator who would prepare the Project Stickybeak reports. This was discussed at the Fiji ASM in June and several individuals expressed an interest in helping to continue this invaluable project. Those interested should make themselves known either to the President, Chris Acott, or the Editor.

A similar process has been established in New Zealand with Water Safety NZ, the NZU Accident Recorder, Dr Lynn Taylor and the Editor.

Fitness standards for beach lifeguards

Dear Editor,

Occupational Medicine has published two papers by Reilly et al on occupational fitness standards for beach lifeguarding that you might like to cite for your readers.^{1,2} Its website is <www.occmed.oxfordjournals.org>.

These papers beg the question as to what standard of fitness holders of the RLSS Bronze Medallion should attain and maintain bearing in mind the need not ‘to beat the aqualung’ whilst undertaking subaquatic rescue, let alone ‘beat the bubbles’ to the surface. There is a plethora of other considerations concerning physical capacities of rescued and