

reactivity with the group of prospective divers all having a history of airway's reactivity, we see that both groups had a similar (30% and 33% respectively) response at the 10% level to hypertonic saline. This suggests that the criteria outlined, by Edmonds et al.<sup>10</sup> in *Diving and Subaquatic Medicine*, stating that "asthma provocation producing 10% or greater reduction in FEV<sub>1</sub> after both histamine and hypertonic saline challenge" leads to a FAIL, may be too stringent. In these two studies, fall in FEV<sub>1</sub> of 10% after provocation failed to differentiate between the group of experienced divers and the student divers. Further studies will be required to decide whether a 15% fall in FEV<sub>1</sub> after provocation indicates significant increased risk to diving (as suggested by Anderson et al.<sup>11</sup>) or whether a greater than 20% fall is stringent enough (at present part of our protocol). In order to answer these questions, more data is required. It would be useful to follow up candidates with borderline challenge test results and, if they have chosen to continue to dive, document their progress. This is the only way that guidelines can be set out based on clinical data rather than on purely theoretical grounds.

### Acknowledgments

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### DIVERS WITH ASTHMA: AN INVESTIGATION IS REQUIRED

Douglas Walker

*"For any complex question there is a solution which is simple, appealing...and wrong."*

There is undoubted logic in the medical opinion which states that asthmatics will be exposed to excessive risk if they attempt to scuba dive and should therefore never be granted permission to do so if a medical fitness certificate is requested.<sup>1</sup> Certainly it is the medical dogma in Australia that such people are subject to an unacceptable increased risk of morbidity and death should they be in an environment of changing ambient pressure. Questioning of self-evident truths requires an open-minded attitude which is not always easily reconciled with the advantages of accepting what is the local shibboleth. Unless we continually check the fit of what we believe against new data we are claiming that everything which there is to know is already known and understood.<sup>2,3</sup> In reference to the subject of asthma and diving it is timely to remember that in England a more relaxed opinion is held and there had not been any evidence of increased morbidity among scuba divers as a result.<sup>4</sup>

Nobody researches problems they believe fully understood. It is therefore necessary first to question the obvious, a worthwhile undertaking even if it only confirms the validity of beliefs. The fact that some asthmatics do indeed scuba dive cannot be denied,<sup>5,6</sup> a few coming to

notice in incident reports. Divers are notoriously reluctant to admit to being asthmatic, hard experience making them aware that most doctors (and diving instructors) who hear such an admission will respond with a lecture on the dangers they run.<sup>7,8</sup> If they omitted reference to asthma at their Diving Medical they may fear a loss of their certification should such an omission become known. There is another group of divers who deserve investigation of their diving experiences, those who gave some history of asthma in the past but have been assessed Fit to Dive after testing. The diving experiences of members of both these groups, if known, would greatly increase our understanding of the real natural history of the various degrees of the asthma syndrome in scuba divers. Their experiences are the only valid data base for discussing safety in diving with asthma.

It will be extremely difficult to persuade scuba divers that admitting to asthma will help towards a more flexible attitude by doctors to assessing less arbitrarily on medical fitness to dive, and the first step towards obtaining their involvement is to make them realise the necessity for the data only they can provide, and that there is a 100% guarantee their identities will never become known beyond those involved in this survey. Indeed they must have an assurance that whatever their diving history it will remain as medically confidential information. It is for this very practical reason that the investigation will attempt to follow-up those who have been passed as fit despite a history of asthma when younger, as they are unlikely to harbour such fears.

On page 260 is a draft questionnaire for an investigation into asthma and diving. It is published in the hope that readers can provide the author with feedback to improve its contents and layout.

There have been a few surveys of asthmatic divers which have achieved a certain degree of success.<sup>9,10</sup> These have relied on use of a proforma in a diving publication and have been criticised for a perceived bias because there would be a tendency for those having suffered problems to have ceased diving, thereby unduly enriching the sampled diver population with the less affected. But this may be considered a counterbalance to relying on morbidity reports which only record the presence of an asthma history where a diver has been involved in some diving incident. There is a tendency to assume a causal relationship is present between an asthma history and any morbidity such a diver suffers. A closer analysis of such incidents will often reveal additional critical factors likely to have been far more significant in the genesis and progress of the incident.

The medical concerns with those who have a history of asthma revolve around two elements of the dive. First there is a risk of pulmonary barotrauma on ascent due to constriction of the airways in response to effort, stress,

cold air, or inhalation of ultra fine droplets of salt water. The second is the more general reduction in safety if airways impairment makes the diver unable to perform the required physical effort either underwater or at the surface. Strangely there is little evidence in local or overseas reports of such problems, though they would be a readily identifiable risk factor to report if present. Few things in medicine are "always" or "never" and asthma is no exception. While some claim that once the person has suffered an asthma wheeze the hyper-responsiveness will always remain in their bronchial tubes to some degree,<sup>14,15</sup> others believe this respiratory tract responsiveness to provocation will fall to within "normal" levels in many.<sup>16</sup> Great variations exist in medical attitudes in different countries concerning the safety of asthmatics who dive but no evidence that this is reflected in the morbidity or mortality statistics in the Australia or New Zealand diving incidents reports compared with those of the UK or the USA.

When carrying out a Fitness for Diving examination there are applicants who have to be told that their bronchial system is too reactive for medical acceptance standards, and they complain there are asthmatics who scuba dive. Unfortunately they carefully avoid providing identification of these people, though they certainly do exist. It would be useful if there was a data bank containing the details of such persons, both those who suffer problems from their asthma when diving and those who dive uneventfully, for this would provide a better basis for fitness decisions.

One problem which requires resolution is to define "asthma", as while some consider any history of a wheeze, even in childhood, as a contraindication to a positive fitness assessment, there will be others who will accept even those who require present use of a bronchodilator as being acceptable. Many more take a middle path and rely on the response to provocation testing.

An examination of Australian scuba diver fatalities reports, between 1955-1993 inclusive (203 cases),<sup>17-30</sup> shows that in only 9 cases was there mention of asthma in the victim's medical history. This has to be set against the lack of information concerning both the proportion of divers "at risk" who had a similar medical history. It was assessed as the initiating factor in one incident, possibly a significant factor in two others. In each of these incidents it was the actions of the victim rather than the asthma itself which decided the outcome. No cases have been identified in the reports made to the BS-AC where asthma was identified as being present and it is not treated as a significant factor in the code used to record the USA (University of Rhode Island) cases. This lack of representation of asthma among identified critical factors may indicate that few asthmatics scuba dive, or that few get into serious trouble. There is need to clarify this matter by examination of incident reports where there was a non-fatal conclusion.

**ASTHMA AND SCUBA DIVING INVESTIGATION**

**You need not provided your name and address etc. but it would help the investigator if you do, as then he can contact you for further information if needed. Your personal details will be known only to the investigator (Dr Douglas Walker) and never revealed to anyone else.**

Name..... Present age  
 Address..... Phone (...)  
 Post Code ..... Fax (...)

**MEDICAL HISTORY OF WHEEZING / ASTHMA / TREATMENTS**

Age at onset	Age when asthma/wheezes last occurred		
Severity	Occasional wheezing	Wheeze more than once a week	Need medication all the time
Trigger events	Exercise / Head cold / Pollen/ Weather / Emotion / Other		
Treatment	regular / occasional / rare / emergency		
	tablets (name .....	YES	NO
	Ventolin/similar	YES	NO
	Atrovent	YES	NO
	Bricanyl	YES	NO
	Intal	YES	NO
	Becotide / Beclofort / Turbuhaler / Pulmicort	YES	NO
	Other		

Hospital treatments ?

Present condition wheezing / breathlessness problems YES NO How often.....  
 Present treatment / management

Other medical or surgical past or present problems

Diving History

Had medical before training ? YES NO  
 Disclosed asthma/wheeze ? YES NO  
 Medical Examiner asked about asthma YES NO  
 Response when told of wheeze/asthma respiratory function tests ?  
 Special respiratory tests for asthma  
 Advice given

Instructor

Aware of wheeze/asthma history ?  
 Response when told of wheeze / asthma history

Training level

Experience

Any diving-related problems (not necessarily due to asthma) YES NO  
 specify  
 Any asthma related problems when diving YES NO (Describe below)  
 Use of medication before / after dives

Any comments on medical / instructor / other advice on asthma and diving.

You are invited to add any additional information or comments, including your views on or experience of “diving medicals” and the attitude of diving instructors to those who admit to “asthma”, on the back of this form. Also your views on present medical standards for divers and your observations on those you have seen scuba diving with disabilities either physical (eg paraplegic, amputee) or medical (eg asthmatic, diabetic, or with heart or other problems).

Please return this form direct to Dr D G Walker, PO Box 120, Narrabeen, New South Wales 2101, Australia.

It is hoped to enlist the interest and active involvement of not only divers who have an asthma history and dive (either with, or without, medical agreement) but also those persons, other divers or medical, with an interest in this problem. It is appropriate to seek out those who scuba dive who have been medically assessed as having only a mildly increased responsiveness to a test exposures to saline or methacholine (having admitted a history of wheezing, or use of inhalers such as salbutamol in the past). As assessment of the duration of effective protection against this type of test provocation by use of the most modern inhalations would have real value, as the problem should be examined with regard to treatments of a prophylactic nature which are now available.

The proposed manner of conducting this research requires the involvement of both medical and non-medical persons having either an interest in improving our understanding of asthma as a risk to diving safety or an interest in legitimising asthmatic divers. To this end a request is made for interested persons to communicate with the author. The information may concern personal experiences or observations of others, or statement of a willingness to follow up those who have revealed a history of asthma but been judged as safe to dive after pulmonary testing. There is a guarantee that a Medical Confidentiality management code will apply to all reports and correspondence. The "asthma community" is here presented with an opportunity to perform a useful service to those who suffer or have suffered from this condition.

For far too long the problem of deciding on the influence of some medical condition in the context of giving a formal decision on fitness to dive has been managed on an absolutist basis rather than by examination on a case by case basis. This has the benefit of simplicity and was defensible in court before the intrusion of the concept that medical beliefs must be demonstrably grounded on acceptable data. The basic fault has been our medical assumption, surely ill advised, that diving accidents commonly had a "medical" basis and could be eliminated (or at least significantly reduced) by medically examining every applicant before training commenced. A less proud boast of the profession's prognostic skills might in truth have been more appropriate and engendered an approach which was more open to examining the facts. Undoubtedly there are those whose medical or physical condition makes diving far too risky to be approved and others where the applicant's experience balances out the physical or medical adverse factors. There is need for an acceptance that people cannot be divided into one or other of two absolute groups, the totally fit and the absolutely unfit to dive. There is indeed a need to re-examine Australian standards.

An excellent basis for debating the case for initiating this investigation is given in the 1987 UHMS Workshop report *Fitness to Dive* and the recent paper by

Neumann et al. on *Asthma and Diving* in addition to the other references given.<sup>31,32</sup>

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### **AN INTERESTING CASE OF DECOMPRESSION ILLNESS**

Neil Banham

During the final dive of her initial training course a 35 year old female novice diver who developed constitutional and neurological symptoms. As the history of the incident, obtained on admission to the Emergency Department was unclear, the narrative here was compiled from the patient when she presented to hospital, on completion of treatment and at follow up a month later, from the diver's buddy and also from the dive master.

The dive which resulted in the presenting problems was to a maximum depth of 4.4 m for a total dive time was 37 minutes. Of this ten to twelve minutes at least was spent

on the surface for instruction and most of the dive was spent around 2 m practising underwater skills such as mask clearing and controlled octopus ascent. Such a profile is well with in all recognised decompression tables and there was no suggestion of a rapid ascent.

Before entering the water she had been quite well. There were some problems with her new mask leaking and slow clearing of her left ear. Some nausea developed during the dive.

Her buddy reported later that the diver complained of feeling absolutely exhausted while she was snorkelling to shore but her speech was normal at this time. It was noted that, when she left the water, she was somewhat unco-ordinated but she was able to carry her gear up to the bus, wash it and to stow it. She complained of feeling unwell with nausea and headache.

At the dive shop, about an hour after the dive, she complained of feeling "weird" and had to sit down. A sensation of numbness developed over the dorsum of her left hand which progressed to paraesthesia extending up her left arm and there was some tingling on the back of her right arm.

The dive master reported that although she was able to answer questions appropriately he was concerned about the progression of symptoms so he took her by car to Fremantle Hospital, some five minutes away.

On examination in the emergency department she was noted to be alert but confused. Her Mini Mental State score of 19/30 indicated a significant psychometric deficit. Peripheral nervous system examination while she was recumbent was normal and while on oxygen in the emergency department her paraesthesia resolved.

On being stood up to assess her co-ordination it was noted that her heel-toe gait was poor, she was unable to perform a sharpened Romberg test and her overall condition deteriorated. She became drowsy, confused and agitated. Her speech was unintelligible. She had been erect for no more than thirty seconds

The differential diagnoses considered were cerebral arterial gas embolism (CAGE) and decompression sickness (DCS). DCS was thought to be unlikely because of the absence of a significant nitrogen load. The possibility of paradoxical embolism of venous bubbles through a patent foramen ovale was later excluded by a normal bubble contrast echocardiography.

Against CAGE were the absence of a history of rapid ascent, no clinical or radiological evidence of barotrauma and the long delay before obvious symptoms. CAGE is usually almost immediately apparent, although delayed cases have been reported many times. Rapid