

## MORE ABOUT ASTHMA

Carl Edmonds

Australians have the reputation for being naturally fit and rugged individuals. Apart from myself, this is not always necessarily so. I may have mentioned in a recent article that we "fail" almost 10% of the candidates for amateur diving courses, on medical grounds.

Because there has been a plethora of articles in our SPUMS Newsletter (*sic*) from OS (overseas) experts showing the arbitrary nature of their prejudices, I felt that I should respond likewise and give the Oz.(Australian) experience.

There are probably no more than 20 diving medicos in Australia and after this article I shall receive 19 protests. I guess I have faced the problem of the asthmatic would-be-diver more than most. Any diver who I believe has, or is likely to have, an asthmatic tendency is failed. If I make mistakes by "passing" someone who has sinus disorders, unilateral deafness, or other problems, then the chances are that he will live to complain about it. Not so with the asthmatic diving accident.

Only twice have the Diving Medical Centre (DMC) doctors really dissented and both were over mild asthmatics. In the first case the subject was passed because he had letters of fitness from the most eminent of our respiratory specialists. He burst his lung and developed a pneumothorax at depth. The second was failed three times by the DMC (despite flattery, cajoling and threats) and was finally given a medical certificate by his father - a professor of medicine. He died during an exercise/cold/aspiration induced asthma attack after arriving on the surface.

Asthmatics seem to have to prove themselves, and failure to pass the medical is a severe blow to their self esteem. I try and explain that, because they are susceptible to asthma, they are more likely to develop pulmonary barotrauma, a diving precipitated asthma attack and unexplained loss of consciousness.

In determining whether there is an asthmatic tendency, special attention is paid to the history of asthma, wheezing, hay fever, use of inhalants, aerosols, allergies, etc. Auscultation is performed during hyperventilation and the percentage FEV1 is performed, with Ventolin if indicated. Exercise provocation, 1200 KPM/min for 6 minutes, is used if there is any suspicion of exercise induced asthma. If, after all these studies and assessments, I am still not perfectly convinced, I will send him to a respiratory function unit for more sophisticated provocations and respiratory function testing. Fortunately, this is not often required after a comprehensive clinical examination.

Asthma treatment is also a problem. Ventolin is a cardiac stimulant, as are other sympathomimetics. I do not consider them desirable to use in the diving situation, especially with our current beliefs of the causes of the sudden death syndrome due to cardiac disease. It is also unfortunately true that all the aerosols have a patchy and variable effect on the respiratory airways and the resistances from them (certainly not to be relied upon to prevent pulmonary barotrauma). The second case referred to above was a young man who died on the surface, with an asthma attack, while he was swimming back to get another puff of his

Ventolin!

The pulmonary barotrauma is explained to the candidate, with the importance of his increase in airway resistance and the greater pressure gradients that would exist along his airways, the reduced compliance of the lungs, the greater transpulmonary pressures he will develop and the larger lung volumes that he uses with his normal breathing.

When the candidate understands how these factors work in favour of him bursting his lung, I then explain how important it is at the shallow depths, as the argument he always puts forward will be "but surely I can dive as long as I don't go deep."

Asthma may be precipitated by exercising, breathing against the resistances associated with the diving equipment, breathing very dry air or very cold air. The dry air comes from the need to produce dry air with compressors, and it becomes cold because we are breathing in a cold environment, and because of the adiabatic expansion of gases in the first and second stages of the regulator. The exercise induction of asthma is well known, and in the underwater environment exercise may be particularly necessary, such as in swimming against a current or by trying to swim without neutral buoyancy. The production of asthma from the aspiration of small quantities of sea water is less well known, and is quite a separate entity to the salt water aspiration syndrome, which I referred to in a recent article.

The production of asthma due to aspiration while diving can perhaps be due to a number of factors, one of which is the presence of various marine proteins in the aspirant. The most interesting aetiology is that of inhalation of hypertonic saline (sea water).

Interesting work was performed by Findlay and his colleagues (OS) and Sandra Anderson and her colleagues from the Professorial Unit of a Sydney University. Dr Anderson demonstrated asthma attacks can be produced by a variety of aerosols, including distilled water and hypertonic saline (2.7% and 3.6%), in potential asthmatics (not in normals!). Isotonic saline does not have this same effect. Saline with the hypertonicity of seawater produces a drop in the FEV1 of 20% in potential and actual asthmatics. It is thought to be due to the release of a histamine from mast cells which are especially sensitive to the change of osmolality. (This response is very similar to the histamine provocation test), and is now a well validated test for detecting bronchial hyper-reactivity.

The aspiration of sea water may be due to regulator problems (eg. failure of a non-return valve to be fully functional) or inhalation of water around the regulator or after removal of the regulator on the surface.

The only way in which I believe it would be safe for an asthmatic or potential asthmatic to take up SCUBA diving would be if he guaranteed that he would never need to ascend rapidly (ie. never have buoyancy problems, never have a regulator failure, never be pulled up by his float or by other line), never have to exert himself, breath warm humidified air and swim in an isotonic ocean. The other requirement I would make is that he remains between 100 and 200 ft depth, where the volume changes are much less, and never come to the surface.

Unfortunately the asthmatic often still wishes to dive. I then fall back on my "soft sell" approach and ask if he is married, the names, ages and sex of his children, whether his life insurance policy covers them adequately, and if it specifically covers them for a fatality during SCUBA diving, especially when the recipient is medically unfit for it?

By this time he is losing a bit of the savoir faire and starts listening, and reconsidering the whole project. I then ask to speak to the spouse/parent and if this fails I ask for written permission for autopsy in the event of an accident "to further our knowledge of diving medicine, for the sake of future patients." The last trump card usually wins, as the subject recoils in horror, clutches his chest and glares with a "he-is-after-my body" stare. Only one patient complied with my request for autopsy permission and still proceeded to dive. I did not actually have the heart to attend the autopsy when it finally eventuated.

I often need repeated consultations to effectively get across the full message about the contraindications of diving with asthma. I sometimes try to encourage the asthmatic to go to any other field, and become the Australian champion. The only qualifications I make are that the field should not be SCUBA diving, working dark, damp, underground caissons, or becoming an astronaut.

I do not try to explain the cases of loss of consciousness, as I do not understand them myself. Perhaps they are related to CO<sub>2</sub> toxicity combined with nitrogen narcosis.

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#### PROJECT STICKYBEAK

*This project is an ongoing investigation seeking to document all types and severities of diving-related incidents. Information, all of which is treated as being CONFIDENTIAL in regards to identifying details, is utilised in reports and case reports on non-fatal cases. Such reports can be freely used by any interested person or organization to increase diving safety through better awareness of critical factors. Information may be sent (in confidence) to:*

Dr D Walker  
PO Box 120  
NARRABEEN NSW 2101

#### MEET DES

#### NEW DIVER EMERGENCY SERVICE APPROVED BY GOVERNMENT

The Minister of Defence, through his Minister Assisting, has agreed to an approach by the Australian Underwater Federation, that the RAN School of Underwater Medicine accept the responsibility of a National Co-ordination point for assistance in the event of Diving Emergencies.

Now, to obtain assistance in a Diving Emergency, there is Australia-wide a single telephone number to call. That phone (02 960 0321), manned 24 hours a day, seven days a week, will provide access to the doctors of the RAN School of Underwater Medicine for immediate advice on treatment and to provide advice on future transport or further treatment that may be needed.

Mr Frank Poole, the National Director of Coaching for the AUF, was quick to point out, that this in no way lessens the importance of the several professionally serviced recompression chambers available around our coast. Divers tend to be very migratory. Now there would be a single telephone contact and a simple reporting procedure instead of a multiplicity of reporting numbers and differing procedures. The Navy would normally utilise the closest appropriate facility to the accident and provide advice on first aid and subsequent treatment and on arranging transport to move the patient to the facility. The Navy's willingness to assist with Service expertise will be a major factor in improving the safety of diving in Australia, Mr Poole said.

If you have a DIVING EMERGENCY, call "DES"

Ring: 02-9600 321

State: "This is a diving emergency"

Ask: That they contact the duty Doctor of the School of Underwater Medicine.

Give: Details of the incident:-

1. Exact location of patient
2. Telephone number where someone can be contacted, including STD code. Make sure that someone stays at the phone and that the phone is not used.
3. Details of the accident or incident and of the patient's condition.
4. Current first aid being applied.
5. Contact's name.
6. Have any emergency, medical or police services been notified? If so, when.

Check: That the following have been correctly recorded

1. Location
2. Telephone number
3. Dive details
4. Signs and symptoms
5. Contact name

by having them repeated back to you.