ASTHMA

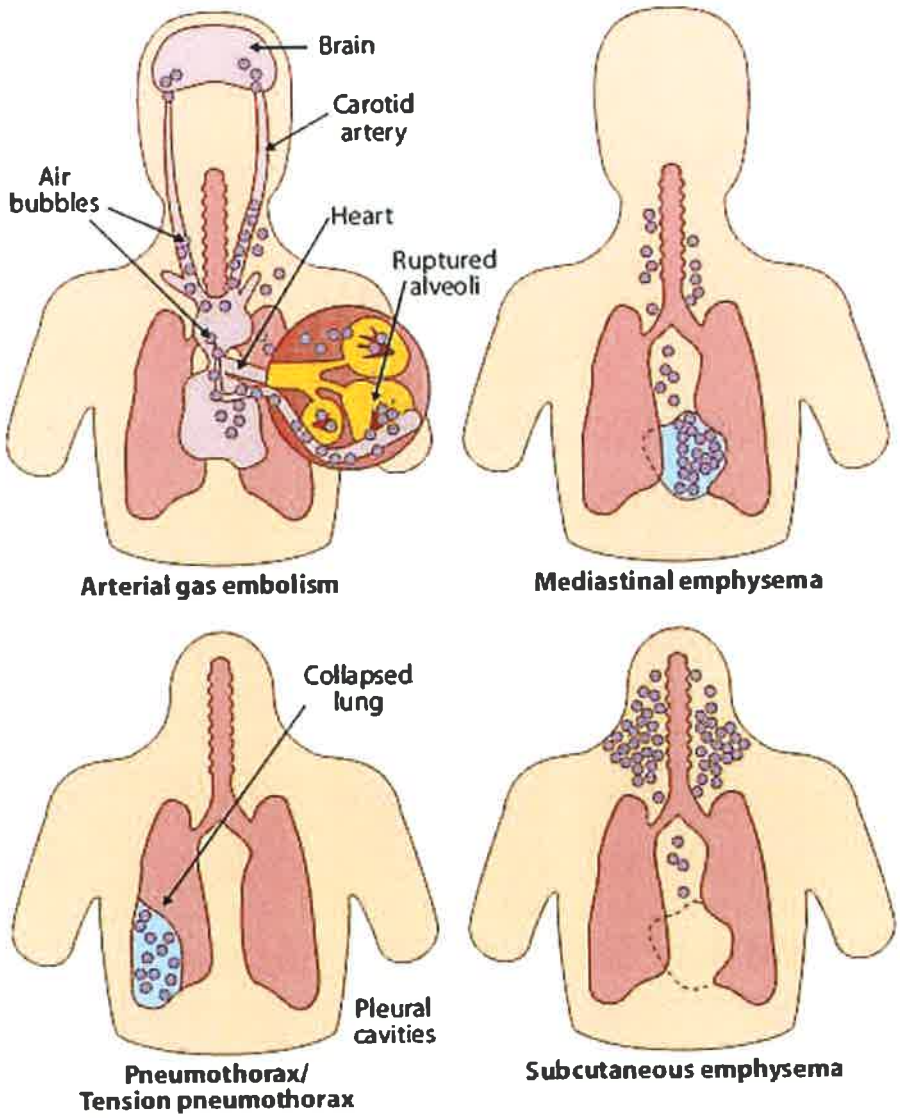
By Dr. Richard O'Regan

Asthma is a disorder where people get attacks of wheezing and difficulty in breathing due to bronchospasm, swelling of the lining of the air pipes and excessive mucus secretions. Symptoms may be variable. Traditionally asthma was thought to be either extrinsic (allergic) or intrinsic asthma (non allergic, with no identifiable factors found as the cause of the asthma).

All of the recreational dive agencies suggest that asthma and it's cousins, the obstructive airway diseases, are a relative contraindication to diving. Despite this it is the most frequently questioned problem that DAN has to answer. Traditionally the dive agencies advised by the various dive medical organisations suggested that asthma was somewhere between a absolute and a relative contraindication to diving and this would probably have had its origins in military medical practices. In 1996 the Underwater Hyperbaric Medical Society (UHMS) in United States held a work shop on asthma and diving. UHMS advise the Recreational Scuba Training Council (RSTC) on medical fitness to dive guidelines. PADI is the largest affiliate to the RSTC. In Australia, New Zealand and South Pacific SPUMS advises on diving medical standards. In United Kingdom the UKDMC has a set of guidelines which been described by DAN as being the most liberal in the world in allowing asthmatics to dive. CFT is affiliated to the UKDMC with regard to medical fitness to dive practices . So what is the problem with asthmatics diving. Every diver from the earliest diving course is aware that gasses are compressed on decent and expand on ascent . For breath holding divers this is not a problem but however for scuba divers who breathe air through their scuba regulator at the ambient pressure at which they are diving, if they ascend without venting their lungs on ascent the gas will expand causing pulmonary barotrauma. For this reason all scuba divers are taught from the earliest stage to always breath and never hold their breath. But what happens if air is trapped in a portion of the lung and is unable to vent on ascent.

Every diver knows about Boyle's Law, the volume and pressure are related. As the pressure lessens the volume increases. Unfortunately lung tissue is not a rubber balloon that can keep expanding and beyond a certain point it will pop. Patient's in intensive care units have been found tosuffer pulmonary barotrauma while being ventilated in a very controlled situation if the pressure within the lungs is much greater than 30 cm of water (or 0. 03bar). Lung tissue in isolation will expand but most alveoli are found to burst by 90 cm of water (0. 09bar). In a diving situation this means that if one holds one's breath and ascends without venting for more than a meter one is at risk of pulmonary trauma/burst lung.

e consequences of burst lung can be pneumothorax, mediastinal emphysema, subcutaneous emphysema or the much feared cerebral arterial gas embolus (CAGE) which can result in a stroke or death.



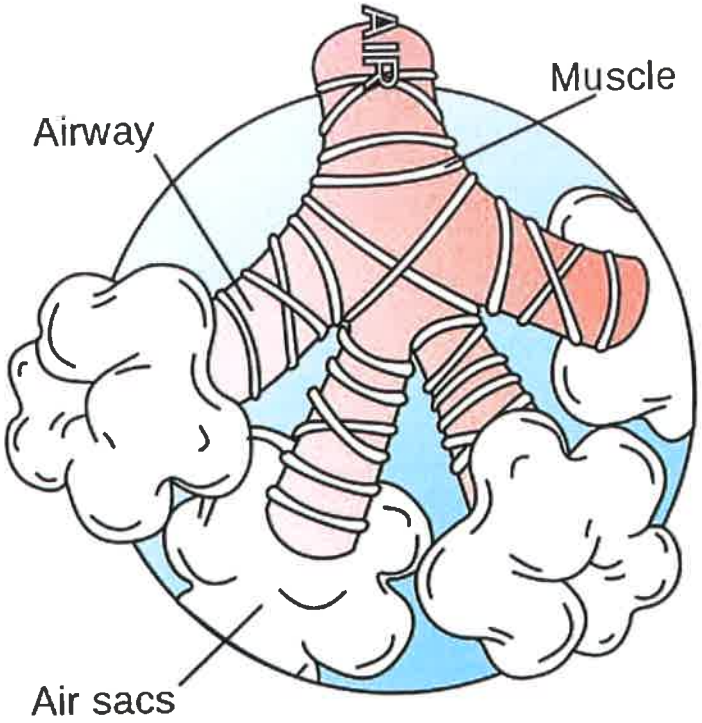
So back to Asthma, what is the problem ??

Well, potentially air breathed in at depth cannot escape on ascent. It can be held behind, mucus blocked airways or behind swollen airways because of irritations by either allergens or environmental noxious agents. Also some people seem to develop exercise induced bronchospasm . Compressed air when released from the tank is colder and dryer than that usually breathed on the surface, it can be an airway irritant. All of these exacerbating factors can provoke an acute asthma attack in people who have a tendency to asthma and this can be exacerbated by compressed air which is much denser so that work of breathing is much increased at depth and this can worsen an asthma attack.

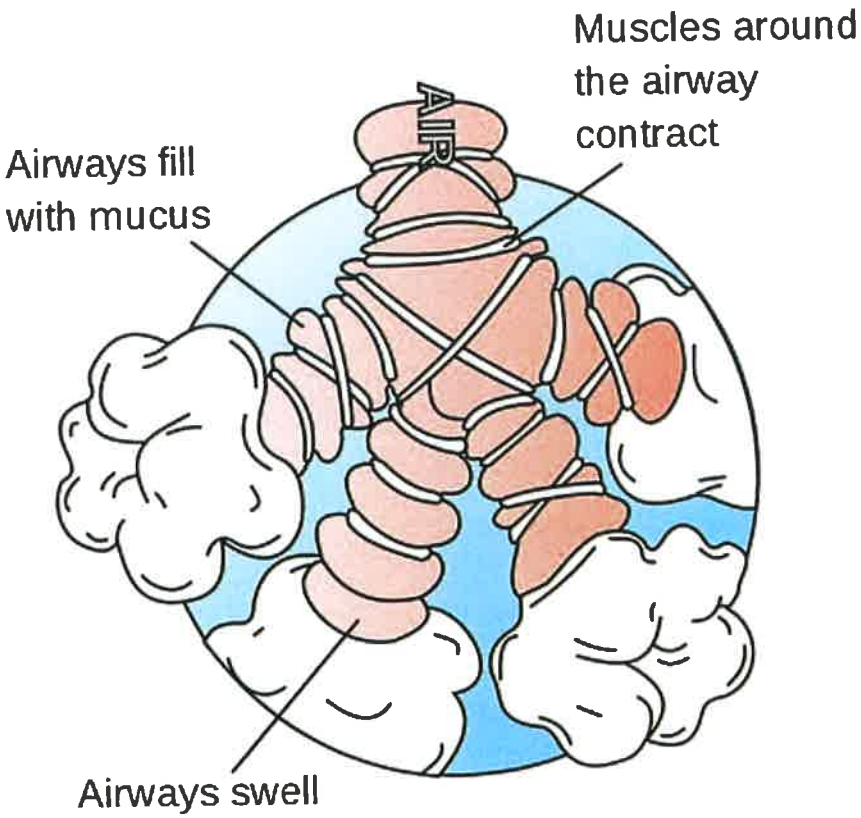
In people who have had a history of asthma or in asthmatics who feel asymptomatic and controlled, it has been shown that despite partaking in normal day to day activities and having normal pulmonary function tests many lung units can lay behind closed and blocked airways . These individuals seem to be very susceptible to provocation by airway irritants such as exercise, cold air or regulator generated saltwater mists. Medical provocation agents can be used to provoke asthma in some pulmonary function tests.

While some people think they grow out of asthma this might not be the case. A lot of people who appear to grow out of asthma subsequently develop asthma in their 30's and 40's again. Approximately about 7 to 8% of the population seem to have asthma and of those somewhere between 80 and 90% have exercise induced (or worsened) bronchospasm . is is a particular problem in diving. Whilst on the surface if one becomes wheezy while exercising one can stop and seek relief but underwater however this can't be done as one has to ascend in a safe manner both in an attempt to prevent pulmonary barotrauma of ascent and also playing heed to their compression/ decompression profile requirements.

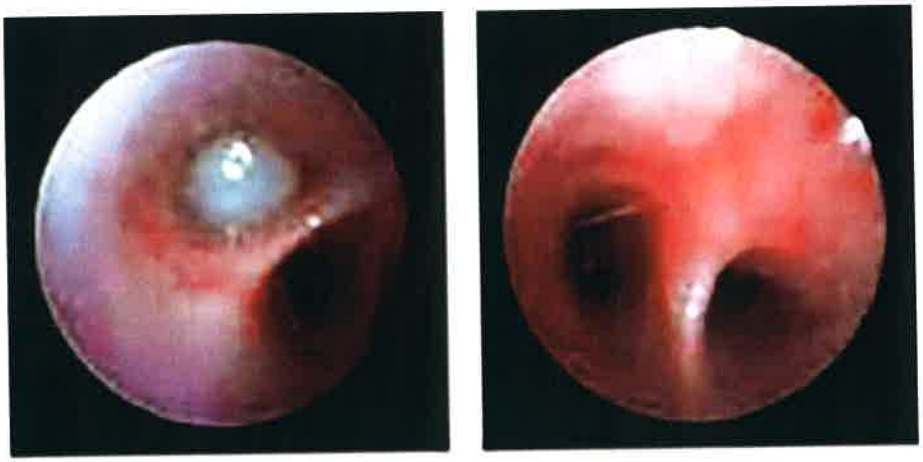
Before an asthma episode



After an asthma episode



Mucus plugs/airway castes.



Mucus plug blocking one airway and inexplicably not the other side.

So what do the experts say ?

Strauss (USA) suggests that a history of asthma is disqualifying if there has been any asthma attacks in the preceding two years or on medications are needed for relief or if there has ever been an episode of exercise induced bronchospasm.

Lineweaver (USA) is more adamant, he says never, once an asthmatic always a asthmatic and one should not dive.

Davis (New Zealand) suggests that any person with active asthma shouldn't dive. Anyone with childhood asthma or asthma symptoms previously might be allowed dive if they have full normal pulmonary function test including allergy challenge tests.

Gorman (New Zealand) suggest anyone with any symptoms or suggestions of or having used treatment for asthma in the preceding year should not dive.

Edmonds (Australia) suggests no diving if asthma or its treatment in the last 5 years or wheeze on examination provoked by exercise.

So it would appear that both the Americans and the Australian/New Zealanders have adopted very strict guidelines to asthma and diving.

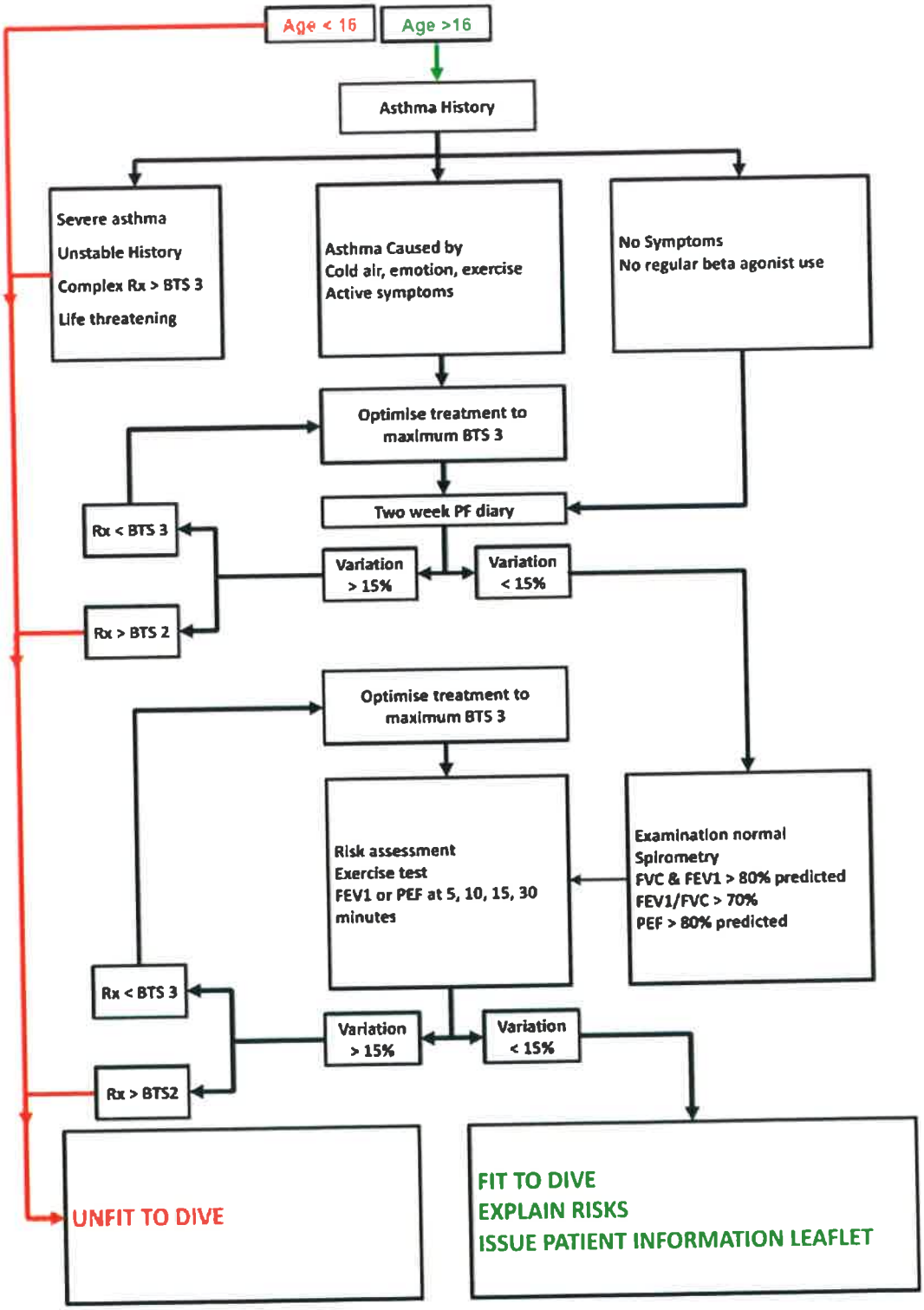
e UKDMC however have taken a much more liberal approach. It doesn't suggest all asthmatics be allowed to dive but only those with well controlled asthma and demonstrating no evidence of airway trapping. e UKDMC guidelines have been adopted by CFT. e guidelines are on the UKDMC website and any asthmatic wishing to dive CFT should familiarise themselves with the guidelines

e flow sheet indicates what criteria anyone with a history need to meet if they wish to dive. Following on the adoption of these guidelines these guidelines, the CFT NDO has made arranged pulmonary function testing free of charge to CFT members.

However even those passing the pulmonary function tests also need to keep a day to day diary of their pulmonary function which can be self monitored using a peak expiratory flow rate metre and documenting their

UKDMC

Asthmatic diver algorithm



pulmonary performance on a regular basis in the manner that diabetes are expected to monitor their blood sugars.

Diving is then allowed if they have not needed any form of asthmatic relief medication (eg Ventolin) within 48 hrs of diving and they have had no decrease in their pulmonary testing performance as monitored by themselves and keeping within the UKDMC advisory guidelines for self monitoring.

So whilst many CFT members might feel aggrieved that they are now expected to comply with UKDMC guidelines, these are and have been described by DAN as being the most liberal guidelines in the world. ey allow people who heretofore might have been disqualified from diving to dive but they have to for their own safety to comply with the guidelines. ■

References can be supplied by the author on request.