

Oxygen Toxicity Protocol

by Scott Hunsucker

The purpose of this protocol will be to establish standard operational procedures for dealing with in water oxygen toxicity events by divers of the Woodville Karst Plain Project. These techniques are not recommended for anyone's use except WKPP personnel. WKPP has removed the contact numbers on this web published document, the surface manager will always have them at the appropriate site.

I. Possible Causes

- A. Prolonged exposures to elevated PPO₂'s.
- B. Sudden spike in PPO₂ (i.e. switching gases).
- C. Use of improper deco gas or use of gas at the wrong depth.

(This should NEVER HAPPEN)

II. Signs and Symptoms

- A. Convulsions
- B. Visual Disturbances
- C. Ringing in the ears
- D. Nausea
- E. Muscle twitches, especially facial
- F. Irritability
- G. Dizziness

III. Assessment

Particular attention needs to be given to maintaining the divers airway, primarily after the seizure has ceased. It should be noted that the diver will NOT be breathing immediately following the seizure. This is a normal reaction and is to be expected. The diver should resume spontaneous respiration within 60 seconds. The diver should be carefully observed for the end of the tonic/clonic (seizure) period. During this period nothing should be done.

Care also needs to be given to the divers buoyancy. It is important that the diver remains close to the depth at which the seizure first occurred in order to prevent possible problems with decompression or air gas embolism (AGE)

IV. In Water Response for Tonic/Clonic episode w/o aspiration

- A. Observe the seizure activity and stay close enough to the diver to prevent buoyancy problems.
- B. After the seizure has stopped, maintain the diver in a face down (prone) and horizontal position. Check pulse.
- C. If at all possible, transport the diver to the appropriate trough. The diver should ascend NO MORE than 10'. Descending to a deeper trough would be preferred. Transport needs to be carried out as soon as the seizure ceases and BEFORE respiration resumes.
- D. Secure the diver in the trough. Place the diver on 20/20 mix or back gas (to lower PPO₂). Place the regulator in the divers mouth and purge for a few seconds. Check pulse again. This also needs to be carried out before respirations resume.

- E. Notify a support diver that there has been an oxygen toxicity episode, give them the divers name, depth, and time of oxygen toxicity event; at this point the support diver should immediately inform the surface manager.
- F. Watch for the divers respirations to resume. Check the pulse again. If no spontaneous respirations occur within 60 seconds initiate artificial respiration. This should be done by use of the purge valve of the regulator. Purges should last for no more than 2 seconds, with an exhalation phase of 2-3 seconds. It will be necessary to manually open the divers airway and hold it in that position. This is done simply by lifting the chin upwards.
- G. Once the diver has resumed respirations, note the time and wait for the diver to regain consciousness. The diver will be confused and may be combative for several minutes following, this is normal and to be expected. During this time talk to the diver to reassure him and maintain control. Once the diver is fully conscious, he should spend 15 minutes on a mix with a lower O2 percentage before resuming decompression. Deco should be resumed at the point that the diver became toxic.
- H. After the toxicity episode the diver should be attended by a safety diver for the remainder of his/her decompression. This diver may well tox again and at NO TIME should they be left alone.
- I. If the diver is wearing a full face mask w/ Q.D. regs, replace the gas line into the mask w/ a mix containing a lower oxygen content. Secure the diver in the trough and wait for him to regain consciousness. Notify support diver to inform surface manager. Keep the diver on the lower mix for 15 mins before allowing them to resume deco and watch carefully.

V. In water response for Tonic/Clonic episode with aspiration.

NOTE: Preventing aspiration is of utmost importance. Diligent attention needs to be given to the divers airway. If the regulator pops out of the divers mouth IT IS IMPERATIVE that the either the divers head is out of the water or that a regulator is replaced BEFORE respirations resume. The diver must stay in a prone (face down) position while being rescued.

- A. Follow above steps for non-aspiration episode. If it appears that the diver aspirates proceed as follows.
- B. Inform support diver that the diver in question has aspirated, they in turn will inform surface manager.
- C. As long as the divers airway never relaxed underwater, then there should only be a small amount of water in the lungs. There is nothing that we can do about this underwater. The diver will most likely cough violently after he regains consciousness, therefore he will need to be watched very closely to prevent further damage.

VI. Surface responsibilities

- A. Upon being notified of an oxygen toxicity event, write down all information given. It would be wisest to assign someone as a note taker. Careful documentation will be needed. A copy of divers name, depth and time of onset, deco status at time of onset and profile for dive, should be prepared in case diver has to be transported to the chamber.
- B. The surface manager is to call or assign one person to call Tallahassee Community Hospital ER and advise them to let the chamber personnel know of the event. It might not be necessary to have the diver transported, but the forewarning of necessary personnel is advisable. If the diver has aspirated it is necessary to let them know, and that we will be coming to them as soon as it is safe to transport.

Recommendations:

1. Regulator retention straps for all decompression bottles.
2. Better mouth pieces on decompression regulators to facilitate retention in case of seizure.

3. Full face masks with quick disconnects for exploration team and divers with very long exposures.
4. Specially trained and designated safety divers, these divers should not be considered part of the support team. If this is not feasible than periodic training of all safety divers should be performed.