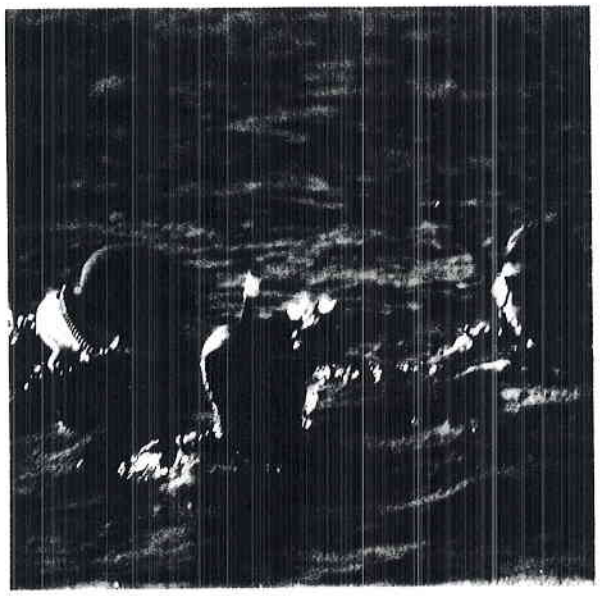
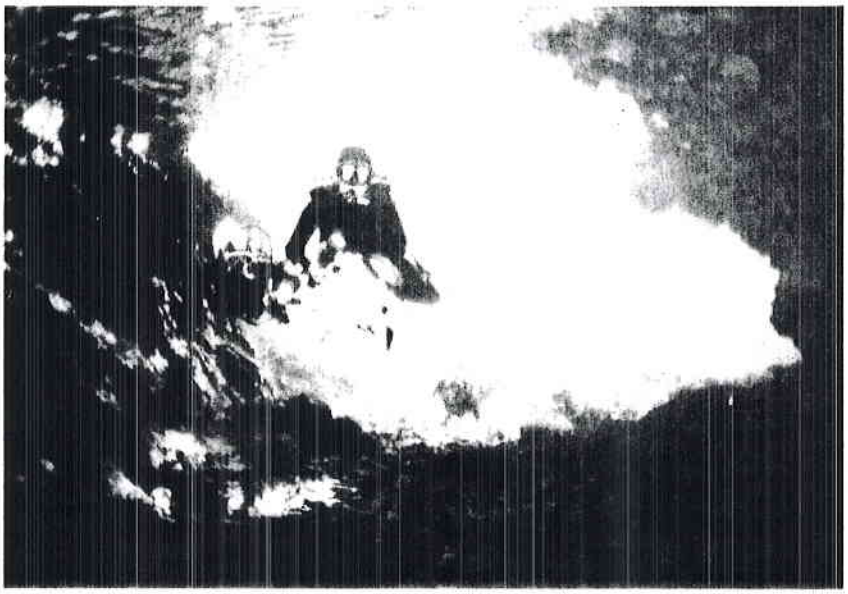
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SCIENTIFIC DIVING METHODOLOGY



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- Nitrogen Narcosis

As the partial pressure of inert gas (Nitrogen) increases with depth, it dissolves in greater quantites in the membranes of the neural junctions. Narcotic effect is very similar to alcohol.

Depth fsw (mts)	Symptom
100 - 200 (30-60)	Light headness, loss of fine discrimination, euphoria.
200 - 300 (60-90)	Poor judgement and reasoning slowed reflexes, peripheral parathesias, overconfidance.
300 - 400 (90-120)	Progressive depression of sensorium with hallucinations loss of memory. Unconsciousness.

Objective changes are measurable at 100 fsw on air and increase in severity as depth increases. A kind of acclimatization occurs in divers who are diving deep on air. Symptoms disappear very rapidly by ascent. Hypercapnia is aggravating narcosis.

HYPOXIA

This is mainly caused in diving by the use of close or semi-close diving equipments It may also occur with the use of longly stored steel tanks where the partial pressure of Qxygen decreases below % 16 because of oxidation.

The symptoms and signs of hypoxia become obvious when the arterial Oxygen tension drops below 50 mm Hg and the tender realises the signs generally rather then the diver himself. A rapid fall causes loss of consciousness. With slower falls an observer may note poor coordination. Diver experiences fatique, headache and amblyopia.

Treatment is cardio-Pulmonary resuscitation using % 100 Oxygen. Care must be spent on equipment and air quality to prevent this pathology.

OXYGEN TOXICITY

Oxygen itself is toxic over pressures of 400 mm Hg. This time and pressure related pathology never seen among SCUBA divers. It is seen in the following situations.

a- Closed and semi-closed rebreathing apparatus.

b- Saturation diving.

c- Decompression on oxygen.

d- Therapeutic recompression.

Two forms of toxicity are encountered.

1- Pulmonary O_2 toxicity.

2- Central nervous system toxicity.

- Pulmonary O_2 toxicity mostly occurs during recompression treatments. Alveolar lining break-down because of the hyper-oxides and the intersistiel space widens while the endotelium of the capilleries get thicker. Pulmonary toxicity develops in long terms.
- Central nervous system toxicity has rapid onset and the symptoms are:

Over 3 ATA oxygen tensions, onset is so rapid ant it is never allowed up to these pressures except in hyperbaric oxygen treatments.

Symptoms can be remembered with the first initials very easily "VENTID" as the warning symptoms.

V = Visual disturbances
E = Ear disturbances
N = Nausea
T = Twitching
I = Iritability
D = Dizziness

Generally convulsions, similar to grand mal seizures occur. Signs and symptoms disappear rapidly when the O_2 pressure reduced.

BREATHING GAS CONTAMINATION

-CO (Carbon Monoxide) poisining.

Carbon monoxide is a colorless, odorless and tasteless gas which reacts with hemoglobin chemically. This prevents oxidating of hemoglobin. there fore blood can not transport oxygen to the cells.

Concentration of Carbon Monoxide is usually expressed in ppm (particules per million).

Main sources of CO in the diving are; improper compressor lubrication (flashable oils), entry of exhaust fumes into the intake of compressor,production of humanbeings. Since the CO has an affinity 210 times of oxygen, for hemoglobin it is very dangerous. Levels more then 10 ppm are not allowable in breathing gases.

Clinical manifestations include, headache specially in the frontal zone, dyspnea on exertion, confusion, collapse, unconsciousness, coma and death.

Treatment is depends majorly on hyperbaric oxygen, steroids and alkalic infusion solutions.

- Oil contamination.

Oil seperators which are not working well and misuse of oils may cause too high oil mist levels in the inspired gas. Oil mist can cause lipoid pneumonia in high doses and also gives a bad taste and odour.

HYPOTHERMIA

Hypothermia is coused by exposure to conditions in which body heat production is less than the heat loss. This condition leads to hypothermia in time. In most of the seas a protective suit is needed in order to have a comfortable and a cost effective diving. Fater conducts heat 25 times as rapidly as air. Energy required to raise $1^{o}C$ a same amount of water if compared to air is 1000 time more. Failure in maintaining the body heat at $36.5^{o}C$ results a drop in the core temperature and some defence mechanisms of the body are activated. 1^{o} - 2^{o} C drop make the body to shiver. This little drop in core temperature is enough to worsen the manual dexterity. Further drop in core temperature, will develop much more serious disorders such as confusion and disorientation. In land death occurs at core temperatures of $24^{o}C$ but in water this will be between $35^{o}C$ and $31^{o}C$.

Treatment includes hot drinks, warming of the body by immersion into warm water or active core rewarming.

Prevention during diving must be the very first step. Divers who start to shiver must leave the water.

INFECTIONS

- Schistosome Dermatitis:

Named "swimmer's itch" is more likely happen at the surface. Schistosome cercariae is the larval stage of this parasite. Has a life-cycle; adults in mesenteric vessels of shore-loving birds; miricidae in sea snails and cercaria free swimming larvae. These larvaes can peretrate the human skin and cause itch. They cannot penetrate into vessels and active foreign body reaction of human destroys them. Prevention is obtained by the use of wet suits. Treatment is symptomatic.

- Erysipeloid :

A gram positive bacillus. Erysipelothrix rhusiopathie is the responsible bacteria. Contact with fish, shell fish lead to abrasions and cause infection, usually limited to skin. Clinically skin injury appears to heal for the first week then a sudden sharply defined purplish red area spreads outward from the injury site, adjacent joints become stiff and painfull. A rare complication is endocarditis.

Systemic penicillin and local ointments should be used.

- Swimming Pool Granuloma :

Mycobacterium Marinum is the causative organism. This organism may penetrate through skin and develop infection.

Clinically granulomas develop over bony parts of the injured sites. Onset is within 3-4 weeks. Discrete red papuls occur. They may become indurated or ulserated.

- Treatment :

Trimethoprim-Sulfamethoxazole can be effective.

- Micotic infections :

Trichophyton is very common in the feet of divers.

- Primary Amoebic Meningo Encephalitis :

Amoeba-Naegleria is the causative protozoo. Infection occurs only in fresh water. Organism probably enters the brain through nasal mucosa and alfactory nerve. Mostly reported after lake dives. Clinically incubation period is 3-7 days. A sudden on set of headache, pyrexia progress over 3 days with vomiting, neck rigidity, disorientation and coma and death. It is usually fatal. Amphotericin 8 is the first drug to choice. Prevention is not to dive in contaminated fresh waters.