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28 Change of physiological parameters for divers in hyperbaric hellox environment of 31 ATA

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The hyperbaric environment at the pressure more than about 21 ATA (Atmosphere Absolute) causes high pressure nervous syndrome (HPNS) which generates physiological tremor and lowers the attention and the function of sensorimotor (Brauer et al., 1969). The detection of HPNS and its prevention have been an important problem to work safely in the sea-bed. it is the purpose of the present study to confirm the human security for the exploitation of natural resources in the bottom of open-sea around 300m which corresponds to the depth of the continental shelf in the neighboring waters of Japan.

The physiological parameters measured were the microvibration (MV), which is mechanical vibration on the skin surface, the eyelid and the thenar and the electroencephalogram (EEG) at Tq site and ***02*** were measured at various atmosphere conditions. MV was used to detect the omen of HPNS, and EEG was employed to check the lowering of the level of consciousness.

The period of the experiment was one month: the number of days required for precompression, compression, pressure holding, decompression, and post-compression were 6, 1, 7,11, and 5 days, respectively. The compression rate was set at a slow rate of 25m/hr. The partial pressure of oxygen gas at pressure holding was 0.3ATA. The subjects were four males (28 to 33 years), of whom two were scientists and two were professional divers. MV and EEG were measured with MV pickup (MT-3T) and disk type electrode, in the supine position and with the eyes closed. The fast Fourier transform of the data during every ten second epoch was measured from a signal processor ATAC-450 and the square root of power spectrum was obtained in the frequency range from 3 to 30 Hz. The maximum peak frequency and the amplitude at the maximum peak frequency were evaluated from the power spectrum. The mean values of the peak frequency and of the amplitude for each subject in precompression (Le., 1ATA) days were used as respective control values (Le., 100%). The mean values for each of the other atmospheric conditions for each subject were represented as a percentage of the baseline mntroi value.

The amplitude of MV increased after compression compared with the value at precompression, and this observation was emphasized in the eyelid MV postcompression (Le., lATA), whereas the peak frequency of MV did not change significantly throughout the experiment. A remarkable hyperbaric effect was observed, however, in the EEG peak frequency. The peak frequency of the power spectrum was lowered during each phase of compression, pressure holding, and decompression respectively. As the high pressure nervous syndrome symptoms was not overtly recognized here, especially as might have been expected during compression, MV could not be an indicator of symptoms of HPNS. The MV amplitude of the eyelid, whose muscles are composed in greater part of fast twitch fibers, increased still more post-compression. Therefore, the influence of high pressure on skeletal muscle must be considered as a source of the observation, particularly the ballistocardiogram component of the MV. The EEG denoted a lowering in the level of wnsciousness during pressure holding, and is especially noteworthy for us as relevant to the safe operation of humans in a hyperbaric environment.