EFFECT ON THERMAL BALANCE OF BREATHING COLD GAS DURING DEEPER DIVING.

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INTRODUCTION

In deep saturation diving, the divers thermal balance are influenced by the temperature of the breathing gas and the hot water supply to the diving suits. Using heliox as breathing gas, a significant respiratory heat loss may be experienced. Reduction of divers body core temperature, with or without symptoms, have been reported (1-6). The aim of the present studies was to investigate whether a cooling of the body core could take place at high ambient pressure without mental awareness or compensatory heat production.

METHODS

Dry and wet experiments were performed. During all trials the skin temperature was kept within comfortable limits while the inspired gas temperature was regulated to the lowest comfortable level. At rest and in a dry chamber atmosphere, 6 divers inhaled the cool gas mixture for 2 hours at 37 bar (1,2) and 4 subjects for 3 hours at 46 bar (4). Diving in 4°C water with standard deep diving equipment were performed by 4 divers for 3.5 hours during work routines at 21 bar (7). Similarly, 3 divers performed 3 hours work and rest routines at 37 bar (8).

RESULTS AND CONCLUSION

No significant reduction in rectal temperature was recorded during the wet trials. Mean skin temperature was 36°-37°C and accepted lower inspired gas temperatures were 11°-13°C (21 bar) and 16°-18°C (37 bar) for extended periods (7,8). In the dry situation, all divers had significant reductions in core temperature when breathing a gas temperature of 16°-18°C (37 bar) and 19°-21°C (46 bar). This cooling did not cause any discomfort for 9 of 10 divers. A comfortable mean skin temperature were obtained at 32.5°-33°C. Thus, our results from the dry experiments at 37 bar and 46 bar indicate that it is possible to induce heat losses that result in symptomfree core cooling (1,2,4). It has not been possible to produce such situations when simulating diving with hot water suits due to the high level of acceptable and comfortable skin temperature and thereby a negligible heat loss over the skin. In the wet test situations that resultated in nearly stable rectal temperatures, the divers lost about the same amount of heat through the respiratory system as they produced by metabolic processes.

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