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SUMMARY REPORT

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OFFICE OF NAVAL RESEARCH

1965-1976

In Vivo Effects of Oxygen at Varying  
Pressures on Erythrocytes and Brain

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The following is a list of the major scientific accomplishments achieved under support of this contract. Details of all of them are to be found in the publications derived from these studies.

1. First evidence of hemolysis in a human after exposure to oxygen under high pressure (OHP).
2. Evidence for a relationship between in vivo tocopherol status and central nervous system toxicity (seizures) during exposure to OHP.
3. Demonstration of in vivo inhibition of RBC cholinesterase by OHP and definition that it was due to peroxides.
4. First proof of in vivo peroxidation of lipid in RBCs (produced by hyperoxia).
5. Description of changes in RBC glycolytic intermediates due to OHP and associated enzyme changes.
6. Determination of the exact biochemical and functional events leading to in vivo destruction of RBCs by hyperoxia.
7. First evidence for in vivo consumption of tocopherol during exposure to hyperoxia.
8. Demonstration of in vivo changes in fatty acid composition of RBCs induced by hyperoxia and their relation to RBC destruction.
9. Evidence that hyperoxia of any degree could produce hemolysis if prolonged enough.
10. Demonstration of changes in WBCs produced by hyperoxia.
11. Effects of drugs on susceptibility of tissues (RBCs and brain) to hyperoxia.
12. Role of circadian rhythm in susceptibility to hyperoxic seizures.

13. Proof of in vivo production of  $H_2O_2$  in RBCs and brain during exposure to hyperoxia.
14. Proof that senescent RBCs were those most susceptible to in vivo hyperoxia.
15. Study of factors that influence oxygen transport of RBCs.
16. Effect of drugs on red cells in humans that might influence susceptibility to hyperoxia.

PUBLICATIONS OF STUDIES DIRECTLY RELATED  
TO THIS RESEARCH PROJECT

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