Measurements of blood PO_2, PCO_2, pH, HCO_3^- concentrations and lactic and pyruvic acid concentrations were performed during diving; during the inhalation of 100% nitrogen and following the administration of massive doses of NaCN.

PO_2 falls during diving and N_2 administration, and rises following CN^- administration reflecting the fall in O_2 supply in the former cases and the decrease in intracellular O_2 utilization with CN^-. CO_2 tensions fall during N_2 and CN^- administration and increase during diving reflecting the net balance between CO_2 excretion by the lung and CO_2 generated by buffering during anaerobiosis. H^+ increases during diving and tends to fall during N_2 and CN^- administration reflecting the net balance between H^+ generated during anaerobiosis and H^+ equivalents lost by hyperventilation. Plasma HCO_3^- falls because of anaerobically generated H^+. Plasma lactic acid concentrations increase during all three procedures.

These studies establish that prolonged survival during complete anaerobiosis is based on the ability of the turtle to obtain sufficient energy for periods up to 5 days from glycolyses.

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THE VENTILATORY RESPONSE TO CO_2 IN A DIVING MAMMAL, THE HARBOR SEAL, *Phoca vitulina*

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It has been suggested that one of the adaptive mechanisms which permits prolonged diving in the seal is a reduction in the sensitivity of respiratory centers to CO_2. However, data supporting this possibility are limited because of the technical problems associated with gas measurements. These data were extrapolated to suggest that the respiratory centers of the seal are unresponsive to concentrations of CO_2 in inspired air less than 10%.

The availability of a rapid acting infrared CO_2 analyzer has permitted an accurate quantitative estimation of the ventilatory response to CO_2 in the seal. The ventilatory response to the following mixtures of CO_2 in air (4%, 6%, 10%) was determined in 6 trained seals. For comparison similar data were obtained in 5 untrained humans (H. sapiens). CO_2 stimulus-response curves were constructed and the slopes of these curves $\frac{\Delta VE}{\Delta P_A CO_2}$ and the intercepts of these curves were compared in the 2 species.

The mean slope in the seals was 0.32 L/min/mm Hg as compared with 1.52 L/min/mm Hg in the humans. The threshold was higher in the seal.

These data are consistent with a lower respiratory center sensitivity to CO_2 in the seal as compared with the human and presumably explain the higher resting alveolar CO_2 tension found in this animal. These data establish that the seal does respond to increases in body fluid CO_2 tension, albeit sluggishly, but supports the hypothesis of diminished chemosensitivity as an adaptive mechanism during problonged diving.

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