In the case of muscle it would appear that the volume of ECF is quite low, the chloride space averaging only 13% (concentration per volume of H_2O and not weight). Elasmobranch muscle cells are low in Na^+ and high in K^+ suggesting that the general mechanism of maintaining ion gradients in muscle is the same in the elasmobranch as in mammals.

In the case of brain, the mean chloride space is approximately 3 times that of muscle and it would appear that some of brain chloride is intracellular in location. In addition the distribution of values of Na^+ and K^+ appear to show 2 populations of cells some of which are rich in Na^+ and Cl^- and some of which are rich in K^+. This dual population has also been found in mammalian brain cells and it has been suggested that the NaCl-rich cells are glial; while the NaCl-poor cells are neuronal.

In general, these data suggest that although the absolute concentrations of these ions differ markedly from the mammalian pattern, ratios between ECF and ICF are similar suggesting basically functionally similar mechanisms for maintaining ion gradients.

This work was supported in part by a grant from the National Science Foundation and in part by a grant from the United States Public Health Service (HE-05059-04).

1962 #25

PROBABLE FUNCTION OF THE ALKALINE COELOMIC FLUID OF THE FRESHWATER TURTLE, Pseudemys scripta elegans

H. V. Murdaugh, E. D. Robin, W. Pyron, and E. Weiss, University of Alabama, Birmingham, Ala., and University of Pittsburgh, Pittsburgh, Pa.

In 1929 Homer Smith demonstrated that coelomic fluid in the freshwater turtle is more alkaline than plasma and contains a higher concentration of HCO_3^- (circa 100 mM/L as compared with 35 mM/L in plasma). No definitive function has been described for this fluid.

Recent studies in this laboratory have demonstrated that during diving the turtle uses anaerobic metabolism for energy and as a result generates large amounts of lactic acid. The ability of lactic acid to penetrate coelomic fluid was compared with the penetration by mineral acid (HCl). Coelomic fluid pH and HCO_3^- concentrations were measured for periods up to 5 hours following the administration of approximately 5 meq of H^+ in the form of either lactic or hydrochloric acid. These studies showed that mineral acid penetrates coelomic fluid quite slowly as compared with the rapid penetration of lactic acid. Preliminary measurements of lactic acid concentrations in plasma and coelomic fluid suggest that either equilibrium was not attained in the period of study or that simple non-ionic diffusion does not explain the penetration of lactic acid into coelomic fluid. However, it is clear that a substantial amount of infused lactic acid is buffered in this compartment. It is possible that a function of the alkaline coelomic fluid is to buffer endogenously generated lactic acid arising from anaerobiosis during prolonged diving.

This study was supported in part by a grant from the National Science Foundation and in part by a grant from the United States Public Health Service (HE-05059-04).