puncturing the thick peri-oral surface of the sea urchin, and the sea water bathing the sea urchin were analyzed for total CO_2, pH, and pCO_2. Using the Henderson-Hasselbach equation, with an alpha value of 0.0545 and a pK′ for sea water of 6.17, the concentration of carbonic acid in sea water and coelomic fluid was calculated.

Sea urchins were maintained in sea water baths of varying concentrations of bicarbonate (1-50 millimoles/liter) and under varying partial pressures of CO_2 in sealed air-tight jars.

As the sea urchins were maintained in the baths for increasing time periods, up to 75 hours, it was noted that the bicarbonate concentration of the coelomic fluid slowly came into equilibrium with the bicarbonate concentration in the surrounding sea water. No relationship suggesting an active mechanism involving pCO_2, pH, or total CO_2 could be observed.

It is believed that the bicarbonate concentration of the coelomic fluid reflects endogenously produced carbon dioxide. The small area of the coelomic membrane lining the body cavity of the sea urchin relative to the large volume of coelomic fluid, presents a limited diffusion surface for the bicarbonate; the quantity of sea water under natural conditions obviates the possibility of attaining bicarbonate equilibrium.

These considerations suggest that diffusion limitation rather than active transport is responsible for the bicarbonate concentration qradient across the sea urchin coelomic wall.

Active Transport by Renal Tubule Cells

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Three different approaches were used to elucidate certain physicochemical characteristics of divalent ion transport by renal tubules of glomerular and aglomerular fish kidneys. Transfer rates for magnesium ions were determined in intact fish using clearance techniques, in isolated and perfused kidneys, and in thin slices of fish kidneys maintained in synthetic media. Experiments were designed to determine whether the active transfer of magnesium ions is limited by a maximal rate (Tm), whether transport is via a mechanism shared by other divalent cations, and whether the transfer process is dependent upon aerobic phosphorylation as an energy source. Also, preliminary experiments were conducted to characterize the mechanisms accountable for the active cellular transport of creatine and trimethylamine oxide.

Perfusion of the isolated aglomerular kidney of Lophius could provide a very useful method for studying the kinetics of the tubular transfer process because it obviates the complication of glomerular filtration and

permits careful control of the chemical constitution of the perfusate. However, after many attempts the procedure was abandoned as impractical because of the very low rates of urine formation and the presence of protein in urine formed by the isolated perfused kidney. Clearance studies were used to establish standard rates of tubular excretion, but the effectiveness of this procedure was found to be limited because of the difficulty in controlling extra-renal effects of metabolic inhibitors and pharmacologically active agents. *In vitro* procedures utilizing thin kidney slices showed the most promise, and plans for next summer call for intensified studies of active transport of the compounds employing Warburg techniques.

Studies on the excretion of naturally occurring nitrogenous end products disclosed that creatine transport is a much more active process than that involving either creatinine or trimethylamine oxide. Normal excretory rates were determined, but to date only preliminary observations have been made on the nature of those biochemical and enzymatic events which underlie transport of these weak bases.

Incidental observations disclosed the relative specificity of renal blockade whether induced *in vitro* by high phenol red concentrations or by a medium containing high potassium and no calcium, in that these conditions did not depress oxygen uptake by kidney slices. The acetylation of p-aminohippuric acid by dogfish kidneys was again noted, and clearances were measured with high plasma PAH concentrations to complement earlier studies made at low levels.

Auditory and Visual Communication in the Herring Gull, Larus argentatus

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Field studies on herring gulls, utilizing recorded calls played back to the birds, allow the designation of at least four principal calls of adult birds: (1) food-finding call; (2) crowing or trumpeting; (3) alarm call; (4) an unnamed call, easily characterized when heard. There may also be a "departing call', like that reported for insects. The food-finding call was used to attract gulls from some distance and, by thus separating auditory and visual communicative mechanisms, to study the food-finding behavior. The alarm call has a powerful repellent effect on gulls and may prove to be useful where it is desired to drive them away. The young gulls apparently develop full vocal ability at about three years of age. Before that, they have only high pitched squeaks and rattles. The great black-backed gull, *Larus marinus*, has a similar series of calls, pitched about one octave lower than those of the herring gull. Each species reacts to the calls of the other. Laughing gulls, *Larus atricilla*, in New Jersey also react to alarm calls of herring gulls recorded in Maine.