bicarbonate; excretion of a sodium bicarbonate load is slow and not effected by the gills. The two species respond similarly with respect to branchial elimination of CO_2 which is partially inhibited by Diamox. Unlike the dogfish, the branchial carbonic anhydrase of the freshwater catfish seems to facilitate the formation of diffusable CO_2 from HCO_3^-, rather than supplying ions for an exchange mechanism.

Excretion of Sodium Bicarbonate and CO_2 by the Fresh-water Catfish, *Ameiurus Nebulosus*

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As recorded previously (Am. J. Physiol. 183:155, 1955), a carbonic anhydrase (C. A.) which is sensitive to inhibition by Diamox is present in the kidney of the fresh-water catfish. Intraperitoneal administration of sodium bicarbonate leads to alkalinization of the urine and renal excretion of sodium and bicarbonate. Sodium bicarbonate is not excreted by the gills. Branchial CO_2 excretion is partially inhibited by Diamox, possibly in consequence of inhibition of C.A. in red cells. The branchial C. A. seems to facilitate the formation of CO_2 from HCO_3^-, rather than to promote an ion exchange mechanism. These results are in contrast to the marine dogfish, *Squalus acanthias*, which has a Diamox sensitive carbonic anhydrase in the gills but not in the kidney; and in which exogenous sodium bicarbonate is entirely excreted by the gills (apparently by an ion exchange mechanism) and does not alkalinize the urine.

The Effect of Chlorothiazide on the Urinary Excretion of Sodium Chloride, and Potassium in the Marine Dogfish, Squalus Acanthias

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Chlorothiazide is a diuretic which in man and the dog inhibits the reabsorption of sodium and chloride, supposedly by an inhibitory effect on carbonic anhydrase, but possibly by a second mechanism as well. The kidney of the marine dogfish contains no carbonic anhydrase sensitive to inhibition by Diamox. Therefore, this kidney was considered suitable for the study of the carbonic anhydrase independent diuretic effect of chlorothiazide. Fifty to 200 mg of the drug were given iv. to 8 dogfish weighing between #10.5 and 7.3 kg, after collection of control urine and blood specimens. The second urine and blood specimens were taken 2½

to 6 hours after the injection. Blood plasma, and urine samples were analyzed for pH, total CO_2, sodium, chloride, and potassium concentrations.

In blood (or plasma) the total CO_2 and pH increased after chlorothiazide in 6 out of 8 experiments. In this respect the action of chlorothiazide resembles that of Diamox in the dogfish. Changes in the urine volume, pH, and urinary excretion of sodium, chloride, potassium, titratable acid, and total CO_2 were variable and apparently not related to chlorothiazide. It is inferred that chlorothiazide, like Diamox, has no effect on the tubular reabsorption of sodium in this species. The increase in plasma total CO_2 and pH is less than that induced by Diamox. This may be attributable to the failure of the former to enter the red cell, or may be merely a dose difference.

Electrolyte Metabolism of the Swimbladder and Gastric Mucosa

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While direct evidence is wanting, it is believed that the swimbladder secretes gas by acidifying blood. Carbonic anhydrase has a critical role. Because the acidification mechanism would require intracellular H^+ production, it is possible that carbonic anhydrase does not simply maintain a low intracellular pH.

The swimbladder mucosa of the eel (Anguilla vulgaris) was not viable even when mounted, bathed by saline and oxygenated within 10 minutes of pithing. In several instances, the initial resistance was as high as 2000 ohms cm^{-2} but the resistance declined within one hour to 200 ohms. Gastric mucosae from the same animals, mounted subsequently. secreted H^+ and maintained a normal potential. Only one of several possible factors responsible for the resistance deterioration was implicated, carbon dioxide. In no instance was there a transepithelial potential or H^+ secretion.

Though there is an important association between acid secretion and the gastric electrical potential in amphibia and mammals, it is not known where this is obligatory. The importance of the association was demonstrated by spontaneous secretion of H^+ and development of a typical potential by the isolated stomachs of two teleosts; eel (Anguilla rostrata) and catfish (Ameiurus nebulosa). Even though the dogfish (Squalus acanthias) gastric mucosa was isolated with ease, it did not develop either a potential or spontaneous H^+ secretion. The undifferentiated gut of a cyclostome (Myxine limosa) did not develop a significant potential or pH changes.