tion was independent of urine flow. All the flow rates of these investigators now appear to have been above the augmentation limit. Our observations confirm and reconcile the findings of both these groups of workers.

The clearance ("maximal") of our 3 subjects averaged about 16 cc per sq m per min. Since the glomerular filtration rate of normal subjects is about 69 cc per sq m per min, potassium must be reabsorbed by the kidney tubules. Since both the rate of glomerular filtration and the rate of potassium excretion remain constant over a wide range of urine flow rates, the rate of tubular reabsorption must also remain constant. Accordingly, the concentration of potassium in the tubular urine may vary widely without causing changes in the rate of tubular reabsorption. Such reabsorption cannot therefore be entirely a passive process resulting from the gradient established by the reabsorption of water.

The factors controlling such reabsorption are now under investigation in this laboratory.

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Hemolytic Action of Fluorides on Certain Nucleated Erythrocytes.

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In a study of CO_2 dissociation curves of dogfish blood (Ferguson, Horvath and Pappenheimer[1] it was observed that sodium fluoride added to prevent glycolysis caused a slowly progressive swelling, usually ending after 3 to 10 hours in hemolysis. Hemolysis of fish blood by oxalate has been observed by Black and Irving.[2] The effects of several fluorides, oxalates and other salts have been tested on the blood of various species with nucleated erythrocytes. One tenth molar and molar solutions of the salts were added to 9 times their volume of the blood to be tested, which had previously been defibrinated. The final concentration of the salts was, in one series, one-hundredth molar and, in the other, one-tenth molar. In the first series the final solution bathing the cells would be slightly

[1] Ferguson, J. K. W., Horvath, S. M., and Pappenheimer, J. R., *Biol. Bull.*, 1938, **75**, 381.

[2] Black, E. C., and Irving, Laurence, *J. Cell. Comp. Physiol.*, 1938, **12**, 255.

hypotonic and in the second slightly hypertonic. In the later experiments using molar solutions the more alkaline ones (oxalates, citrates and arsenates) were adjusted by the addition of HCl to a pH between 7.0 and 7.4, as indicated by phenol red. This procedure produced in certain cases significant alterations in the results. The following salts were tested on all the species used—sodium chloride, sodium thiocyanate, sodium fluoride, sodium oxalate. In some experiments the following salts were used, too—sodium citrate, sodium arsenate (mostly dibasic), aluminium fluoride, zinc fluoride. The bloods tested included dogfish *(Mustelus canis)*, tautog *(Tautoga onitis)*, sea robin *(Prionotus carolinus)*, squeteague *(Cyonoscion regale)* and a turtle and a snake (species unknown).

Results. Progressive swelling was not observed after the addition of sodium chloride or sodium thiocyanate. All the fluorides tested produced progressive swelling and (when the observations were sufficiently prolonged) hemolysis of the erythrocytes of all the fish listed above. The nucleated erythroctyes of the turtle and snake were not, however, susceptible to fluoride. The results with oxalate, citrate and arsenate were less regular. Sometimes swelling and hemolysis were produced and it occurred more often with the stronger concentrations. In a few experiments it appeared that even the stronger solutions failed to cause swelling when they were neutralized. This phenomenon suggested a possible explanation of the results.

Fluorides, oxalates, arsenates and citrates might be expected to remove magnesium and calcium ions from solution. The latter 3 anions would remove magnesium less effectively in neutral or acid solution, although they would still be effective in removing calcium ion. The removal of magnesium ion from the susceptible bloods might alter the permeability of erythrocytes in some manner which would result in the swelling and hemolysis *e.g.* by increasing the permeability to cations. However, these results are presented in this incomplete form not so much to indicate an explanation as to draw attention to a phenomenon which has complicated investigations of the transport of respiratory gases by fish blood. Circumstances make it unlikely that we shall be able to pursue this investigation further in the near future.

Summary. The nucleated erythrocytes of certain fishes show progressive swelling and eventual hemolysis on the addition of fluorides. Oxalates and arsenates produce a similar effect but with less regularity. The nucleated erythrocytes of a turtle and a snake did not react in this way.