organisms were isolated. As a precaution the other inmates of the house were inoculated with a *paratyphosus* C vaccine, and, as stated above, no fresh cases of infection arose.

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THE RELATIVE CONCENTRATION RATIOS OF SOME CONSTITUENTS OF THE URINE.

(Abstract.)*

BY

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THE "filtration-reabsorption" theory of renal secretion states that the glomeruli filter off from the plasma its dialyzable constituents, some of which are reabsorbed, together with water, by the tubules, thus leading to a concentration of the remainder: the former are described as "threshold," and the latter as "no-threshold" bodies respectively.¹ If two "no-threshold" substances are present together in the plasma, are filtered off by the glomeruli, and are concentrated in the tubules by the absorption of water, the degrees to which they are concentrated should be the same in each case. The "concentration ratio" is the ratio of the amount present in the urine to that in the plasma (expressed in percentages).² The experiments to be described were performed to determine the relative concentration ratios of some of the so-called "no-threshold" constituents of the urine; urea, inorganic phosphate, and creatinine were chosen for this purpose. They are present in a "free" (that is, dialyzable) condition in the plasma, and appear to be equally distributed between plasma and corpuscles *in vivo*, so that estimations made on the plasma give the amounts available for filtration through the glomeruli at that moment. As, however, it has been stated that urea and inorganic phosphate are present solely in the plasma *in vivo*, entering the corpuscles after the blood is shed, unless precautions are taken to avoid injury to them,³ some preliminary experiments were performed on the distribution of these three substances between plasma and corpuscles in the blood of the cat, since this animal was used for the later experiments. It was found that urea and creatinine were evenly distributed under normal conditions: after injection intravenously, the same even distribution might be found, or there might be more in the plasma, while there was always more inorganic phosphate in the plasma than in the corpuscles after it had been injected into the blood stream.

The experiments on the concentration ratios were performed on decerebrate cats: a solution of the substances about to be examined was injected intravenously, a blood sample taken shortly afterwards, and a further sample after a variable length of time, during which the urine was collected; in some experiments further samples of blood and urine were obtained. The blood samples were oxalated and centrifuged, and the plasma used for the analyses. For calculating the concentration ratio the plasma percentage was taken as the mean of the analyses of the two samples obtained at the beginning and end of the period during which the urine was collected.

It was found that the creatinine was always concentrated to a greater extent than the urea—from two to five times more in the different experiments. This occurs whether the plasma or urinary concentrations vary or remain constant during the course of an experiment. The fact that the results obtained when the plasma concentrations are constant are comparable with those obtained when these concentrations vary, suggests that taking the mean plasma concentration for calculating the concentration ratio introduces no appreciable error.

Comparing the concentration ratios of inorganic phosphate and urea, it was found that the phosphate might be concentrated to about the same extent as the urea, or up

to about three times more; but it was always found to be concentrated to a less degree than the creatinine in the same experiment. The degree of concentration seemed to depend directly on the amount of phosphate injected, being greater when the kidney had to remove a larger amount from the blood stream. If the concentration ratio of urea is taken as unity, those of creatinine and inorganic phosphate relative to this as standard can be plotted on a chart, and it is seen that there is a general parallelism between the ratios of the latter two, which possibly depends on the rate of blood flow through the kidney.

The fact that urea, inorganic phosphate, and creatinine may be concentrated to different degrees by the kidneys during excretion is difficult of explanation on the filtration reabsorption hypothesis. If the modification be accepted that the urea is partly reabsorbed in the tubules,⁴ these experiments show that the hypothesis must be still further modified to admit of partial reabsorption of the inorganic phosphate also. It seems more probable that the tubule cells secrete these substances independently, according to the requirements of the moment. On the other hand, the facts are consistent with the view that selective reabsorption takes place in the tubules, the fluid absorbed varying in composition at different times. A fairly definite relationship was found between the excretion rates of the three substances in experiments in which several samples of urine were obtained: the factor correlating the excretion rates is presumably the blood flow through the kidney.

The experiments give data for calculating the rate of disappearance of the injected substances from the blood stream, taking the initial blood volume to be 5 per cent. of the body weight. Within two minutes of the completion of the injection, 75 to 90 per cent. of the injected urea and creatinine is no longer to be found in the blood; the loss is most rapid at first, and then the rate slackens until a balance is struck between the concentrations in the blood and in the tissues; the concentration in the blood may now remain fairly constant in spite of excretion in the urine, since the tissues act as a reservoir of the substances in question. The injected inorganic phosphate leaves the blood more slowly, and only about 65 to 80 per cent. disappears into the tissues.

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THE DIFFERENTIAL DIAGNOSIS OF SMALL-POX AND CHICKEN-POX.

OBSOLETE DIAGNOSTIC CRITERIA.

BY

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ANYONE who wishes to gain a really sound grounding in this subject will be well advised to assign beforehand their true value to certain traditional criteria with which he may have been equipped as a student. There are certain phenomena which frequently occur indeed, but are not pathognomonic in the hour of trial for the purpose of distinguishing between small-pox and chicken-pox. Into this category fall umbilication, shottiness, palatal and buccal lesions, lesions on the sole of the foot, cropping, uniloculation. Not one of these is a real friend in need; and the first four may prove to be very unreliable in the matter of the assistance which they offer.

In my article in the Jenner Memorial Number of the *BRITISH MEDICAL JOURNAL*, dated July 5th, 1902, on "The differential diagnosis between variola and varicella," the following observations were made: "It is well at once to say that the words 'shotty' and 'umbilicated' are mere broken reeds to lean upon in the matter of diagnosis. The expressions are pernicious in two ways: Their absence in a case suspected to be small-pox is taken as evidence against that disorder, and their presence in a case otherwise suggestive of varicella is held to negative that disease. The words are fetishes, or objects of superstitious worship, which help their devotees as little as do most idols, and

* The full paper is published in the *British Journal of Experimental Pathology*, 1923, vol. 4, pp. 87 and 117.