Observations on a few elements of urine in yellow fever.

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During the actual epidemic of yellow fever, we had an opportunity to make serial examinations, of the urines of patients under treatment at the Oswaldo Cruz Hospital. We were anxious to see what modifications of the elements of the urine occurred during the course of the illness, and also whether by examination of the elements of urine, a diagnosis or prognosis of the disease could be arrived at.

We examined urines of more than 20 patients, in most cases under excellent conditions. The technical methods followed were those indicated by Dr. J. CARNEIRO FELIPPE, all of which were rigourously performed. Later on, applying other processes, using material obtained from S. Sebastian Hospital, we checked the accuracy of our results, by comparing them with those obtained by Dr. FELIPPE.

The general characteristics of urines were found modified in the following way:

*Volume*—Reduced at the beginning of the illness and increased during convalescence. For different reasons, it was not possible to study this point, in order to control the elimination of liquids. Although we missed complete and thorough data, we have a feeling that the volume is reduced in every case during the first days of the illness. This reduction of the volume is more or less proportional to the severeness of the case.

In mild cases, there is a reduction of from 20 to 30 o/o, which reduction is more accentuated in extremely severe cases, being practically nil in the latter. The reduction of the total volume per 24 hours is a phenomenon common to all febrile diseases there being no exception in the case of yellow fever.

*Color*—Topaz yellow during the febrile stage, as in other type of fever; during convalescence the color may acquire a bottle-green shade, owing to the presence of bilary pigments, in large quantity. In certain cases, after the febrile stage, the tint is straw-yellow.

*Odor*—The odor is the same as in normal urines.

*Reaction*—Acid to litmus paper.

*Specific gravity*—Generally higher than normal, however not following in its variation, any systematic alteration. This absence of a systematical variation finds a perfect explanation in the varying and opposed concentrations of some elements existing as solutes in the liquid.

Of normal components, we systematically measured the urea, the chlorides in Na Cl and the uric acid and puric bases which reduce the iodine (RUHEMANN’s reagent).

The concentration of urea varies according to the severeness of the
case. In mild cases, as also in the first days of the illness, its concentration is about 2 1/2 times the normal value (Graphics 1 and 2).

In cases of medium seriousness, and also during the first days of the illness, the concentration is about 1 1/2 times higher than the normal (Graphic 3). In mortal cases during the course of the illness the concentration never reaches the normal values. (Graphics 4 and 5).

In a urine from a corpse, we verified a concentration of 4gr.02 per 1000. It was not a case of the anuric form, for there were 80 c.c. of urine in the bladder, whereas in the anuric form only a few drops, or hardly a few cubic centimeters should be found.

Excepting in very severe forms, the daily elimination of urea is also increasing, while the reduction of volume of the urine is less than the increase of urea concentration. Unluckily, we did not have a single case at hand in which we were able to control these elements from the first hours of the Illness.

The convalescence appears suddenly, and at this time, the concentration and the total amount of eliminated urea decreases equally, in a very sudden manner, remaining sometimes under the normal amount until the patient is cured.

We realize then that some prognostical conclusions can be arrived at, through an appreciation of the values of ureics elimination. Of course, in cases in which the numbers stating those concentrations remain in the intermediary zones, the conclusion is a more difficult one.

The chlorides specified in Na Cl follow a process inverse of the urea diagram. Their concentration is the fifth part, or more, of the normal value at the beginning of the illness. This is a general phenomenon observed in whatever case of the disease, either mild or mortal. Only once, in a patient whose agony lasted a particularly long time, we observed a very high concentration of chlorides in the urine, excreted during this period. (Graphic 4) An another occasion, in the mildest of the examined cases, there was a decrease of the chloride concentration, about one half on the 3rd and 4th day. These were the exceptions we met with. As a rule, however, the concentration oscillates between 0.5 and 2.5 per 1000 in the first days of illness, and increases suddenly at the moment of the convalescence crisis.

On the day before this crisis of chloruria the concentration, sometimes falls lower than in the first days (Graphics 1 and 2). One can not say the small chlorid elimination should be determined by the lack of chloride absorption. When condition permitted the patient was provided with salted food which brought to the system a quantity of Cl Na higher than the amount eliminated during the next 24 hours.

Dr. J. TEIXEIRA had an opportunity, in a mild case, on the 6th day of the illness, to make a proof of the chloride elimination (LIPCHWITZ technics) and ascertained that the kidney was perfectly permeable in this case. The case was a particularly mild one at the end of the febrile stage probably already entering into the convalescence stage.

We believe that, in the course of the illness, there is a noteworthy decrease in the chlorides eliminated, more accentuated than stated by reference books, and consequently a retention of those elements within the system. This is confirmed by the measurements effected in the blood and
Graphico n. 2
Graphico n. 4

Graphico n. 5
liquor in which, in most cases, chlorides are increased (Drs. J. CARNEIRO FELIPPE, J. G. LACORTE and G. G. VILLELA).

The uric acid and the puric bases, reducing agents of iodine are, as a rule, increased in the first days in mild cases. In other cases, this increase is of small extent and its variations are given in the vicinity of 0.8 per 1000. We seldom found the quantities of the above to be less than normal during the course of the illness. However during convalescence, there is a sensible fall of these rates. The concentration of these elements is more or less parallel to the urea concentration.

Of the abnormal elements, we searched for the real albumin, the pseudo-albumin and glucose, the two first were found in all cases.

The real albumin, always present, has a highly varying concentration. In mild cases, the quantity is rather small (about 0.50 per 1000) and disappears quickly. In fatal and severe cases, this quantity is very high (2 to 12 grams) and persists for a longer time.

The pseudo-albumin was also found in less quantity than albumin disappearing still earlier.

Glucose was never found in the first period. Only once, in the convalescence of a severe form we found glucose, to a small extent during a short period.

It is interesting to report this fact, because the patients, besides being fed, systematically received injections of glucose serum, either via rectal or subcutaneous. One sees that the system, in the course of the illness, normally retains sugar.

The biliar pigments were only observed in the period of convalescence. At times the quantity was so high that the urine would turn to a bottle-green shade. In the first days however, its absence from the urine was complete, without any exception.

The biliar salts, however, appear earlier than the pigments, but however never during the primary period of the illness.

The urobilin was found in every case and in most variable quantities. We did not measure this by a chemical process. We confined ourselves to estimating the quantity by the degree of fluorescence. We were unable to conclude that urobilin neither could be used either for diagnosis or for prognosis purposes. As this chromogen is to be found in numerous diseases, we believe its value is of very small value for the diagnosis of the illness.

The indoxyl was found in big quantities in the severe forms, principally those in which there were abundant intestinal hemorrhages. In mild or in severe which were not hemorrhagic the absence of this chromogen is a general rule. Its reappearance in normal quantity occurs during the convalescence.

The sediment in the urine of yellow fever patients is very interesting in the invading stage, a very strong epithelial desquamation of the whole urinary apparatus is to be observed. One sees an excessive number of epithelial cells, flat, racket shaped, fusiform, cylindrical small and large and always numerous leucocytes. As the disease progresses the flat and racket-shaped epithelial cells begin to disappear. The cylindrical epitheliais and the leucocytes remain and dominate in number the flat and racket
shaped epithelial cells. In the convalescence stage, the large cylindrical epithelial cells disappear and then the normal flat ones of the urine appear again. Cylindruria is most frequent, and we find as a rule the granulous cylindruria during the febrile stage, the granulous and hyaline in the period of convalescence and finally the hyaline and waxy about the time of the cure of the illness. We also noted in mild cases an epithelial cylindruria in combination with cylinders of other kinds. This combined cylindruria is in severe forms exceedingly intense. It is to be noted that these casts easily disappear in fermented urines. Besides the cellular elements, we observed crystals of urates with an abundant amorphous substance especially in urines kept in low temperatures. We must also point out a crisis of oxalaturia which we observed in the mild cases at the end of the convalescence. There might be perhaps some relation between this oxalaturia and the lime casts observed in cuts of kidney of yellow fever patients.

CONCLUSIONS.

I. We may determine the severeness of yellow fever cases by serial examination of urines.

II. In mild cases, urea exists in high concentration in the urine and its daily elimination is high.

III. In fatal cases, the elimination of urea is much reduced and its concentration much below the normal.

IV. The elimination of chlorides is very small, either in severe or in mild cases.

V. Uric acid and puric bases are eliminated in a similar way as urea.

VI. The elimination of chlorides and urea follow an inverse process in relation, one to the other. There is an increase of the elimination of chlorides and a decrease of the elimination of urea at the time of convalescence.

VII. Albuminuria and cylindruria appear as a rule at the 3rd day.

VIII. There is no glycosuria during the course of the illness.

IX. In the urinary sediment, large cylindrical cells are to be found, probably proceeding from the tubes of the kidney.

X. In yellow fever the elimination of urine effects itself as in nephrosis.