INSTRUCTIONS

FOR THE USE OF THE

URINARY TEST PAPERS

INTRODUCED BY

DR. G. OLIVER,

FOR THE CLINICAL EXAMINATION OF THE URINE

AT THE BEDSIDE.

PARKE, DAVIS & CO.,

DETROIT AND NEW YORK CITY.

PHYSICIAN'S POCKET REAGENT CASE.

CONTAINING A COMPLETE SET OF CHEMICAL APPARATUS AND REAGENTS FOR BEDSIDE URINE ANALYSIS, QUALITATIVE AND QUANTITATIVE.

For cut see fourth cover page.

This case contains, in addition to the series of urinary test papers issued by us (see third cover-page), a comprehensive book of instructions for the use of Dr. Oliver's bedside tests, and the following apparatus:

1. Two test tubes, one of which is graduated.
2. A graduated minim pipette.
3. A set of six specific gravity beads, corresponding with specific gravities respectively of 1.005, 1.010, 1.015, 1.020, 1.025 and 1.030. These will be found more convenient to use than the ordinary urinometer, which is, moreover, a very fragile instrument.

PRICE.—Leather, $1.50; paper, $1.00. Sent to any address on receipt of price.

A more compact arrangement it would be difficult to devise, and the physician cannot well forego the convenience of such a vest pocket chemical laboratory.

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Tests for Sugar.

Two tests are furnished in this series.

1. Indigo Carmine.
2. Picric Acid.

These reagents are both used in connection with sodium carbonate in the manner described under the individual heads following.

The diagnosis of glycosuria may be made with certainty by means of these test papers, and an approximate estimation made of the quantity of sugar present.

The presence of albumen and of uric acid in the urine does not interfere with either of these tests, which are capable of detecting the smallest quantities of sugar that can be considered pathological.

Indigo Carmine.

Mulder's Test for Sugar.

This is an exceedingly sensitive test for diabetic sugar, and its indications may be accepted as infallible.

Place in a test tube 30 minims of water with an indigo and a sodium carbonate paper. Heat the tube gently until the indigo is dissolved. [The solution should be of only a pale blue color. A portion of one of the indigo papers may suffice, but the whole of the soda paper should be used.] Add to the blue solution from a pipette one drop of the urine to be tested, and keep the fluid at the boiling point, without, however, permitting active ebullition, for sixty seconds. If no change is produced add a second drop of the urine, and heat once more. If any notable quantity of sugar is present, the fluid will be observed to change from pure blue to violet, then to purple and red and finally will fade to a pale yellow. If there is only a trace of sugar, the color will merely change to one of the intermediate shades.

☞ Normal urine itself produces a reaction if added in sufficient quantity, 5 to 8 drops generally being sufficient to change the color to purple or red. If, however, no more than two drops of the urine are employed in the test, a change of color is proof that sugar is present in abnormal quantity.

☞ If the tube is agitated during the experiment so that the fluid is brought in contact with the oxygen of the air, the reaction is retarded.

Indeed the blue color of the solution may be momentarily restored even in presence of a large excess of sugar by vigorously shaking the tube, and the color can be discharged and restored repeatedly, by the alternate action of the sugar and the oxygen of the air.

QUANTITATIVE ESTIMATION OF SUGAR BY INDIGO CARMINE.

The test papers may be made to yield approximate quantitative results, by observing that the color of 30 minims of a pale blue solution of indigo is changed to yellow by heating one minute with one minim of a urine containing ten grains of sugar to the fluidounce, or by heating two minutes with one minim of a urine containing five grains to the fluidounce. For exact work, it is necessary of course to have papers especially prepared, containing a definite quantity of the reagent, but a rough approximation to the truth may be based upon the statement just made, and information of great value may be thus obtained in observing the influence of remedies in a case of diabetes.

If the quantity of sugar is smaller than that named, the change of color will be only partial,

but exact quantitative estimations are of less importance in these cases than where the amount is more considerable.

In case the urine contains more than ten grains of sugar to the fluidounce, it will be necessary to dilute it until it is reduced to that strength. If four times its volume of water is required to effect this, the urine must contain 5+10=50 grains of sugar to the fluidounce. The details of this method can be best worked out by each individual for himself.

Picric Acid.

DR. GEO. JOHNSON'S TEST FOR SUGAR.

When an alkaline solution of picric acid is boiled with a little glucose, picramnic acid is formed, and the color of the solution changes to a garnet red. To apply the test to the urine, put in a test tube one of the picric acid papers with 20 minims of water and about 3 grains of sodium carbonate, add 10 minims of the urine and boil sixty seconds if necessary. The color of the mixture always darkens perceptibly, but if sugar is present the change is much more prompt and decided than in the case of normal urine. If the olor changes rapidly to a dark red, repeat the

experiment with 5, 3 and one minim successively, to form an approximate estimate of the quantity of sugar present. If one minim gives a strong reaction, dilute the urine until a single minim of the dilute fluid gives only a deep amber color with a distinct shade, however, of red. In a diluted urine this reaction will indicate the presence of about one grain of sugar to the fluidounce.

About the same shade of color is generally produced by two minims of a normal urine, so that there should be deducted from the result obtained about half a grain to the fluidounce, as "normal sugar." This test should always be confirmed by the indigo carmine test, since there are other substances than sugar—notably kreatinine—which react like glucose with picric acid.

COMPARATIVE VALUE OF TESTS FOR SUGAR IN THE URINE.

The copper test, which is commonly employed, is perhaps the least trustworthy of all the tests for glucose. Among the normal constituents of the urine, uric acid is capable of reducing copper compounds, and numerous substances which may be accidently present have a similar action. Kreatinine and many other organic compounds

prevent or retard the precipitation of small quantities of cuprous oxide, so that urine containing less than one grain of sugar to the fluidounce fails to respond to the copper test, or gives an indication only after half an hour or a longer time.

Picric acid is an exceedingly sensitive reagent for the detection of sugar, but a larger amount of alkali must be used than can be put in the form of a test paper, so that a supplementary supply of the alkali must be carried in the pocket case, if the test is to be used at the bedside. The reagent is not affected by uric acid, nor by most of the substances occasionally present in the urine which reduce copper. It does react however, with kreatinine present in normal urine, and with ferrous salts, tannin, and inosite which occasionally occur in the secretion. Normal urine always shows a distinct reaction, as though it contained as much as ½ grain in the fluidounce of glucose.

Indigo is not affected by any known normal constituents of the urine. Since normal urine always produces a reaction with it, we must conclude either that glucose (or inosite) is constantly present in urine in small quantities, or else that there is a constituent constantly present which

has a similar action but is as yet unknown. Of the possible accidental constituents of the urine, only ferrous salts and tannic acid affect indigo, so that we may regard this test as not only the most sensitive, practically, of any yet proposed but as practically free from fallacies. Finally unlike the copper test, indigo carmine can be preserved unchanged for years, especially in the convenient form of these test papers.

Albumen Tests.

Four different reagents for albumen are furnished in this series of test papers.

1. POTASSIO MERCURIC IODIDE.
2. SODIUM TUNGSTATE.
3. POTASSIUM FERROCYANIDE.
4. PICRIC ACID.

These reagents are all used in connection with citric acid. Put into a test tube 30 minims of the urine with a citric acid paper (or if the specimen be alkaline, more than one acid paper) and allow a few moments for the acid to become dissolved. If a cloudiness is produced by the acid, it is due

to mucin, or uric acid, or rarely to oleo resin, as where balsam copaiba has been taken medicinally. The urates dissolve on warming the urine, mucin remains, being distinguished by this behavior from any other constituent of the urine. The oleo resinous precipitate clears up by boiling, but quickly returns while the urine is yet warm.

After observing the effect of the acid alone, add the albumen precipitant—one of the four named above. As the reagent dissolves, albumen, if present, is precipitated in the form of a distinct cloud, soon resolving itself into flakes. If any cloudiness is produced, the urine must be heated, when, if the reaction is due to albumen, the precipitate remains undissolved. A precipitate cleared up by heat may consist of peptones, or of compounds of vegetable alkaloids.

If a very large quantity of albumen be present, it may happen that the paper will become coated with the precipitate which forms instantaneously on its surface, and no cloudiness appear in the urine. Such a contingency could very rarely occur, and application of heat would be sure to reveal the presence of the albumen.

Another method of using the papers is thus described by Dr. Oliver: "Those who prefer to

develop a zone of precipitation along the plane of contact of a test solution and the urine can do so with these papers as follows: Put the reagent paper with 15 minims of water into one test tube, and a similar quantity of the urine with a citric acid paper into another. When the reagent is dissolved a portion of the solution is taken up with a pipette and allowed to trickle down the side of the tube, in which it will either glide over the urine, or collect below it." Dr. S. C. Smith, of Halifax, suggests as a still better way to bend the papers into a circle so as to fit the inside of the test tube and push them down, say within an inch of the bottom of the tube, which is then to be filled with the urine. If albumen be present, the whole of the urine below the papers becomes opaque, while that above them remains transparent and unchanged. The advantage of observing separately the effect of the citric acid is, however, lost in this mode of applying the tests.

Potassio Mercuric Iodide.

This is the most sensitive of all the tests for albumen, and in general should be the first test tried, since if this fails albumen is surely absent. The reagent precipitates peptones, and vegetable

alkaloids; the precipitate of peptones is cleared up by heat, but returns as the urine cools. The precipitate of alkaloids forms a diffused cloudiness which does not break up into flocculi. On applying heat, it clears up, and it is soluble also in alcohol. In case albumen and alkaloids are present together, the fluid will partially clear on heating.

Sodium Tungstate.

This reagent will detect one part of albumen in 20,000 of urine; it is therefore nearly as sensitive as the potassio mercuric iodide. It has the advantage over the latter that it does not precipitate alkaloids. It does, however, precipitate peptones, the precipitate redissolving on applying heat.

Picric Acid.

This test equals in sensitiveness that just named, and has this advantage that it may be used to detect either sugar or albumen. It precipitates like the potassio mercuric iodide, peptones and vegetable alkaloids, and also throws down oleo resins, and occasionally uric acid. The discrimination of the albuminous precipitate is, however, made with certainty by the application of heat which dissipates all other precipitates.

Potassium Ferrocyanide.

This test is less sensitive than the others in the series, but is capable of detecting albumen when present in the proportion of 1 part in 12,000 of fluid. It is therefore comparable in the range of its indications with nitric acid. It does not precipitate peptones or the vegetable alkaloids which one is likely to meet with in the urine. It is therefore not liable to lead to false conclusions in the hands of careless observers, and it is selected on this account by Dr. Oliver as likely to be of the most service to medical men who have not had much experience in applying chemical tests.

Quantitative Estimation of Albumen by the Method of Dr. Oliver.

Twenty minims of the urine are placed in the smaller test tube, a mercuric and a citric acid paper introduced into it, and the tube is shaken during one minute, so that the whole of the albumen is precipitated. The opacity produced in the fluid is directly proportional to the quantity of albumen present, and this is determined by the aid of the printed test lines which are provided for the purpose. The fine lines are just discernable when the urine contains 1-10

per cent. of albumen. The dark lines are rendered indistinct if there is more than 0.2% present. If the fine lines are not distinguishable, add water, a little at a time until they can just be discerned through the center of the tube.

If it require five times the original volume of the urine to reduce the opacity to this extent, the urine contains 5×0.1%, i. e. one-half of one per cent. If the quantity of albumen is greater than this it is best to dilute a portion of it 2, 4, or 8 times with pure water before precipitating the albumen, and multiply the result obtained by the factor representing the degree of dilution of the urine.

Color Scale.

In describing the color of a specimen of urine, it is desirable that there should be uniformity in the designations given to the various shades. We have therefore reproduced Dr. Vogel's scale of tints. The advantage of having such a color scale at hand at the moment of making the examination will be at once apparent.

Specific Gravity Beads.

The ordinary urinometer is too fragile an instrument to be carried safely in the pocket. In place

of it we furnish with this series of tests a set of specific gravity beads, marked respective 5, 10, 15, 20, 25 and 30, the figures being the last two of the specific gravities, water being 1000.

The beads are dropped into some of the urine (about 2 fluidrachms) in the larger test tube. If three of them float the specific gravity is between 1.015 and 1.020. If all float it is above 1.030. If all sink, it is below 1.005. The exact density can be determined by adding water, drop by drop, from a graduated pipette until one more bead sinks. The water must of course be made to mix thoroughly with the urine after each addition.

Suppose by the addition of 20 minims of water one out of three beads which had remained floating is made to sink, or rather, to come to a state of indifferent equilibrium; then 120 : 120+20 : : 15 : +. The value of + therefore is 17.5 and the specific gravity of the urine 1.0175.

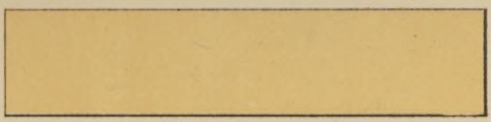
Rule. Multiply the figure on the bead which is made to sink, by the total amount of fluid, water and urine, and divide the product by the amount of urine, the quantity being expressed in minims. The temperature of the urine must be about 60° Fahr. (15.6 C.) If higher than this,

to obtain an exact result, add to the figure obtained one unit for every 8° F. (4.5° C.) in excess of the standard temperature.

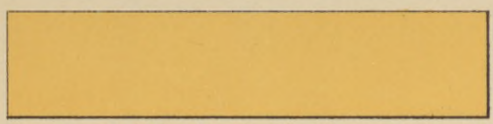
Ordinarily it is sufficient to observe how many of the beads float; the exact specific gravity is of importance only when the whole amount of urine voided during 24 hours is examined; for clinical purposes a rough approximation is all that is generally necessary, and this is all, moreover, that the ordinary urinometer as commonly used affords.

If all the beads float, dilute the urine with an equal volume of water, take the specific gravity of the mixture, and multiply the fractional portion of the figure obtained by two.

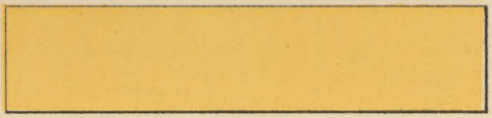
Table of Colors of the Urine.



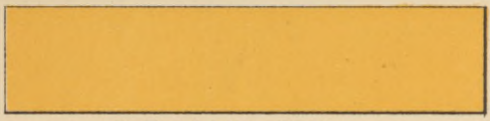
1. Pale Yellow.



2. Bright Yellow.



3. Yellow.



4. Reddish Yellow.

5. Yellowish Red.

6. Red.

7. Brownish Red.

8. Reddish Brown.

9. Brownish Black.

URINARY TEST PAPERS.

We take this opportunity of notifying the medical profession that we are prepared to supply Urinary Test Papers, prepared after the method suggested by Dr. G. Oliver, of Harrogate, England, in the London Lancet.

These Papers are put up in convenient packages for carrying in the vest-pocket, each package containing all the necessary reagents for Bedside Urinalysis.

PRICE :

These packages will be sent by mail, postage prepaid, for 50 cents each.

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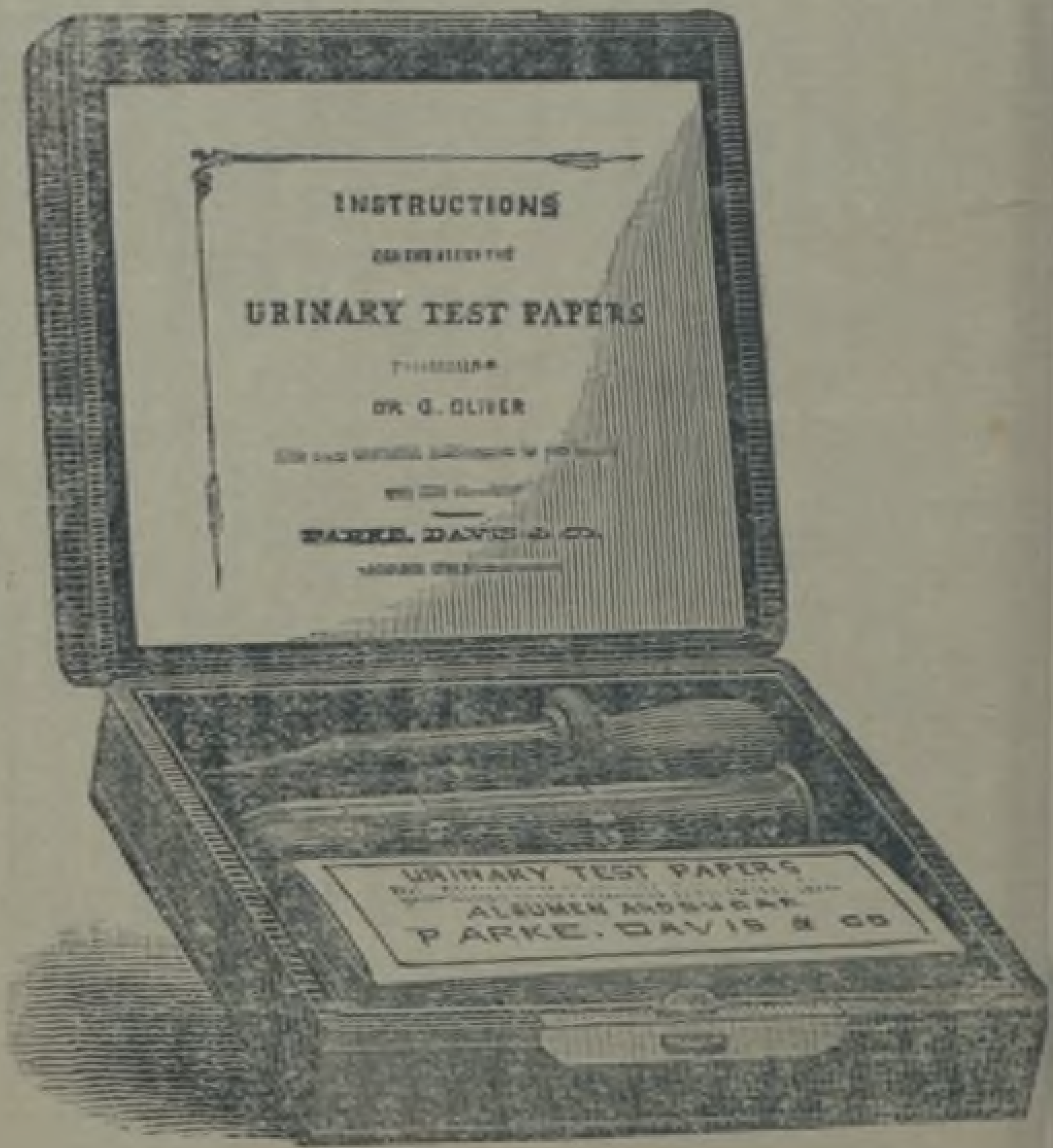
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