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CLINICAL LECTURE
ON
THE VARIOUS MODES OF TESTING FOR SUGAR IN THE URINE.

BY GEORGE JOHNSON, M.D., F.R.S.,

Professor of Clinical Medicine, and Senior Physician to King's College Hospital.

IN a previous lecture (BRITISH MEDICAL JOURNAL, December 8th, 1883) I described and demonstrated the various modes of testing for albumen in the urine; and on the present occasion I propose to show the chief tests for sugar, and to estimate the relative value of each. I will first show you what is called Moore's test. I pour about a drachm of saccharine urine into a test-tube, and add half its bulk of liquor potassæ, and heat it over the lamp; and after boiling it for a minute or two, you see it gradually assume a brandy-brown colour. This test is easily applied, but it is not very delicate, since it will not indicate a proportion of sugar less than about two grains to the ounce. I will presently show you far more delicate tests. Then Moore's test has sometimes misled inexperienced observers in this way:—Liquor potassæ often contains lead from the bottles in which it has been kept, and when lead-contaminated liquor potassæ is boiled with albuminous urine, the sulphur of the albumen combines with the lead to form a dark sulphide, which unpractised observers might mistake for the brown colour produced in saccharine urine.

The Fermentation-Test.—When saccharine urine is mixed with yeast and kept warm, fermentation takes place with the evolution of carbonic acid and the formation of alcohol. Dr. Wm. Roberts (on *Urinary and Renal Diseases*) has shown that this test may be made use of for a quantitative analysis. As the sugar is decomposed, the specific gravity of the urine falls. Each degree of specific gravity lost indicates one grain of sugar to the ounce. The great objection to this method is the length of time, at least twenty-four hours, required for its completion. The urine is capable of absorbing about its own bulk of carbonic acid, and, according to Dr. Roberts, urine containing two and a half grains to the ounce or less, gives no visible sign of fermentation. It is therefore less sensitive than even Moore's test.

Trommer's Test.—To this saccharine urine in a test-tube I add a drop or two of a solution of sulphate of copper, and to this an excess of liquor potassæ. The oxide of copper, which is first thrown down, is redissolved, and forms a clear blue liquid. Now, on applying heat the oxide of copper is reduced to a suboxide, which forms a dense red or yellow deposit. An excess of copper, not being dissolved, may cause confusion, and the dark brown colour, from the action of the potash on the sugar, may interfere with the result.

Fehling's Solution.—A more satisfactory mode of applying the copper-test is in the form of Fehling's solution, which contains the following ingredients:—Sulphate of copper, 90½ grains, neutral tartrate of potash, 364 grains, solution of caustic soda, specific gravity 1.12, four fluid ounces, cold water to make up six fluid ounces. To use this solution, a column of about three quarters of an inch is poured into a test-tube, and heated until it boils, and then a drop or two of the urine to be tested is added. In a few seconds, if the urine contain much sugar, the liquid becomes of an opaque yellow colour, and a copious red or yellow precipitate falls. If the quantity of sugar be small, the urine is added more freely, but not beyond the volume of the copper-solution. Fehling's solution soon undergoes change by keeping, a portion of the oxide of copper becomes precipitated, and then, of course, the strength of the test is changed. When the test has been kept for some time, it will deposit suboxide on boiling without the presence of sugar. This is one reason for boiling the test before adding the suspected urine. If boiling the liquid render the test turbid, it must be filtered, or a fresh solution prepared. When the solution is used for a quantitative analysis, it must be freshly prepared, and its strength is such that 100 minims are decomposed by half a grain of sugar, the decomposition being shown by the decoloration of the liquid, and the precipitation of the suboxide of copper. When the urine is highly saccharine, it must be diluted to a definite proportion, five, ten, or more times, before the analysis is made, and then the result is to be multiplied by the number of dilutions.

For laboratory-work, Dr. Pavy has modified and improved upon Fehling's method of analysis. The essential difference between the method of Dr. Pavy and that of Fehling consists in the addition of a sufficient quantity of ammonia to the copper-solution to prevent the precipitation of the cuprous oxide, after its production by the reducing action of the glucose. Rochelle salt (potassic tartrate of soda), though it effectually dissolves cupric oxide, is incapable of dissolving cuprous oxide, and some difficulty is often experienced by Fehling's process in ascertaining the exact moment of disappearance of the blue colour due to cupric copper, on account of the turbidity and red tint imparted by the precipitated cuprous oxide. This difficulty is removed by Dr. Pavy's process, since the ammonia altogether prevents the precipitation of cuprous oxide, and in a clear solution the exact amount of sugar required to completely decolorise the cupric blue tint may be much more easily determined. The only precaution necessary is to completely exclude air during the determination, because a colourless ammoniacal cuprous solution is rapidly rendered blue by exposure to atmospheric oxygen, the cupric hydrate being thereby reproduced.

The Picric Acid and Potash Test for Sugar.—In a letter which I published in a medical paper, November 18th, 1882, I stated that I had accidentally stumbled upon the fact that picric acid, when boiled with caustic potash, forms a most delicate test for glucose. I added some picric acid solution to a boiling specimen of diabetic urine, which had been previously mixed with liquor potassæ, and found, to my surprise, that the liquid at once assumed an intensely dark colour. I was not then aware of the fact that the reaction of picric acid with grape-sugar had been observed by Braun, a German chemist, nearly twenty years ago ("Ueber die Umwandlung der Pikrinsäure in Pikramminsäure, und ueber die Nachweisung der Trauben-Zucker." C. D. Braun. *Zeitschrift für Chemie*, 1865). In this paper, it is shown that grape-sugar, when boiled with picric acid and potash, reduces the yellow picric acid to the deep red picramic acid, the depth of colour depending on the amount of sugar present. I am not aware that hitherto any attempt has been made to utilise this as a qualitative clinical test for sugar in the urine, or as a means of accurately estimating the amount of sugar in a saccharine solution. I think, however, that, after having been the subject of much hostile criticism, the value of the test for both purposes has been completely proved and established. I take a fluid drachm of a solution of grape-sugar, in the proportion of a grain to the fluid ounce, mix it with half a drachm of liquor potassæ (*P.B.*), and ten minims of a saturated solution of picric acid, and make up the mixture to four drachms with distilled water. The mixture is conveniently made in a boiling tube, ten inches long and three-fourths of an inch in diameter, which should be marked at the height of four drachms. With a long boiling tube, there is little risk of the liquid boiling over; and the steam, condensing in the upper cooler part of the tube, flows back as liquid, so that there is little loss by evaporation. The liquid is now raised to the boiling point, and kept boiling for sixty seconds, so as to ensure complete reaction between the sugar and the picric acid. During the process of boiling, the pale yellow colour of the liquid is changed to a beautiful claret-red.

The liquid having been cooled by cautiously immersing the tube in cold water, we ascertain that its level is that of the four-drachm mark on the tube; and if found below the mark, it is brought up to it by the addition of distilled water. The colour now is that which

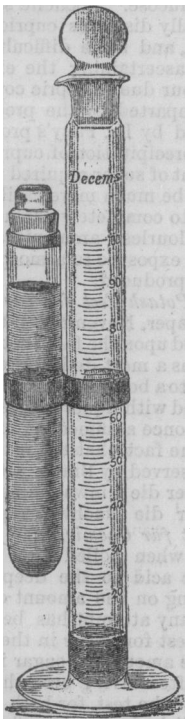
results from the decomposition of picric acid by a grain of sugar to the ounce four times diluted; in other words, it indicates one quarter of a grain of sugar to the ounce, and this colour is a convenient standard for comparison in making a quantitative analysis. The picramic acid solution, however, on exposure to the light even for a few hours, becomes paler; but the colour may be exactly imitated by a solution of ferric acetate with an excess of ferric perchloride, and a slight excess of acetic acid. The following is the formula for the standard solution, for which I am indebted to my son, G. Stillingfleet Johnson.

Liq. ferri perchlor. fort., ʒj; liq. ammon. acet., ʒiv; acid. acet. glacial ʒiv; aq. dest. ad. ʒiiss.[1]

The colour of this is equal to a quarter of a grain of grape-sugar to the ounce. When a fresh solution is made, it should be checked by comparison with a grain-solution of sugar, boiled with picric acid and potash, and four times diluted.

I have here an iron standard solution, which was made six months ago, and which, having been kept for the most part in the dark, retains its colour unchanged. I have also a solution of grape-sugar, one grain to the ounce, in eighty per cent. of water and twenty per cent. of rectified spirit, which has kept without change in an accurately stoppered bottle for the same period. The alcohol prevents the spontaneous decomposition of the sugar, but has no reducing action on picric acid.

If, now, a drachm of a solution of grape-sugar, containing two grains to the ounce, be mixed with the same quantity of liquor



The picro-saccharimeter, as described in the text. The shading of the side-tube indicates the ferric acetate standard. The darker shading at the bottom of the graduated tube shows the saccharine fluid, darkened by boiling with picric acid and potash, and occupying ten divisions before dilution.

potassæ (half a drachm) as before, but with double the amount of picric acid (*i.e.*, twenty minims), and made up to four drachms in the boiling tube, the result of boiling the mixture as before for sixty seconds will be the production of a much darker colour than when the one-grain solution was acted upon; but, if now the dark liquid be diluted with its own volume of water, the colour will be the same as that of the one-grain solution.

The dilution is accurately done in a stoppered tube, twelve inches long and three-quarters of an inch in diameter, graduated into 10 and 100 equal divisions. By the side of this tube, and held in position by an S-shaped band of metal, is a stoppered tube of equal diameter, and about six inches long, containing the standard iron-solution.[1] (See Fig.)

Sufficient of the dark saccharine liquid to be analysed is poured in to occupy exactly ten divisions of the graduated tube. Distilled water is then added cautiously, until the colour approaches that of the standard. The level of the liquid is then read off and noted. A more exact comparison of the saccharine liquid with the standard is made by pouring into a flat-bottomed colourless tube, about six inches long and an inch in diameter, as much of the standard as will form a column of liquid about an inch in height, and an exactly equal column of the saccharine liquid in a precisely similar tube. The operator then looks down through both tubes at once, one being held in each hand, upon the surface of a white porcelain slab, or a piece of white paper. In this way, a slight difference of tint is readily recognised; and, if the liquid to be analysed be found to be darker than the standard, it is returned to the graduated tube, and diluted until the two liquids are found to be identical in colour, when the final reading is taken. The saccharine liquid having been diluted four times before it was boiled, a colour equal to that of the quarter-grain standard would indicate one grain of sugar per fluid ounce. If further dilution were required—say from ten to twenty divisions—the proportion of sugar would be two grains per ounce, and so on to thirty or forty or upwards, or to intermediate divisions. Thus, dilution from ten to thirty-five divisions would indicate 3.5 grains of sugar per ounce.

We have found, by experiment, that ten minims of a cold saturated solution of picric acid are rather more than sufficient for decomposition by one drachm of a solution of grape-sugar in the proportion of one grain to the ounce. A drachm of the solution would, of course contain one-eighth of a grain of sugar. In making an analysis, the picric acid must be added in proportion to the amount of sugar. If the proportion of sugar be as high as six grains per ounce, a drachm of the picric acid solution will be required. If the proportion of sugar be higher than this, the saccharine fluid should be diluted with distilled water, in a definite proportion, before commencing the analysis, and the product of the analysis of the diluted fluid is then to be multiplied by the degree of dilution—two, five, or ten, as the case may be, to which the original liquid has been subjected.

When the urine has been diluted ten times, the figures on the saccharimeter indicate the number of grains per ounce. Thus, when the diluted urine, after boiling with picric acid and potash, is further diluted from 10 divisions to 35, to obtain the standard colour, the amount of sugar is 35 grains to the ounce.

Distilled water, or clear rain-water, should be used for diluting. Hard water, containing salts of lime, is rendered turbid by the carbonate of lime precipitated by mixture with caustic potash, and any turbidity in the liquid interferes with the estimation of the depth of colour. In testing undiluted urine, a slight turbidity often results from separation of phosphates by the potash. This turbidity may be removed by allowing the phosphates to form a sediment, or more speedily by filtration. When a highly saccharine liquid is diluted five or ten times before mixture with the testing materials, no phosphatic turbidity occurs. In making a volumetric analysis, care must, of course, be taken that the measurements and dilutions are accurately made.

The preliminary dilution of a strongly saccharine specimen may be made in the graduated tube; or, into a flask graduated to contain fifty cubic centimètres, five or ten cubic centimètres of the saccharine liquid may be delivered from a graduated pipette; then, the flask being filled up to the graduation with distilled water, the dilution will be ten times with five cubic centimètres, and five times with ten cubic centimètres of the liquid to be analysed. Or, without any special apparatus, an accurately measured drachm of urine may be diluted up to five or ten drachms with distilled water.

Another important point is that, while the amount of potash remains the same, the picric acid must be in proportion to the amount of sugar in solution. It has already been mentioned that ten minims of the picric acid solution are more than equal to one-eighth of a grain of glucose, which is the amount contained in one drachm of a solution, in the proportion of a grain to a fluid ounce. A slight or even a considerable excess of picric acid does not appreciably affect the colour of the picramic acid, while a deficiency would, of course, lead to an underestimate of the amount of sugar. If an analysis with thirty minims of picric acid solution indicate, say, from three to four grains of sugar, it is probable that some sugar has been left

[1] This standard solution may be obtained from Messrs. Bell and Co., and probably from other pharmaceutical chemists.

[1] This picro-saccharimeter was made for me by E. Cetti, 36, Brooke Street Holborn, E.C.

undecomposed; and a second analysis, with a larger proportion of picric acid, might therefore give a higher and a more correct result. If, on the other hand, a second analysis, with a larger proportion of picric acid, give an identical result, we may feel certain that the whole of the sugar has been decomposed, and the amount indicated by the resulting picramic coloration. In any case, when the amount of sugar indicated is less than would suffice to react upon the amount of picric acid employed, the result may be relied upon as correct.

The presence of albumen, even in large amount, has but little influence on the picric acid test for sugar. In illustration of this, the following experiments will suffice. A specimen of urine, normal as regards the amount of saccharine or saccharoid material, but containing a large amount of albumen, was boiled with picric acid and potash, with sufficient water to dilute the urine by its own volume of liquid. A second portion was treated in the same way after the separation of the albumen by boiling and filtration, and the first specimen gave a darker tint than the second, to a degree that might be considered to indicate one-tenth of a grain of sugar per ounce. Another portion of the urine was decolorised by repeated filtering through charcoal; and, of this, one specimen was tested while it retained its albumen, another after the separation of the albumen; the result being that both yielded identical tints of colour, and this was very slightly paler than that of the specimen which was tested after having been deprived of its albumen without previous decolorisation by charcoal. The explanation is, that pure albumen has no reducing influence on picric acid when boiled with dilute potash, such as is used in testing for sugar; but with seralbumen, as with white of egg, there is associated a colouring matter which is partly separated by filtering off the coagulated albumen, and entirely removed by repeated filtering through charcoal. The colouring matter in question has a reducing influence on picric acid, although the colouring matter of normal urine has been found to have none. The coagulated albumen collected on the filter, after being thoroughly washed, gives no red reaction when boiled with picric acid and potash diluted in the same proportion as that employed in testing for sugar. This has been proved by repeated experiments.

When I first published to the profession my observations in picric acid and potash as a test for sugar, it was suggested that unoxidised sulphur-compounds in the urine, and especially in albuminous urine, would form an alkaline sulphide when boiled with potash, and this would decompose the picric acid and render the test fallacious. Experience has proved that these theoretical objections were quite groundless. My son proved conclusively that, when pure albumen is boiled with diluted solutions of potash, such as are used in testing for sugar, no alkaline sulphide is formed.

The final communication of my son, in which he demonstrates that the apparently contradictory results obtained by different observers are explained by the varying proportions of the caustic potash employed, is published in the *Chemical News*, February 23rd, 1883, page 87.

The accuracy of the picric acid method of volumetric sugar-analysis has been fully and fairly tested. Our plan has been to compare the results of this process with those obtained by Dr. Pavy's ammonio-cupric method. We have analysed the same specimens, many of them albuminous as well as saccharine, by the two processes, my son employing Dr. Pavy's method in the laboratory at King's College, and I the picric acid process at home; and our results are found to be practically identical, the differences being only such as are due to unavoidable slight errors in conducting an experiment. Both methods, in fact, are based upon the same chemical principle—namely, that glucose, when heated with potash in the presence of an oxidizing agent, has a tendency to rob it of its oxygen. In the one process, the reducing action of the sugar is exerted upon an oxide of copper; in the other, on picric acid. A definite weight of sugar reduces, in the one case, a proportional amount of cupric oxide, and in the other an equivalent proportion of picric acid, with resulting picramic acid and a corresponding measurable intensity of colour.

In the majority of cases, the ammonio-cupric process gives results slightly in excess of the picric acid method. This excess is due to some non-saccharine ingredients in the urine, which reduce cupric oxide, but not picric acid. Amongst other ingredients of normal urine, uric acid and urates are known to have this reducing effect on cupric oxide.

I claim for the picric acid and potash method of analysis that it is as accurate as any other, and that for the estimation of sugar in the urine it is even more accurate than either Fehling's or Dr. Pavy's process, because the picric acid is not acted on by uric acid or urates, which reduce the oxide of copper. The method of analysis by the picro-saccharimeter is at least as speedy and as easily acquired as any other. The materials and apparatus required are easily prepared, inexpensive, and not, like Fehling's copper-solution, liable to undergo rapid changes. The standard iron-solution, as I have shown, may be kept in the dark for months without the slightest change of colour; and a solution of grape-sugar in water, one grain to the ounce, with twenty per cent. by volume of rectified spirit, may be kept unchanged for an indefinite period, and used occasionally for comparison with the ferric acetate standard.

During the last nine months, I have tested with the picric acid and potash a large number of specimens of normal urine, with the almost uniform result of a depth of colour indicating the proportion of 0.6 grain of sugar in the fluid ounce, the indication usually varying between the limits 0.5 and 0.7 grain in the fluid ounce. In a considerable number of cases, my son has tested the same specimens by the ammonio-cupric method, with the indication usually of from 0.7 grain to 0.9 grain in the fluid ounce; *i.e.*, an excess of that obtained by picric acid of from 0.1 to 0.3 grain in the fluid ounce.

The following have been the proportions of the various liquids: a drachm of urine, ½ a drachm of liquor potassæ, 10 minims of picric acid solution, made up to 2 drachms with distilled water. The mixture is kept boiling for a minute, and, when cooled, is compared with the standard. The urine having been diluted by its own volume, a depth of colour equal to that of the standard would indicate 0.5 grain of sugar; but, in nearly every case, I have found it so much darker than the standard, as to require further dilution equal to 0.1 grain before the standard colour is reached, thus giving an indication of 0.6 grain.

When the mixture is rendered turbid by phosphates, these must be removed by filtration before the colour can be quite accurately estimated.

So constant is this degree of coloration with normal urine that if, instead of diluting up to 2 drachms, the dilution be carried further by 24 minims, the resulting colour might be taken as an approximation to an exact quarter-grain standard, and, in the absence of a more exact standard, might be used for making a quantitative analysis. The question arises: Does normal urine contain as much as 0.6 to 0.7 grain of glucose in the fluid ounce? I am not prepared to assert this without further evidence than we have as yet been able to obtain; but, if it be not glucose which gives these almost identical analytical results with the two processes, it must surely be some nearly allied substance.

For bedside sugar-testing, I carry in my pocket-case, in addition to powdered picric acid, grain-lumps of caustic potash, and a test-tube which is graduated up to four drachms. I put into the test-tube a small brass measure of picric acid about one-third grain, urine to the half-drachm mark, and water up to a drachm, then drop in a grain-lump of caustic potash, and boil for about thirty seconds.

In normal urine, the resulting colour is usually darker than the quarter-grain standard, until the dilution is carried up to the twelve-minim mark above the drachm, indicating 0.6 grain. If the colour be still darker than the standard, more water is to be added until the standard colour is obtained. Dilution to two drachms would indicate one grain per ounce, and each further dilution of a drachm indicates an additional half-grain per ounce, so that dilution to the top of the graduated four-drachm tube would show two grains per ounce, which is about three times the average normal amount. For the quantitative analysis of an amount of sugar beyond this, the saccharimeter must be used.

The Indigo-Carmine Test.—Dr. Oliver has recently had papers prepared by drying after immersion in a solution of indigo-carmine with carbonate of soda. These papers form a delicate qualitative test for sugar. A paper is placed in a test-tube and covered with distilled water; heat is then applied until a blue solution is formed. A drop of diabetic urine is then added, and the heating continued. The solution changes from blue to violet, purple, red, yellow, and finally straw-colour. After cooling and exposure to the air, the liquid passes back through the various colours into the original blue. The delicacy of the test is increased by using a carbonate of soda paper with the indigo-carmine paper. This paper-test, delicate and easy of application as it is, is not more so than the picric acid and potash test before described, and, so far as we at present know, it affords but an imperfect indication of the amount of sugar.

Since using the picric acid and potash test, I have so often found an excess of sugar in urine, when, from the comparatively low specific gravity, I should not have suspected it, that I now invariably test

for both sugar and albumen in every specimen of urine. This double qualitative testing, which occupies less than two minutes, is done as follows. To about a drachm of urine in a test-tube is added an equal volume of a saturated solution of picric acid. If albumen be present, the liquid is rendered more or less turbid, and this turbidity is increased by boiling. Then half a drachm of liquor potassæ is added to the boiling mixture, the albumen, if present, is redissolved, and the boiling is continued for about thirty seconds. If sugar be present in the proportion of a grain to the ounce, the liquid will become darker than the quarter-grain standard, and two grains or more to the ounce will make the mixture black. The presence of an excess of sugar having thus been ascertained, the actual amount may be speedily and accurately determined by the quantitative method of analysis before described.

AN ADDRESS
ON
COLLECTIVE INVESTIGATION OF DISEASE.

Delivered at a Meeting of the Northern District of the Metropolitan Counties Branch.

By DYCE DUCKWORTH, M.D.,
Physician to St. Bartholomew's Hospital, etc.

GENTLEMEN,—Addresses on the subject of Collective Investigation of Disease have become a part of the machinery employed by the Committee of the Association which I represent here to-night. Most of those who now hear me have, I suppose, read the masterly addresses delivered this year by Sir William Gull, Sir James Paget, Dr. Wilks, and others, and may even have been stirred by their voices. I assume that you all know the design of our Committee, and that I have nothing to tell you in respect of that, or of the method in which it is sought to garner the fruit of the experience of many capable and hard-working members of the Association. I can, therefore, only ask you to take my remarks as a text for the discussion which your district Branch has, as I think wisely, determined to hold on this subject to-night. I have been told that there are members of the Association not in sympathy with this great movement. I cannot believe that they are numerous. It is conceivable that objection may be taken to parts of the scheme, and, as a matter of fact, I know that objections have reached the Committee in respect of this. I may add, at once, that such objections are in all cases carefully considered. It were too much to expect that a vast piece of machinery, such as we have set going, should work smoothly all at once. And that it is truly vast, cannot be gainsaid, for I hold it to be very remarkable that so many inquiries should have been issued, and responded to, within the last eighteen months, and that so much addition to general medical knowledge should have been furnished by this Committee as was embodied in the first volume of its *Record* in July last. So far, the work is certainly encouraging, and there is clear prospect of greater things to come. For my part, I think the Association never before so vindicated its existence as when it determined to employ its unrivalled resources for this good purpose.

I take it that, as a profession, we are bound not only to do all we can for the sick committed to our care, to seek constantly for truth and for increase of knowledge that shall help us, but also to make known our experience for the common welfare of humanity.

Now, gentlemen, it cannot be denied that, day by day, the grave closes over members of our body, who are taken to their well-earned rest, who leave us not only the poorer for their personal work, but who carry with them stores of knowledge and experience, honestly and hardly gained, which never went further than to do good service to the sick they tended.

Of course, much of this is inevitable, much of the art of medicine (and, gentlemen, it is well to emphasise it in these days, our profession is an art, and we are artists, if we are worth anything, as ministers to the sick), I say, much of the art of medicine is personal to the possessor of it, and is, in the nature of things, incommunicable by word or letter. Albeit, there is much, very much, that may be unburdened from the well-stored mind, and that ought so to be passed on to the stock of common knowledge. This is our special work. Systematically, categorically, and with exactness, to gather in the fruits of careful and observant practitioners; to do this in full recognition of the many calls and claims upon the time and energies of men who are mostly busy, mostly pressed as bread-winners, and without, in many cases, the unquestionable stimulus that urges on some to seek position and fame as just recompense for their efforts.

This has been nobly achieved, in many instances, long before this Committee was formed. Some of the hardest-worked men have done much in this direction, and it would be easy to adduce examples.

Those who have preceded me in offering addresses of this kind, have indicated well how private practitioners must naturally bear the largest share in building up the particular knowledge we seek. You have the special privilege of retaining your patients, for the most part, under long-continued observation, both in health and disease; and pray remember that, much of the best knowledge needed in treating a case of disease, is derived from accurate acquaintance with the healthy or ordinary life-history of the patient. The family-practitioner is at a great advantage here, as compared with a consultant, or a hospital-physician, who is often heavily handicapped in this respect.

The great doctrines of diathesis and heredity, which are happily coming back to prominence, enlarged and rendered more certain and trustworthy by the light of advancing knowledge, are available as material guides for better therapeutics; so that we now, more than formerly, treat our patients rather than their diseases. With family- and life-histories before you, you have great aids to diagnosis and prognosis.

As you are aware, several inquiries are now in progress. The question of the contagiousness of pulmonary phthisis is not yet fully answered. This is, perhaps, the largest and most difficult problem issued by our Committee, and, perhaps, none has excited more wide-spread interest, and, at the same time, more obloquy.

It is all very well to scoff, as some have done, at the idea of contagion in connection with phthisis, but the question still waits for an answer; and facts alone, if they can be had, and not opinions, will furnish the reply. I may say here that the residuum of evidence adduced so far by the inquiry, goes to prove that any fears on this head, fears which, if they exist, are either justifiable or unwarrantable, are all but vain. We have learned that only under conditions of extreme contiguity and of most vicious hygiene, can this malady prove communicable. It was surely worth the effort to learn this; we had no knowledge at all on the subject previously, and, without doubt, ere the inquiry is closed, we shall be wiser still.

The endeavour to gain more exact particulars about the workings and manifestations of syphilitic virus is one set on foot, and such an inquiry at once commends itself, and cannot fail to be helpful to us. The same may be surely said of the inquiries as to diphtheria, chorea, acute rheumatism, pneumonia, and acute gout; and I may remind you that the subcommittee on pneumonia desires soon to issue its report, and therefore begs for a return of cases as soon as possible.

Objection has been raised to the number of inquiries set going almost simultaneously, and I think there is some reason in this, though I cannot but suspect that the objections come, in some instances, from Gallios amongst us, who consign all the documents of the Committee, without qualms of conscience, to their waste paper-baskets. It is, I believe, the experience of our subcommittees and secretaries, that the men from whom a report is expected on one subject, are equally to be depended on for efforts in respect of all; and this only confirms what is well-known, that the men who have least time to lose, contrive to do more work and have more true leisure than less active men. As I am seizing as many points upon which objection has been raised as I can, I may here refer to those which have reached me in respect of the card issued upon acute gout. As an instigator of that inquiry, and having taken a share in drawing up the questions upon it, I was surprised to hear that some of these were thought incapable of reply. In respect of the temperature-curve of acute gout, it seemed not a hard matter for a practitioner to secure this. It has been said that no one attends a case of acute gout more than once a day, and that, therefore, no two temperatures can be secured in twenty-four hours. Surely, there can be no insuperable difficulty here. The public are rapidly learning to use the clinical thermometer—too rapidly, as some may think—and a duly set instrument may safely be left with