

MANNER OF USING THE INSTRUMENT.

The eye-piece above described being adjusted to a microscope, the draw-tube is so arranged that for a given objective (No. 2 Nachet is suitable) a side of the square micrometer in the eye-piece measures exactly $\frac{1}{2}$ mm. upon a stage micrometer. The depth to which the draw-tube has been pushed in is then scratched upon the tube, so as to be easily arranged in a moment, and the microscope is ready for use.

I have always adopted as a standard of dilution 1 to 250, as this scatters the corpuscles sufficiently to make them easy to count. The actual process is as follows:

The pipette *a* is filled to the mark 5 *D* with the diluting fluid, which is at once emptied into the glass cup *f*. The pulp of the finger of the patient, whose blood is to be tested, should be deeply pierced with a glover's needle having a triangular cutting-point. The blood should not be driven forward into the finger by pressure before the puncture. A string should not be tied around the finger. A round, sharp needle should not be used. Repeated experiments, with needles and knives upon myself, which lack of space forbids my reproducing here, have proved to me that the above suggestions must be heeded in order to be certain of always obtaining uniform specimens of capillary blood. The triangular cutting-needle does away with Hayem's objections to puncture,¹ and is a less formidable instrument than the knife in the eyes of the patient.

¹ "De la Numération des Globules du Sang," (*Gaz. Hebdomadaire*, May 7, 1875, p. 291).

After piercing the pulp of the finger, quick, firm pressure down the finger will force out a large drop from the puncture. This must be sucked into the capillary pipette without delay, lest it coagulate. When the pipette is full to the mark 2, its point should be rapidly wiped clean of any blood adhering on the outside, and the contents at once blown into the artificial serum in the cup *f*. A little suction, back and forth, clears the tube of any blood-corpuscles which may have adhered to the glass within. Both tubes should be carefully washed before being put away.

The mixture should now be thoroughly agitated with the glass rod, and, before it has time to settle, a drop is placed in the middle of the cell on the slide *d*, care being taken that the drop is not large enough to touch any part of the circumference of the cell (Fig. 1, *d*). The covering-glass, *e*, should be immediately placed upon the cell. Should the drop be too large, so that, when the thin glass is adjusted, it spreads out enough to touch the circumference of the cell and to be partly sucked up beneath the covering-glass and top of the cell, the latter must be wiped and a new drop placed within it. Finally, a small drop of water or saliva is applied to the edge of the covering-glass, under which it circulates around the top of the cell, serving to hold the cover in place and prevent the evaporation of any part of the drop within.

The slide thus prepared is placed under the microscope. In a few moments the counting may begin; the blood-corpuscles will have all settled to the bottom of

the cell, and a picture similar to that shown in Fig. 2 will be seen on looking through the microscope. The counting should not commence until all the corpuscles are upon the same plane and can all be focused together. It is better to count each of the sixteen squares and write down its number separately, so that in counting the square beneath it, should there be any doubt about counting a given corpuscle lying upon the line, a glance at the number recorded for the square above may remove all doubt. Many corpuscles will be found lying upon the outside lines bounding the large square. I have adopted the rule of rejecting all those lying upon the upper and right-hand outside lines (of the large square) and counting all those lying upon the lower and left-hand outside lines.

After having thus obtained the number of red corpuscles situated within the large square, it becomes easy by a simple equation to find the number in a cubic millimetre. A single count, however, exposes to sources of error, and, in order to approach more nearly to exactness, I have uniformly counted the number contained in the large square in five different portions of the field (sometimes ten), and have taken a mean of the whole number of counts as the standard.

The computation is as follows: The glass cell on the slide is $\frac{1}{5}$ mm. deep. The eye-piece micrometer marks off $\frac{1}{5}$ mm. square, therefore the count of red corpuscles (or white, as the case may be) must indicate the number contained (in the dilution used) in $\frac{1}{5}$ mm. cube. But $\frac{1}{5}$ mm. cube is $\frac{1}{125}$ th of a cubic mm., there-

fore the number counted must be multiplied by 125; and the blood was diluted by adding 250 parts of fluid to one of blood (2 cubic mm. to 500 cubic mm.), therefore the product above obtained must be again multiplied by 251, to get the number of corpuscles in a cubic mm. of pure blood. Instead of multiplying twice, a single multiplication by the product of 125×251 (31,375) will give the same result.

Letting x = the mean of 5 counts; the equation then is simply: The number of red corpuscles in a cubic mm. of blood = $x \times 31,375$.

The fluid which I have found to possess the best qualities as an artificial serum is urine, prepared as follows:

Take of urine, neutral or slightly alkaline, sp. gr. 1020, a sufficient quantity, filtered. Add gr. v of corrosive sublimate in powder for each ounce of urine. This will throw down dense clouds of amorphous urates, so fine that ordinary filter-paper will not remove them. After standing, the urates deposit, and the clear fluid above may be easily decanted. Reduce with water to sp. gr. 1020.

The result is a limpid, sparkling, acid fluid which remains clear, no matter how often contaminated with the pipette, and does not seem to allow of the growth of any form of vegetation. It makes a perfect mixture with blood. It bleaches the red corpuscles quickly, and very slightly, but uniformly, increases their size. They retain, however, their flattened, bi-concave, disk-like shape, and do not become dissolved after standing more than twenty-four hours.

The choice of the fluid is the result of a great number of tentative experiments. It possesses all the necessary qualities. It does not putrefy, bacteria cannot develop in it, nor round-celled vegetable growths—the presence of either of which is fatal to the usefulness of a diluting fluid.

With this instrument up to November, 1875, I had counted more than five hundred times the blood of twenty-one syphilitic and six healthy persons. From these my report was made out. The conclusions reached at that time have been repeatedly verified since by numerous examinations of the blood of other persons. I quote the conclusions in full:

1. 5,000,000 red blood-corpuscles in the cubic mm. is a full, high average for the adult healthy male. Anæmia very rarely goes below 3,000,000; fine conditions of physical health reach above 6,000,000. In ordinary seasons, in the city, 4,500,000 would indicate a fair state of health.

2. Mercury decreases the number of the red cells when given in excess, especially in hospitals (Wilbouchewitch).

3. Syphilis diminishes the number of red corpuscles below the healthy standard.

4. Mercury in small doses continued for a short or long period in syphilis, alone or with the iodide of potassium, increases the number of red corpuscles in the blood, and maintains a high standard of the same.

5. Mercury in small doses acts as a tonic upon healthy animals, increasing their weight (Liègeois, Ben-

nett's report, above referred to). In larger doses it is debilitating or fatal.

6. Mercury in small doses is a tonic (for a time at least, as long as the experiments lasted) to individuals in fair health, not syphilitic. In such individuals, it increases the number of the red blood-corpuscles.

Counting the white corpuscles I have found unsatisfactory. Their number is constantly varying from causes which have nothing to do with a prolonged chronic disease. A four-per-cent. solution in water of chloral tinged to a rich bluish purple by methyl aniline, makes it very easy to count them. The red cells are mainly dissolved or heaped into transparent clusters by such a solution, while the white cells remain unaltered and of a rich blue tint. I used a larger field than $\frac{1}{5}$ mm. and made many counts of white cells, but recognized so many sources of error that I gave up the search as unreliable and unprofitable.

I have also studied the effect of the administration of iodide of potassium¹ upon the blood in syphilis, early and late in the disease.

The iodides certainly are tonic, and increase the number of the red cells. In syphilis they do this to a greater degree than mercury does. During the investigation, however, it turned out that while iodide of potassium given early in syphilis increases the number of the red cells more rapidly than does mercury given under similar circumstances (for the increase is apt to

¹ And received in all these researches great assistance from my friend Dr. L. A. Stimson.

be light at first when the depressing influence of syphilis begins to blight the patient's vitality), yet the syphilitic symptoms appear none the less, and are not so much modified and delayed as they are by the seemingly less tonic influence of mercury.

Hence it appears that Grassi was only measurably wrong, and wrong by omission, for mercury (in excess) indeed does diminish the number of the red cells in the blood of syphilitics, both early and late in the disease, and iodide of potassium in moderation or in excess (within limits) does increase the number of the red cells early and late in syphilis; but the *hématomètre* shows, what Grassi did not discover, that mercury in minute doses in early syphilis as well as in late syphilis and in health, increases the number of the red blood-cells, and maintains a high average of the same.

Having now shown that mercury is tonic, and not in itself harmful to the individual, even where it is taken continually for long periods,¹ it remains only to prove that mercury is at all useful in syphilis, and at what times.

That mercury is useful in controlling the symptoms of syphilis I think is conceded by every one. Nearly all physicians employ it for this purpose, and daily clinical experience justifies the conclusion that mercury is antagonistic to many (it might even be said to all) symptoms of the disease; for the reports of cases where the most varied lesions, even gummata, have yielded to its influence, abound in the journals of the day. Over

¹ In two cases in my report the period exceeded three years.

gummata mercury has the least power, the different preparations of iodine being unquestionably of greater value in this field.

Mercury, indeed, needs hardly to be defended as being best able to overcome the symptoms of syphilis, for even the enemies of the drug allow this; their claim being that the mercury, although subduing the symptoms, harms the patient, produces tertiary disease, etc.

Not only has it been demonstrated by clinical experience that mercury, given by the mouth, controls syphilitic symptoms, but its power, when applied locally, is equally evident, as has been shown by Hebra, Ch. Hunter, Koebner, Monti, and others, by the local effect of the subcutaneous injections of mercury. The advantage of local mercurial dressings of syphilitic lesions has been long established.

That mercury is useful late in syphilis, as well as early, is proved by the well-known value of the mercurial vapor-bath for many forms of ulcerative lesion, occurring late in the disease; by those cases of severe nervous syphilis where the symptoms are reported to yield when the gums become touched; by certain cases of tertiary disease, where mercury cures after iodide of potassium has failed, of which I have seen and reported examples.

Mercury certainly carries the palm in inherited syphilis, the mixed symptoms of this form of disease yielding more certainly to mercurial inunction, as a rule, than to any other means.

THE IODIDES.

The preparations of iodine are of value—a certain value, doubtless, as a tonic—throughout, in the treatment of syphilis. The number of the red blood-cells increases under their administration; but as anti-syphilitics proper the preparations of iodine have very little worth—they do not keep off the earlier eruptions, or prevent relapse. In cases of gummy tumor, on the other hand, wherever situated, for all sorts of brain-lesions, for all kinds of nervous symptoms, all visceral changes where the parenchyma of organs is involved, for many forms of ulcers and inveterate cutaneous lesions, the preparations of iodine hold the very first rank in value, and their skillful use yields marvelous results.

In certain parenchymatous lesions of the deeper organs (one of the forms of syphilitic orchitis) and many chronic skin-affections, a combination of mercury with iodine, in what is known as the mixed treatment, gives the best results.

My object, in what has been written, has been to show that—1. Mercury is generally recognized as capable of overcoming the symptoms of syphilis and postponing their appearance; 2. Mercury in minute doses, long continued, is tonic.

Before going into a detail of the steps of treatment I have only to add that I have now for many years carried out the plan of treating syphilis by the long-continued, unremitting use of small doses of mercury.

This I did, before I ever heard of the *hématimètre*, under the instruction and advice of my preceptor and partner, Prof. Van Buren. Three years ago we jointly published our views on this subject.¹ Since then I have been at work upon the problem, and think I have established a firm scientific justification of the treatment, which had before very amply justified itself clinically. Of late years I have been using smaller and smaller doses of mercury, and continuing their use for longer and longer periods, and feel satisfied that this has been a step in the right direction. I have also been using the iodides less, except in certain selected cases, where I believe they must be pushed unsparingly.

My experience leads me to state that syphilis, in private practice, is a very manageable disease; that a patient rarely has more than one full, general eruption (the first), during which his treatment was commenced. That subsequent lesions are of a trifling character for the most part, and tertiary symptoms very rare. I rarely see iritis, and not often any appreciable loss of the hair. Mucous patches about the mouth and tongue, and throat-symptoms, are often obstinate, and their duration protracted. I am now in the habit of keeping patients two and a half or three years or more under treatment continuously, and then I see them marry and produce healthy children.

The bad cases of syphilis I meet have generally been overtreated or undertreated early in the disease,

¹ Van Buren and Keyes's "Genito-urinary Diseases, including Syphilis." New York: D. Appleton & Co., 1874.

and have not pursued a regular systematic, continued course.

I think the method I shall now proceed to lay down in detail will succeed as well in the hands of others as it does in mine, provided it be carried out with conscientious exactness, and be persisted in with long-suffering patience by the physician as well as by the patient.

CHAPTER II.

DETAILS OF GENERAL TREATMENT.

When to commence General Treatment.—Details of the Continuous Tonic Treatment by Mercury.—The Tonic Dose; the Full Dose; the Reserve Dose.—The Duration of General Treatment.—Inunction; Subcutaneous Injection; Mercurial Vapor-Bath.—Treatment of Salivation.—Preparations of Iodine and their Use in Syphilis.—Mixed Treatment.—Limit to the Dose of the Iodides.—Duration of Treatment by Iodine.—Other Means used in General Treatment: the Woods, Zittman's Decoction, Syphilization, Hot Springs of Arkansas.—Treatment of Pregnant Women.—Treatment of Inherited Disease.

THE diagnosis of syphilis must be established beyond question before treatment is commenced. The general treatment should last during at least two years, and is not to be undertaken lightly. A chancre is not enough to convict a patient, even if it be single, very hard, of apparently long incubation, and attended by indurated, multiple inguinal ganglia, etc. In such a case, if confrontation establish the source of the contagion to have been true syphilis, treatment may be commenced, otherwise it is wiser and as well in the end for the patient to wait until the early eruption has come to confirm the diagnosis, and then to commence the administration of mercury. Meanwhile, if something must be done to satisfy the patient, a little iodide of potassium or sodium may be given, for this is tonic, can do no harm, may do a little good, and cannot prevent the appear-