judiciously used relieve it. The indication is to deplete the vessels, and especially those of the pelvis, by saline laxatives aided or not by enemata, especially such as glycerine enemata or suppositories. I have now eliminated all the varieties of dysmenorrhœa except one—namely, that which has so many aliases, and is known as spasmodic, neuralgic, mechanical, obstructive dysmenorrhœa, and the remarkable subdivision of the same, which is known as membranous dysmenorrhœa. In doing so I shall revert to the classification of Carus, who, in 1829, divided dysmenorrhœa into inflammatory or spasmodic. I shall reverse the logical order, and take the membranous variety first.

Demonstration

OF

DR. KOCH'S METHOD OF TREATING TUBERCULOSIS,

Given at the City of London Hospital for Diseases of the Chest, Dec. 1st,

By G. A. HERON, M.D., F.R.C.P. LOND.,
PHYSICIAN TO THE HOSPITAL.

GENTLEMEN,—This demonstration is given at the request of my friend Dr. Koch, who desires that in London and elsewhere his method of treating tuberculosis should, so far as is at present practicable, be open to the inspection of the medical profession. Certain parts of this work are already established upon a basis of clinical observation. Other parts of it remain still to be worked out. I think practically all that is yet known to be of consequence in the work is stated in Dr. Koch's paper, which was published in Berlin on the 14th of last month,—a paper which has excited more widespread interest than any other contribution to medical literature. As a matter of course, you are all familiar with the details of the paper, and I propose to do no more to-night than to touch briefly upon those parts of it which it seems to me are essential to the understanding of the method of the administration of the remedy to our patients, and to a clear apprehension of the obvious results which follow its use in human beings.

The mode of action of the remedy within the body is not yet fully known. This much, however, is certain: tubercle bacilli are not destroyed by it in the tissues. It is upon the living tubercular tissues encircling the tubercle bacilli that the remedy produces its effect, and Koch says of this action that there is, "as is shown by the visible swelling and redness, considerable disturbance of the circulation and, evidently in connexion therewith, deeply seated changes in nutrition, which cause the tissue to die off more or less quickly and deeply, according to the extent of the action of the remedy." "To recapitulate," he goes on to say, "the remedy does not kill the tubercle bacilli, but the tubercular tissue; and this gives us clearly and definitely the limit that bounds the action of the remedy. It can only influence living tuberculous tissue; it has no effect on dead tissue, as, for instance, necrotic cheesy masses, necrotic bones, &c., nor has it any effect on tissue made necrotic by the remedy itself."

In dead tubercular tissue living tubercle bacilli are often found. If the organisms so situated do not escape in some way from the body, they may find a nest for themselves there, and so set up fresh centres of tubercular disease. This fact clearly indicates that the treatment of tuberculosis by this new remedy must be continued for some time. From what is now known, it seems likely that about six weeks will be required to rid patients in the early stage of consumption of the symptoms of their disease. Whether this does or does not mean the complete cure of the disease is at present a question which will be answered conclusively by patients treated in hospital wards. It is in the highest degree probable, as every bacteriologist will understand, that relapses will occur. They must be treated on the principles already laid down by Koch, and their importance as a factor in the ending of the case must be worked out in

public hospital practice. This I can say concerning the success which attends the use of this remedy in tuberculosis. I have never seen in a considerable series of cases treated by any remedy such uniformly good results, nor results so favourable to the patients. I do not, in what I have just said, include cases of advanced lung tubercle. Of that class of patients I have seen too few treated in the new way to entitle me to speak of them from my own knowledge. What we have heard and read of such cases in connexion with this treatment leads us to expect at most temporary amelioration of their condition. Attention cannot be too forcibly drawn to what Koch says, in his paper of Nov. 14th, concerning the grave responsibility which will in future rest upon medical men, who leave any means untried to diagnose tubercular disease in its earliest stages. To that end the examination of the sputum ought, he says, to be much more frequently practised than it is to-day in Germany. Speaking from an experience in that direction which is not small, I venture to say that this remark of Koch's applies with at least quite as much truth to England as to Germany. Now that we have the means, in this new remedy, of holding out to our patients, who are in the early stages of tuberculosis—whatever form the disease may assume—the highest probability of a cure of their condition, it will, in my opinion, be a very grave reproach to any medical man who neglects to make an early diagnosis of tuberculosis, and, having done so, postpones needlessly the systematic use in those cases of Koch's remedy.

Koch has said that the action of his remedy consists in the destruction of living tubercular tissue. The destroyed tissue must be thrown off or absorbed. We might, perhaps, feel uneasy as to the consequences of this, even in some cases of lung tubercle in its early stages, and especially in tubercle affecting the larynx, where the swelling, which is part of the effect of the remedy, might conceivably prove dangerous. Experience has, however, shown that, in the considerable number of such cases already treated, no serious risk has arisen. It is a fact that the mucous membranes of the tubercular larynx, while under this treatment, do not swell to such an extent as to interfere very seriously with respiration. Even in advanced cases of lung tubercle, with excavation of considerable portions of lung tissue, there have been no ill effects from the treatment, when it has been conducted with careful attention to the regulation of the dose of the remedy.

The remedy is a transparent, reddish-brown fluid, not unlike brown sherry in appearance. It has no sediment, and when undiluted does not readily decompose. When diluted with distilled water it is, on the contrary, apt to decompose. Bacterial growths quickly appear in it, and it becomes turbid. In this condition it is unfit for use. Its decomposition in dilution is prevented by boiling it, but that process is not necessary if the dilution be made with a half per cent. solution of carbolic acid in distilled water. It should be remembered that both by the frequent boiling of the dilution, as well as by the mixing of it with carbolic acid in the way described, the vigour of action of the remedy is impaired, and therefore fresh dilutions ought only to be used. Experience has, however, shown, I am told, that a 1 per cent. dilution of the remedy made with distilled water, containing $\frac{1}{2}$ per cent. of carbolic acid, remains efficient at the end of one week. The remedy is introduced into the body subcutaneously by means of a syringe which Koch devised for his bacteriological work. It has no piston or washers, and consists of four parts:—An indiarubber ball, with a small hole in it. This ball is fixed upon a hollow metal stem, furnished with a stopcock; into the other end of the metal stem there fits a glass tube, pointed at the further end, and graduated to 1 cc., each division representing a milligramme. Upon the pointed end of the glass tube there fits a hollow needle. In using this syringe the glass tube, with the needle affixed, is detached from the metal stem and filled with absolute alcohol. The metal stem and ball are then replaced in position, and the alcohol gently expelled. Every day before using the syringe I think it well to disinfect the metal stem and the indiarubber ball. Alcohol, however, causes cloudiness in the dilutions of the remedy, and therefore it is necessary to get rid of it as much as possible. For that purpose I wash out the syringe with a little distilled water.

The dose of the remedy has been sufficiently well fixed for all practical purposes. In a healthy man 0.25 cc. produces an intense effect. Koch thus describes the symptoms

produced by that dose on himself, after it had been injected into his upper arm: "Three to four hours after the injection there came on pain in the limbs, fatigue, inclination to cough, difficulty in breathing, which speedily increased. In the fifth hour an unusually violent attack of shivering followed, which lasted almost an hour. At the same time there were sickness, vomiting, and rise of body temperature up to 39.6° C. (103.3° F.). After twelve hours all these symptoms abated; the temperature fell until next day it was normal, and a feeling of fatigue and pain in the limbs continued for a few days, and for exactly the same period of time the site of injection remained slightly painful and red."

1 cc. of a 1 per cent. solution—that is to say, a dose of 0.01 cc. of the remedy—is the smallest dose which affects healthy adults, and the symptoms, more or less marked, following its administration are, in the majority of cases, slight pain in the limbs and a sense of transient fatigue. Only a few persons after this dose show a rise of temperature up to not more than about 100° F. The word "reaction" is used to indicate the symptoms, mild or severe, which follow upon the use of the remedy. In non-tuberculous adults there is no real reaction consequent upon the administration of any dose of the remedy less in amount than 0.01 cc.; therefore, the presence of reaction in the adult after a dose of less than 0.01 cc. of the remedy shows the presence of tubercle in the patient. If in the adult no reaction were obtained by any dose short of 0.01 cc., then it would be certain that the case in question was not one of tuberculosis. This is a law to which no exception has hitherto been found, and it gives the remedy great diagnostic value, which, it seems likely, will be one of its most useful clinical applications. The law applies to both man and beast, and to all tubercular conditions. Already cases have occurred in which the presence of tuberculosis was not even suspected, until the remedy was injected and reaction followed.

The dose of the remedy is regulated in tubercular cases by the age and strength of the patient, and by the conditions of his disease. In children and weak people, and in cases of very extensive disease of the lungs, the treatment should begin with the smallest effective dose, which should be very gradually increased. In fairly strong adults with lupus, joint or gland disease, and also in cases of lung tubercle, where the disease is slight in extent, or where the case is doubtful, a full dose of 0.01 cc. may be administered with safety. But in lung disease, however slight or otherwise favourable the case may be, it is well to begin with a much lower dose. The difference in the conduct of the treatment of lung tubercle and of lupus is that the former is treated with small doses daily, and the latter with large doses at intervals of one or two weeks. Tuberculosis of joints, bones, and glands is treated in the same way as lupus.

A first dose in early cases of lung tubercle in an adult should be either 0.001 cc. or 0.002 cc. If reaction follows this dose, then it should be repeated after the temperature has returned to the normal point. The same dose should be continued in this way until no reaction follows its use. The dose should then be increased by one, or at most two, milligrammes at a time; each dose being repeated until it is found that no reaction follows its administration, and so on until the dose of 0.01 cc. is reached. The dose of the remedy should never exceed 0.01 cc., except as a test to ascertain whether the utmost limit of benefit to the patient has been secured, and this test should be applied to every case. The duration of the treatment in early cases of lung tubercle Koch states to be, as I have already said, from four to six weeks. If after the administration of test doses of the remedy no evidence of the presence of disease is noticed, then the case, Koch says, may "be pronounced cured." I repeat, this statement refers to early lung tubercle only.

As regards the immunity from tuberculosis which may be enjoyed by the human patient after such a course of treatment, no evidence, so far as I know, has yet been brought forward concerning it in clinical records from hospitals, though the protective power of the remedy has been established as a fact by Koch's experiments as regards beasts. The doses of the remedy are prepared as follows: Two dilutions of the fluid are in general use, a 1 per cent. dilution and a 10 per cent. dilution. The 1 per cent. dilution is prepared by putting 0.5 cc. of the remedy into a glass vessel graduated up to 50 cc. The vessel is then filled up

to 50 cc. with distilled water containing $\frac{1}{2}$ per cent. of carbolic acid. One cc. of this solution contains a dose of 0.01 cc. of the remedy. Koch's syringe is graduated in milligrammes up to a capacity of 1 cc.; therefore, if 1 c.c. of this 1 per cent. dilution be placed in that syringe, each marked milligramme of it will contain a dose of the remedy equal to 0.001 cc. The 10 per cent. dilution is used exactly in the same way as the 1 per cent. dilution. Every milligramme of it contains 0.01 of the remedy, and by means of this stronger dilution, the larger doses may be given, or, by dilution, any less dose that may be needed. The subcutaneous injection of the remedy is made in the skin of the back, between the shoulder-blades and the spine, or near the lumbar part of the spine. These parts are selected for this purpose because they are less sensitive than most parts of the skin, and because absorption takes place very quickly from their neighbourhood. Before giving an injection the skin around the proposed site of puncture should be disinfected by means of a 1 in 40 dilution of carbolic acid. The needle should also previously to its being used be dipped in a 1 in 20 dilution of carbolic acid.

The reaction in tubercular cases consists in a gradual rise of temperature, beginning three to five hours after the injection. In ten to twelve hours it reaches its acme,—namely, a temperature of 102° to 104° F. It may even rise as high as nearly 106° F. Shivering often occurs as the temperature rises, but it is not a constant symptom. Pains in the joints, increase of cough and expectoration, nausea and vomiting, headache, often frontal in position, and great prostration and drowsiness, sometimes deepening into stupor, are the symptoms of the reaction. In one instance a man who was tuberculous continued in a state of stupor for forty-eight hours, after receiving a dose of 0.01 cc. Slight icterus and a general papular eruption, which has been so very well described by Dr. Radcliffe Crocker in his paper in THE LANCET of Nov. 22nd, are amongst the less frequent symptoms which follow the injection. The fever lasts, as a rule, for from fifteen to twenty-four hours, and is accompanied by an increase in the rate of the pulse and of the respiration. The fever gradually declines, and the temperature falls to subnormal, but often rises again to about 100° F., less or more, and then gradually drops to normal. The patient, as a rule, suffers but little after the fever. Cases of lupus best show the local reaction, but as Dr. Koch has perfectly described all that is meant by the local reaction, it is needless to trouble you now with a repetition of his words. I have also a case to show you which illustrates sufficiently well the early action of the remedy on lupoid tissues.

Remarks

ON

SALPINGITIS AND SOME OF ITS EFFECTS.

By J. BLAND SUTTON, F.R.C.S. Eng.,

ASSISTANT SURGEON, MIDDLESEX HOSPITAL.

(Concluded from p. 1148.)

FIVE years ago I drew attention to the new and important light shed on the pathology of inflammation by the discovery of intra-cellular digestion, which tended to show that inflammation is in essence a struggle between irritant bodies of various kinds and leucocytes, a struggle which may be termed "amoebic warfare." Since Metschnikoff made us acquainted with the aggressive powers of leucocytes and the "wandering cells of the mesoderm" many have confirmed his observations, and a recent contribution to this subject by Dr. Armand Ruffier¹ on the "Phagocytes of the Alimentary Canal" is of great interest. *Phagocytes*, or "fighting cells," are of two kinds. *Microphages*, mono- or poly-nucleated cells, are as a matter of fact large leucocytes. These have long been familiar to histologists as epithelioid cells. *Macrophages* are large mono-nucleated

¹ Quarterly Journal of the Microscopical Society, vol. xxx., part 4, February, 1890.