source of the colour from which the pus derives its name, which is communicated readily to any of the cultivating media in which the bacillus grows. It is no less remarkable for the definite character of the symptoms which it produces when injected into the circulating blood of a living animal. A few drops of the pure cultivation produce pyrexia followed by collapse, purging, and death, with, as is seen on dissection, intense enteritis. In addition to this, all that is necessary for us to have before us just now is that the blue pus bacillus is not only virulent but toxic, that is, that although when introduced in minimal quantity into a vein it kills by multiplication in the organism, after the manner of a contagium, almost all the symptoms of its action can be produced by the injection of the products of its vegetation outside of the body, that is, of a sterilised culture. Now it is this product which M. Charrin found in 1888 to possess the required power of inhibiting the inflammatory process. In the rabbit, as we have seen, cultures of this microphyte when injected *intra venas* produce rapid death, preceded by fever and collapse. If it is injected subcutaneously it does the same thing, producing no local symptoms. In the guinea-pig, which is much less susceptible, it produces local inflammation at the seat of puncture, but no signs of general infection; but, says M. Charrin, if the insusceptible guinea-pig is "prepared" by infusion of some of the product of the very same bacillus it is thereby, so to speak, converted into a rabbit for the nonce; local reaction disappears, constitutional infection takes its place.

What is the meaning of all this? What M. Bouchard says about it is, that the action relates to the inflammatory process as a whole, that is, that it is not a paralysis of ameboid cells, as has been supposed, but an action on the whole machinery of living tissues, on vasomotor nerves as well as blood vessels; and accordingly he places the chemical action of microphytic products with the action of such general depressants as cold, exhaustion, or even mere restraint of bodily movement, each of which has been shown to favour infection by diminishing local reaction. For by experiments which appear to me to be of surpassing interest, he shows that the same culture which, when introduced under the skin of the relatively insusceptible animal in a Cohnheim's tube, produced general infection without local reaction if the animal were immobilised, produced local reaction (that is, suppuration without infection) if it were left at liberty.

What explanation can be given of all this but one, namely, that in each instance the same cause which weakens local reaction weakens at the same time and in a similar degree the power which the organism as a whole possesses of defending itself against infection? In what this power of defence consists I will endeavour to set forth in the next lecture, in so far as present knowledge is adequate. In the meantime, let us avoid attaching any other meaning to the unquestionable fact of phagocytosis, excepting first that the emigration of leucocytes is an essential part of the process of inflammation, and that there is an antagonism between this process and the process of general infection.

OBSERVATIONS ON THE EFFECT OF THE INJECTION OF TUBERCULIN ON THE PULSE.

*Read in the Section of Therapeutics at the Annual Meeting of the
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July, 1891.*

By J. G. SINCLAIR COGHILL, M.D., F.R.C.P. EDIN.,
Physician Royal National Hospital for Consumption, Ventnor.

THERE is a striking contrast between the present state of public and professional opinion on the subject of Koch's treatment and that which prevailed during the later months of last year. The period which has elapsed has been fruitful in experience, and the clinical study of the action of tuberculin has yielded valuable results. In addition it has undoubtedly had the effect of greatly modifying the views originally advanced by Koch and his immediate followers.

The conclusions at which I have arrived may be briefly stated as follows:—

1. That tuberculin is a vastly more potent remedy than originally believed; and that it is a complex substance, certainly containing, in addition to its remedial element, several of a highly toxic character.

2. That it certainly does not act therapeutically as Koch supposed, but that it seems to act principally as a direct and potent stimulant to the nutrition general and local, that is, especially the pulmonary tissues themselves.

3. That the vital phenomena included under the term reaction have been erroneously regarded as advantageous and the measure of the beneficial effect of the remedy.

I was much impressed by the extreme distress and prostration exhibited by the patients in the Berlin hospitals during and subsequent to the reactions. I felt that they could not be beneficial, and my subsequent experience has confirmed it. I was at the time even inclined to attribute them to the toxic elements contained in the tuberculin rather than to the large doses of the tuberculin itself. I always found that if excessive reactions were induced the patients lost weight, and the physical signs were exaggerated, and that on the other hand improvement invariably commenced when a dose was reached which did not raise the temperature much above normal.

One remarkable fact should be noted in connection with the tuberculin treatment. It is this that Koch's second discovery has materially affected the pathogenic position of his first. The tubercle bacillus is not itself directly influenced by the tuberculin. In fact the true position of the bacillus can only be realised when tuberculosis is regarded as an essentially parasitic disease. Tuberculin, and indeed all other remedies hitherto employed in the treatment of tuberculosis, are directed to increase the local and general health of the patient, so that the renewed vitality of the pulmonary tissues render them inimical to the parasites and prevented their multiplication and extension. I have had under observation a gentleman in his 76th year who had been professionally condemned to early death from tuberculosis, but who had since married and had healthy children, and who is in fairly good general health, yet he has bacilli in his expectoration. Tuberculin seems, I repeat, to have a specific effect in stimulating the local and general nutrition. It is the only remedy which undoubtedly has an elective affinity for the tuberculous tissue and which certainly has a potent effect upon it.

There is to be observed a continuous improvement in many of the cases in the condition of the circulation as compared with that before inoculation, in large part no doubt due to the improved state of health, as evidenced by increase of weight under the treatment, but also no doubt to the tolerance established by repeated inoculations of largely increased doses of tuberculin. It was only by such close study of the clinical phenomena observed during the employment of a remedy so potent and so novel, in a disease so conditioned by disturbing elements, that it could be used with safety, its efficacy noted, and its effects—therapeutic and otherwise—correctly estimated.

I believe the time has come when more moderate and judicious views will prevail as to the position of tuberculin as a remedy in tuberculosis. I still hold that, although far from fulfilling the absurdly unscientific expectations with which tuberculin was at first regarded both by the public and the profession—and by the former, it must be admitted, not unreasonably—this remedy has already begun again to receive the attention it deserves. I have no doubt that it will gradually and steadily assume its true place in the treatment of tuberculosis. If the researches, on which it is understood Professor Koch is engaged, with a view to eliminate some of those toxic elements which have been for some time suspected to be present in tuberculin, and which the recently published experiments of Dr. William Hunter have sufficiently demonstrated to exist, result in giving us the innocuous active therapeutic principles contained in tuberculin, the treatment of tuberculous disease will present an encouraging future.

The full and varied expression of opinion, and the numerous details of experience of the tuberculin treatment which the discussions at Bournemouth have evoked, are a striking proof of the utility of the annual meetings of the Association; they afforded an opportunity for those personal explanations which cannot be so satisfactorily given in the columns of the

BRITISH MEDICAL JOURNAL. I am glad to find that so large a favourable experience of the treatment had been placed on record from so many quarters. There seems to be a consensus of opinion that the remedy is valuable as part of the general treatment of tuberculous disease. I quite agree as to the value of climatic conditions as favouring the action of the remedy, but the effect of the climate alone in consumption has been and is greatly over-estimated. The personal surroundings of the patient are equally important—in fact, I believe that the winter resorts of the south coast of England, with the familiar home comforts, family ties, and the society of friends are more favourable to recovery in a very large number of cases of phthisis, especially those which have advanced beyond the first stage, than the most vaunted health resorts on the Continent, and even more distant lands. Management, in the widest sense of the term, constitutes the successful treatment of consumption as hitherto. There have hitherto been no specific remedies for the disease: tonics, cod-liver oil, etc., only act as stimulants to the general health, but in tuberculin, I believe, we have more than the promise of a remedy possessing an elective and specific action on the materies morbi of tuberculous disease.

[Dr. Sinclair Coghill exhibited a number of sphygmograms, along with several charts of cases under inoculation, which illustrated the close sympathy and correspondence of temperature, pulse, and breath rate—a relation, however, very much more marked in the pulse than in the breath rate—without reference even to the extent of the pulmonary lesions. This phenomenon was as marked in all cases as it was unexpected. The pulse tracings show that the effect of the inoculation is simply that produced by ordinary pyretics.]

The dirotism is more or less marked according to the rise of temperature, and seems to bear a close, though not always an invariable, relation to it. Sphygmograms Nos. 1, 2, 3, and 4 illustrate this very well.

Fig. 1.—Female: inoculated 10.33 A.M., January 2nd, 1891. Tuberculin 0.002 g. 7 P.M. Temperature 104.2°, pulse 115, pressure 53ss.

Fig. 2.—Female: inoculated 10.30 A.M., January 19th, 1891. Tuberculin 0.005 g. 7 P.M. Temperature 104.3°, pulse 145, pressure 51j.

The sphygmograms Nos. 3, 4, 5, and 6 exhibit an anomaly in the relationship of temperature and dirotism, and would seem to show that the dirotism is more in relation to the pulse rate than to the temperature when these do not correspond.

Fig. 3.—Male: inoculated 10 A.M., January 2nd, 1891. Tuberculin 0.005 g. 6 P.M. Temperature 103.4°, pulse 83, respiration 32.

Fig. 4.—The same at midnight. Temperature 104°, pulse 116, respiration 36.

Fig. 5.—Male: inoculated 10 A.M., January 2nd, 1891. Tuberculin 0.002 g. 6 P.M. Temperature 103.2°, pulse 90, respiration 49.

Fig. 6.—The same at midnight. Temperature 102°, pulse 120, respiration 36.

Here (Fig. 5) with a temperature of 103.2°, we have a pulse rate of 90, and (Fig. 6) with temperature of 102° a pulse rate of 120, while the respiration is in relation to the temperature.

Sphygmograms Nos. 7 and 8 are from the same patient, No. 7 being the tracing taken before the first inoculation, and No. 8 that taken after the seventeenth inoculation.

Fig. 7.—Tracing of pulse December 26th, 1890, at 9 P.M. Pulse 80, pressure 51j, previous to inoculation.

Fig. 8.—Tracing of pulse March 2nd, 1891, at 8 P.M. Temperature 99°, pulse 80.

At 10.15 A.M. inoculated with 0.05 g. tuberculin. This was the patient's seventeenth inoculation. She had three subsequent inoculations of 0.06 g. on March 10th, of 0.07 g. on the 17th, and 0.08 g. on the 24th, when on each occasion the temperature never rose above normal. No sphygmograms were taken after that of March 2nd. This patient, who had an excavation at the right apex, is now perfectly cured.

Nos. 9 and 10 also illustrate the establishment of tolerance for the remedy, and the increased energy of the circulation as a result of treatment. They are from the same patient, a female with cavitation but no pyrexia. She gained 21 lbs. during the inoculations. The pulmonary lesion underwent a correspondingly favourable change.

Fig. 9.—Tracing taken December 26th, 1890, at 7.30 P.M. Temperature 98.6°, pulse 70.

Fig. 10.—Tracing taken March 2nd, 1891, at 7.30 P.M. Temperature 99°, pulse 68. Inoculated at 10.15 A.M. with 0.05 g. tuberculin.

This was the patient's seventeenth inoculation. She had three subsequent injections—on March 10th 0.06 gr., on 17th 0.07 g., and on the 24th of 0.08 g.—without reaction.

ON THE USE OF TUBERCULIN IN THE TREATMENT OF LUPUS AND TUBERCULOSIS.

Read in the Section of Therapeutics at the Annual Meeting of the British Medical Association, held in Bournemouth, July, 1891.

By E. MARKHAM SKERRITT, M.D.LOND., F.R.C.P.,
Senior Physician to the Bristol General Hospital: Lecturer on Medicine at the Bristol Medical School.

In conjunction with my colleague, Dr. Barclay Baron, I have been engaged for seven months in carrying out at the Bristol General Hospital a series of careful observations on the results of treatment with Koch's fluid. We have declined to inject patients except under the favourable conditions which a hospital affords. The cases treated were some 40 in all, and included 11 of lupus, 23 of pulmonary phthisis, and 6 of laryngeal disease. The following are the results obtained up to the present time.

A.—LUPUS.

1. Very marked improvement occurred in some cases, greatest in two. One, a boy aged 12, with extensive lupus of the face, which is now almost transformed into cicatricial tissue, one small patch of scabbed lupus tissue alone remaining. The other, a woman who had suffered from lupus of the face for about twenty-five years, and had undergone every