but the parents absolutely refused to permit anything in the nature of an operation. I had therefore to do the best I could under the limitations imposed. A three months' course (five days a week) of massage, interrupted current, and mechanical vibration (*sismothérapie mécanique* of French writers) produced very fair results as regards the thigh and hip, despite the long standing of the disease. The buttock muscles were increased to such an extent that the difference between the two sides, previously marked, was no longer noticeable when the clothes were on. At the same time, the thigh gained two inches in circumference.

As to that part of the limb below the knee-joint, however, a very short experience convinced me that little could be done by electricity, etc., without previous surgical correction. In this case, then, the only possibility of benefit lay in the provision of suitable apparatus. The usual cumbersome and unsightly "leg-irons" had been previously suggested; but the patient—a somewhat spoiled and self-willed child—had refused them. To anyone acquainted with these instruments her objection will appear not altogether unreasonable, especially when it is remembered that she could manage to get about after a fashion without any such aid. I therefore set myself to devise a boot which should support the ankle, correct the talipes equinus, so far as possible, and at the same time be neither unduly heavy nor recognizable as a surgical appliance.

Fig. 4.—Patient in new surgical boot, standing firmly on both feet.

The boot shown in photographs 4 and 5 was made to my design by a firm of instrument makers in Newcastle. Its construction is very simple. There is a cork extension having a thickness of $3\frac{1}{2}$ in. at the heel, tapering to $2\frac{1}{2}$ in. at the toe; of this rather more than a third is concealed within the upper. Two light steel side supports are fitted between the leather and the lining; these are furnished with flat joints at the ankle, and their lower ends are firmly attached to the sole. To correct the foot drop—that is, in so far as the retraction of the calf muscles will admit of it—finely tempered steel springs are fitted to the joints on both sides. As can be seen from the photographs, the whole boot is neatly finished, and, except for the thick sole, scarcely to be distinguished from an ordinary piece of foot gear.

The patient now walks considerable distances, still limping, of course, to some extent. Her figure and general carriage are greatly improved. She has learnt to ride a bicycle without special difficulty, and has so far met with no accident.

During the course of the treatment the nocturnal incontinence gradually disappeared. This result was not specially aimed at, but it often happens that in the course of treating a paralysed limb we get beneficial effects not originally expected, or even thought of. Remarkable improvement in the general health, both of body and mind, is not uncommon.

Fig. 5.—Side view of new boot. The outlines of steel side supports and internal cork sole are just visible.

The lessons to be derived from a consideration of the above case seem to me to be as follows:

1. Chronic infantile paralysis of medium severity occurring in persons not yet of full growth should never be regarded as incapable of improvement, even when the condition is of many years' standing.

2. Because the parents will not permit us to perform a simple and, to our minds, obviously necessary operation, we should not therefore throw up the case. It is our duty to do what we can for the patient by other means, thereby conserving the limb, and leaving the way open for surgical measures at some future date.

3. As regards paralytic deformity below the knee, leg-irons and coil-springs are not the last word in supporting apparatus. Provided expense is not a first consideration, special boots can generally be devised to suit individual cases—boots which need not be a source of constant embarrassment to the sensitive girl-patient approaching young womanhood.

4. Lastly, the fact that the patient has well-to-do and intelligent parents, desirous of giving their child every chance, is no guarantee that everything possible has been done. Each case, no matter what the history, should be considered with an open mind.

A SPECIAL clinic for the treatment of internal diseases by phototherapy has been established in the Finsen Light Institute, Copenhagen. The director of the new clinic is Dr. Rubow.

ON THE DETERMINATION OF THE TUBERCLE BACILLUS IN THE BLOOD OF PERSONS SUFFERING FROM PHTHISIS.

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It has usually been maintained, in relation to localized pulmonary tuberculosis, that tubercle bacilli do not occur in the blood stream. The access of the bacilli to the blood stream has been supposed to constitute the commencement of a generalized tuberculosis. Certain recent observations have raised doubts regarding the validity of this view. Thus, Rosenberger¹ has published the results of the examination of the blood of 50 cases of phthisis in various stages of the disease. In every case examined he reports having found tubercle bacilli with ease. In a later paper² he states that he has demonstrated the bacillus in 312 out of 312 cases examined. Later, Forsyth³ reports having examined the blood in 12 cases of phthisis and having found tubercle bacilli in 10 of these cases.

These results, if correct, being evidently of much importance, it was suggested to us by Dr. Philip that we should undertake a further series of observations at the Royal Victoria Hospital for Consumption, Edinburgh.

METHOD.

The method adopted by Rosenberger was, shortly, as follows:

He withdrew from a vein in the arm of the patient 5 c.cm. of blood by means of a sterile syringe, previously boiled in a solution of caustic soda. This blood was at once mixed with an equal quantity of a 2 per cent. solution of sodium citrate in normal saline, well shaken to avoid clot formation, and then allowed to stand in a refrigerator for twenty-four hours. He then, with a sterile pipette, removed a small quantity of the precipitate with which he made a thick film on a clean glass slide, dried on a copper plate at moderate heat, laked in sterile distilled water, and finally stained "by the usual technique" for tubercle bacilli. From each lot of blood he made three films. He maintains that each film should be examined for thirty minutes before giving a negative verdict. Care must, of course, be taken throughout the processes to avoid contamination.

Forsyth's method is similar to that of Rosenberger, with the exception that he centrifuges the mixture of blood and sodium citrate solution "in a fast-running centrifuge for twenty minutes," instead of allowing it to precipitate in a refrigerator.

Out of 22 blood examinations done by us, 13 were performed according to Rosenberger's method and 9 by Forsyth's. As regards staining, our method was as follows:

Slides were first stained with hot carbol fuchsin for five minutes, then decolorized in 5 per cent. sulphuric acid, and finally counter-stained with a watery solution of methylene blue.

As Rosenberger indicated that tubercle bacilli could be demonstrated in the blood even before they were to be found in the sputum, we commenced by examining the blood of two patients with well-marked physical signs of consolidation at both apices, in whose sputa it had been impossible to demonstrate tubercle bacilli. Prolonged examination of four slides in each case failed to reveal tubercle bacilli.

We next examined the blood of an advanced case with double cavity formation, in whose sputum numerous tubercle bacilli were present. Again the result of blood examination was negative, notwithstanding searching examination of four slides for more than an hour each. In confirmation we again removed 5 c.cm. of this patient's blood and treated it by centrifugalization (the former sample having been allowed to stand in the refrigerator). Again the result of examination of four slides was negative.

We then resolved to extend our examination to the blood of 20 cases, varying in type from early consolidation to advanced lung condition, and in some cases accompanied

by tuberculous disease elsewhere—for example, larynx, bones, or glands. In the last 18 cases examined we had previously demonstrated tubercle bacilli in the sputum. The result of these examinations is tabulated below, along with the age, lung condition, and duration of illness of each patient. In every case four slides were prepared, and each slide was examined for at least an hour.

Name.	Age	Disease.	Duration.	Sputum.	Result.
M. J.	24	Consolidation both apices	5 years	T. B. —	Negative.
Mrs. McQ.	36	Consolidation both apices	2 years	T. B. —	Negative.
E. F.	23	Cavity both apices	2 years	T. B. +++	Negative.
E. F. (Second sample)	23	Cavity both apices	2 years	T. B. +++	Negative.
J. N.	48	Cavity left apex. Consolidation right apex	14 months	T. B. +	Negative.
C. S.	36	Cavity right middle lobe. Consolidation both apices	2 years	T. B. +	Negative.
D. D.	40	Cavity right middle lobe. Consolidation both apices	5 months	T. B. ++	Negative.
R. G.	24	Consolidation both apices	3 months	T. B. +	Positive.
R. G. (Second sample)	24	Consolidation both apices	3 months	T. B. +	Negative.
F. G.	25	Consolidation both apices	1 year	T. B. ++	Negative.
A. B.	28	Consolidation both apices. Tubercle of bones of forearm, rib, and cervical glands	3½ years	T. B. +	Negative.
T. T.	22	Two cavities left lung. Consolidation right apex	16 months	T. B. +++	Negative.
A. S. B.	19	Cavity right apex. Consolidation left apex	9 months	T. B. +	Negative.
D. F.	27	Consolidation both apices	1 year	T. B. +	Negative.
A. McL.	23	Consolidation upper left lobe. Consolidation right apex	18 months	T. B. ++	Negative.
B. C.	23	Consolidation both apices	2 years	T. B. +	Negative.
A. L.	25	Cavity right apex. Consolidation left apex. Tubercle of larynx	2½ years	T. B. +	Negative.
Mrs. P.	33	Consolidation both apices	18 months	T. B. +	Negative.
J. F.	53	Consolidation both apices	14 months	T. B. +	Negative.
A. M.	29	Consolidation both apices. Tubercle of larynx	18 months	T. B. ++	Negative.
A. F.	26	Cavity left lung. Consolidation right apex	15 months	T. B. +	Negative.
Mrs. C.	31	Two cavities left lung. Cavity right apex	4 years	T. B. +	Negative.

Analysis of our results shows them to be almost completely opposed to those obtained by the other observers. In one instance only, out of 22 blood examinations from 20 patients, was it possible to demonstrate tubercle bacilli. In this case two acid-fast bacilli were found, resembling morphologically the tubercle bacillus. A second examination of the blood of the same patient proved negative after prolonged search, so that we were led to believe that the presence of the two bacilli referred to may have been accidental.

Our observations seem, therefore, to indicate that at no stage of localized pulmonary tuberculosis is the tubercle bacillus demonstrable in the blood. Our findings are in agreement with the recently published observations of Bernstein and Fried,⁵ who also obtained negative results on injecting the blood into healthy guinea-pigs.

Since the above was written Schroeder and Cotton,⁴ at the United States Bureau of Animal Industry, have tested the blood of 42 cattle, in all stages of tuberculosis, by intra-abdominal injection into guinea-pigs, with negative results in every case, from which these observers conclude "that tuberculosis is not to be classified, in any sense of the word, as a bacteraemia."

We have pleasure in expressing our acknowledgements to

Dr. R. W. Philip for his advice, interest, and assistance in our work.

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THE SCIENCE COMMITTEE

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British Medical Association.

REPORT CXVI.

THE INFLUENCE OF THE UNSATURATED FATTY ACIDS IN TUBERCULOSIS.

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AMONG the many remedies advocated for tuberculous conditions none have been held in such high esteem, or stood the test of time so well, as cod-liver oil. The use of this and the free administration of fat have been recognized as no mean agents in the cure of tuberculosis. The recent additions to our knowledge of the lipoids show how important these bodies are in the animal economy, and further knowledge of the constitution, properties, and action of the compounds of various fatty acids have opened up many fields of research.

The painstaking and careful work of Leathes¹ and his colleagues has, while showing the difficulties of these problems, yielded some important results. Leathes has shown that the liver, among its other actions, has the power of desaturating fats and thus supplying the blood with unsaturated fatty acid compounds. These bodies, having loose affinities in place of the hydrogen atoms which have been removed from them, are capable of exerting chemical action in a marked degree. Moore,² for example, has shown the striking influence they have on haemolysis. The fish and vegetable oils contain as a rule more of these unsaturated fatty acids than do animal fats. Cod-liver oil contains them in a marked degree. The consideration of these facts has led us to investigate the action of cod-liver and other oils on the tubercle bacillus, and to contrast their action with the animal fats, to see if there is any basis for the belief in the use of this drug.

The acid-fast properties of the bacillus depend upon the presence of a waxy envelope. This acid-fast property is reduced to a minimum by bodies such as lecithin. To find if it was diminished by the fatty acids themselves or their glycerides, we performed the following experiment: An emulsion of tubercle bacilli was intimately mixed with saturated and unsaturated fatty acid compounds such as olive oil, palmitin, mutton fat, beef fat, and finally cod-liver oil. The mixtures were then incubated at 37° C. for several weeks. In the case of the saturated fat compounds staining with carbol-fuchsin and treatment in the ordinary way with acid showed after an interval of two months that the bacilli were unchanged. With the olive oil a slight change was observed, the bacilli not showing the staining reaction so well, whereas with cod-liver oil a striking change was observed. After a period of about two weeks the bacilli retained the stain less markedly, and in about two months many of the organisms failed to retain it at all, but were readily decolorized by the acid. The cod-liver oil containing a high proportion of