glycerin agar of human bacilli from a virulent case of pulmonary tuberculosis. Professor Calmette, then of Lille, supplied me with a virulent bovine culture from the mesenteric glands of a cow, and Professor Bang of Copenhagen gave me a culture of avian bacilli from the liver of a chicken.

These cultures have been subcultured on glycerin potato and transferred to glycerin agar every month for twenty years in my laboratory, and the present growths represent the 241st generation. At the end of 1914 I was afraid the work would be interrupted, but I took the cultures with me to France, and as I had a good laboratory in the hospital I was able to continue the subculturing there for the next four years. The growths are still profuse and true to type, but they are now completely non-tuberculo-genic and non-pathogenic to animals.

Every year since 1906 I injected these bacilli into animals with a view of testing their pathogenicity; until 1913—that is, the 84th generation—I noticed no change in their virulence. After that time attenuation became marked, and in a series of inoculations of these bacilli into animals in 1914 they were observed to be avirulent. These experiments conclusively prove that virulent tubercle bacilli can be attenuated to such a degree as to be avirulent and non-pathogenic to highly susceptible animals. Some hundreds of animals have been inoculated to test the powers of immunization of healthy animals, and with excellent results. For the purpose of immunizing calves a vaccine was prepared from attenuated cultures of human bacilli. It is a bacillary emulsion of killed bacilli, and contains all the products of the bacillus. Living bacilli are never used; they are destroyed by heat before preparation.

Calves that are to be immunized should be separated from the mother at birth and fed on healthy milk for a week, when the first dose of vaccine is given; this is followed a week later by the second dose. They then associate with the other animals. The injection is given hypodermically in the usual way, under the skin of the abdomen, with strict antiseptic precautions. The method is only applicable, of course, to healthy animals.

During the last four years over 600 calves in valuable pedigree herds have been vaccinated by careful veterinary surgeons, and tuberculin tests at intervals of six months have so far been most satisfactory; the duration of immunity in 120 calves has been over three and a half years.

The problem of tuberculosis resolves itself into the question of immunity, and, in my opinion, we want to aim at producing an immunity in the animal against the amount of infection it is likely to encounter in ordinary life. It is almost impossible to immunize any animal against a lethal dose of virulent culture. The protection of the community by some safe scientific method of active immunization is the only effective way by which this preventable scourge can be eradicated.

Turning to the question of human immunity the problem is much more difficult, as children are susceptible to both human and bovine infection. At the special request of the parents in a large tuberculosis colony to which I was attached, and where each father has pulmonary tuberculosis, I gave all the children, over a hundred in number, two doses of protective vaccine prepared from dead attenuated bovine bacilli, with the object of protecting them from human infection. So far they appear to be healthy, but it will require at least ten years of observation before we can give any definite opinion as to its efficacy.

In conclusion, I am of the opinion that it is possible to immunize cattle against ordinary infection by using killed cultures of attenuated human tubercle bacilli, in precisely the same way that we can give immunity to man against ordinary infection of typhoid and paratyphoid by using dead cultures of typhoid bacilli. Animals cannot withstand large doses of virulent bacilli as a test of immunity, and I cannot see that it is necessary to give them. Our aim is to protect animals and children against the ordinary infection they are likely to meet with in life, and not against a lethal laboratory dose of virulent bacilli. In my opinion it is not necessary to use living organisms for the purpose of producing a relative immunity against tuberculosis.

TREATMENT OF TUBERCULOSIS.

A NOTE ON THE EFFECT OF COLLOIDAL ANTIMONY.

BY

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PULMONARY tuberculosis is so widespread and accommodation in sanatoriums is so limited that any form of treatment to be of much value to the community at large should be one than can be carried out under ordinary conditions with the patient living at home, or even continuing his work. It should also be such as can be carried out by the patient's own medical attendant.

In looking for a drug which would at least alleviate some of the most distressing symptoms of phthisis it occurred to me to make trial of antimony, which has been used with some success in the treatment of leprosy, kala-azar, and bilharziasis. The difficulty at first was to find a preparation which caused no unpleasant symptoms. A 2 per cent. solution of tartar emetic in normal saline was tried for some time, half-grain doses of antimony tartrate being administered intravenously twice a week. Improvement followed a course of these injections, but the immediate effect was often a feeling of collapse.

I next decided to try colloidal antimony (Crookes's) in 1/2 c.cm. doses intramuscularly twice a week, and found that with this there was no shock, and it could be given in the out-patient clinic without fear of untoward symptoms. On the day after the injection the patient feels a little tired, but when this has passed off there is a distinct improvement; appetite increases, the breathing becomes easier, and the patient feels much brighter and more alert. The effects on the lesion seem to resemble those produced by sanocrysin, but without its dangers; for a week or two moist signs increase and the expectoration becomes more profuse, but these eventually diminish, the evening temperature drops slowly to normal, and thereafter pursues a much more level course.

The colloidal antimony is most conveniently injected into the flexor muscles of the forearm, and in some thousands of injections during the past year I have had no ill effects from it. There is often a little pain with the first few doses, but this is seldom complained of at subsequent injections. The dose at first is 0.5 c.cm., increased later to 1 c.cm. The temperature is as a rule improved after three or four injections, but if the pyrexia persists, both the quantity and the frequency of the injections may be increased. In severe cases I have given daily injections for a fortnight without ill effect. Occasionally when a patient has not reacted to intramuscular injections I have given them intravenously, with immediate result; on the other hand, intravenous injections not uncommonly cause some malaise.

How long the injections of antimony should be continued it is as yet too early to say, but in general one would suppose that they should be persevered with until the physical signs have cleared up.

To patients with troublesome cough during the day I give also a mixture thrice daily of vinum antimoniale 10 minims, oxymel scillae 1 drachm, in half an ounce of water. This reinforces the antimony administration, and also soothes the cough and assists expectoration. For the morning cough, often so distressing, I give asparagin 1 grain first thing, dissolved in a drachm of water; this loosens the tenacious sputum. At night I give the liquid extract of *Sanguinaria canadensis* in 2-minim doses in water to allay bronchial irritation and promote a good night's rest. The two drugs asparagin and sanguinarin have been used by me now for many months and in over 200 cases, and I am convinced of their value, although where there is haemoptysis or even blood-stained sputum I omit the sanguinarin. In very acute cases I administer these drugs alone for a week or two before beginning the antimony injections, lest the antimony, by increasing congestion in the lungs, might do fatal injury. If the sanguinarin irritates the stomach it should be discontinued. For pleuritic pain in phthisis I use a simple liniment of turpentine, alcohol, and compound camphor liniment in olive oil, to be rubbed on the chest and back daily.

It is only right to mention that the temperature often drops directly after administering asparagin and sanguinarin, before the injections of antimony are begun.

I have satisfied myself that under the treatment detailed above a much shorter residence in a sanatorium is required than has hitherto been the case, and this permits a larger number of cases to pass through the sanatorium in a given time. Even in Stage 3 cases I have often found three months' in-patient treatment sufficient to enable them to return home greatly improved with a fairly normal evening temperature and fit to attend the clinic regularly. So far I have treated about 200 cases in this manner, with most satisfactory results on the whole, and but few failures.

It is, of course, essential that the patient should continue to lead a quiet life with sufficient food and comfort until he is fit to resume work. For patients with much bronchial irritation exposure to cold, damp, and foggy weather is harmful; certainly in such cases the fresh-air treatment can be much overdone.

Much more work with this treatment is clearly necessary before it is possible to say whether the results are better than those produced by other methods; but my own observations are distinctly encouraging, and it is with the hope that other workers in this field will give it a trial and report their results that this preliminary note has been written.

Memoranda :

MEDICAL, SURGICAL, OBSTETRICAL.

THE TREATMENT OF VARICOSE VEINS BY ORGANIC ARSENIC INJECTIONS.

In the *BRITISH MEDICAL JOURNAL* of October 2nd, 1926 (p. 614), are described the effects of treatment by injections of quinine and salicylates, causing thrombosis of the diseased vein.

About 1910, when "606" was first introduced, I had occasion to treat a mild case of inherited syphilis. The patient was sitting with the arm resting on a table. When I had injected about 10 c.cm. of the fluid the patient fainted—it may have been due to the view of the 300 c.cm. to be yet injected. We knew little or nothing of the effects of the Ehrlich-Hata preparation except what we were warned against, which was not of much use as the effect happened before we could prevent it.

Later in the day the patient again presented himself, determined to go through with it. Knowing that he had a varicose vein in his leg I decided to inject into this, as I was under the impression that it would be expedited by being put into a large-bore vein, without thinking that no more could go through the needle than the bore would transmit, but knowing, however, that the rule was not to touch the varicose vein unless it was to be excised at once, which I had no intention of doing at the time.

I succeeded in completing the injection at this sitting, but as a precaution had the patient lying on the operating table. I at once bandaged the leg as usual and allowed him to go home. I saw him three days later, when I was informed that the varicose condition had vanished. On examination the vein could not be seen. It has remained well ever since, and no bandages have been worn subsequently. From this experience I have ever since used injections of galyl, kharsivan, neokharsivan, or novarsenobillon, with the same effect, but I have now adopted the regular anti-syphilitic course of treatment in all cases, being convinced that the varicose condition is syphilitic and possibly only hereditary in origin. Piles I deal with in the same way, with most satisfactory results. I have had occasion to treat two sleep-walkers. The first had a very bad history of apoplexy in his father, mother, two brothers, and a sister, who all died between 35 and 43 years of age. This man used to walk in his sleep and screech as if he were being stabbed with a knife, frightening everyone around; he was fast asleep all the time. He had "Circe's girdle" well marked round the upper edge of the liver. One injection of galyl stopped his nightly peregrinations. I lost sight of him during the war, but met him afterwards, when he told me that he had never been troubled with sleep-

walking but had developed rheumatism, probably syphilitic in nature. The second sleep-walker I injected at once without inquiring into the family history, though I had a suspicion that it was tainted. He also ceased to walk in his sleep.

Varicose ulcers I always treat by injections of the arsenical compounds into the vein or veins below the ulcer. I apply a non-irritating dressing to the ulcer and keep the patient in bed until it is soundly healed. This usually, in a very old and hard-edged ulcer, takes about fourteen days. The scar becomes very dense and unyielding; it does not recur if the treatment is carried out to the end. I give the first injection on the day of seeing the patient, the second in fourteen days, and the third three months later. Throughout this period of fourteen weeks I give Hutchinson's formula for mercury, three pills a day. If the gums become painful I stop the pills, to begin them again as soon as the gums are normal. During sixteen years' experience of treating syphilitics I have noticed that the veins in the arm, as well as in other parts of the body, always become narrowed to the normal, where previously they had been more prominent than they ought to be. They further always remain pervious, so that varicose veins can be cured by injection without causing pain or thrombosis. In no case have I seen recurrence of the varicose condition.

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THE AFTER-TREATMENT OF MASTOID OPERATIONS.

In the report of the discussion in the Section of Laryngology and Otology of the Annual Meeting on the after-treatment of mastoid operations, published in the *JOURNAL* of December 18th last, no mention is made of the use of paraffin preparations as a substitute for gauze packing in the radical mastoid cavity. I am so convinced of the advantages of the use of such preparations that I take this opportunity of very strongly recommending them. I claim no originality, having read of the method some time ago in a French journal, to which, unfortunately, I cannot now find the reference. Either the proprietary preparation ambrine, or the B.P.C. preparation No. 7 paraffin, can be used. The latter consists of a mixture of soft and hard paraffin, with resorcin, eucalyptus, and olive oil, and has a melting point of 48°. All that is necessary is to melt the preparation in a test tube in a water-bath and pour it into the cavity. It can be removed without difficulty by picking out with forceps. My practice is to renew the paraffin at weekly intervals. I employ it whether a skin graft has been used or not. The advantages of its use are: (1) The cavity heals with astonishing rapidity, probably owing to the absence of trauma to the spreading epithelium. (2) It can be introduced (and removed) painlessly, and by the unskilled, with the certainty that the whole cavity will be filled. (3) Presumably, owing to (1), the discharge diminishes very rapidly.

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PSEUDO-MUCINOUS CYSTADENOMA OF THE OVARY.

THE combination of a dermoid cyst and a pseudo-mucinous cyst occurring in the same ovary is very uncommon, and is worthy of record.

A woman, aged 48, complained of increasing abdominal distension; she was found to have a large ovarian cyst. The operation was performed by Mr. Rodney Maingot, F.R.C.S., and the removal of the large cyst presented no difficulties; it weighed 12 lb., the tumour consisted of two distinct parts—a large thin-walled portion which lay anteriorly and presented the macroscopical characteristics of a pseudo-mucinous multilocular cystadenoma, and a small hard thick-walled cyst which was situated posteriorly. The latter did not communicate with the former, but was loosely attached to the main tumour by areolar tissue. On section it contained a great quantity of hair, and thick pultaceous matter.

The large cyst, on microscopical examination, showed no signs of malignancy, and Dr. A. B. Rosher confirmed the diagnosis of pseudo-mucinous cystadenoma of the ovary.

Maidenhead.

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