

(4) Water in tanks after treatment for 4 hours.			
1 tube, 50 c.c.	Acid and gas	} Lactose fermenters present in 150 c.c. and absent in 100 c.c.
1 ,, 50 ,,	.. ..	No change
2 tubes, 10 ,,	.. ..	,,
6 ,, 5 ,,	.. ..	,,
(5) Untreated water, May 9.			
1 tube, 10 c.c.	Acid and gas	} Lactose fermenters present in 10 c.c.
1 ,, 10 ,,	.. ..	No change
5 tubes, 5 ,,	.. ..	Acid and gas
1 tube, 5 ,,	.. ..	No change
(6) Water in tanks after treatment for 24 hours.			
2 tubes, 50 c.c.	No change	} Lactose fermenters absent in 200 c.c.
4 ,, 10 ,,	.. ..	,,
12 ,, 5 ,,	.. ..	,,
(7) Water in tanks after treatment for 1 hour.			
1 tube, 50 c.c.	No change	} Lactose fermenters absent in 100 c.c.
2 tubes, 10 ,,	.. ..	,,
6 ,, 5 ,,	.. ..	,,

THE CURE OF TUBERCLE.

By LIEUTENANT-COLONEL C. BIRT.
Royal Army Medical Corps.

SOMEWHAT sensational articles have appeared recently in the daily press on a new cure for consumption. Thus it is stated in one newspaper:—"It should be clearly understood that Dr. Friedmann and the authorities who support him claim that they have an absolute specific against all forms of tuberculosis." In the *Berliner Klinische Wochenschrift* for November 18, 1912, there is a report of Friedmann's announcement to the Berlin Medical Association at their meeting held on November 6. He stated that he had treated 1,182 tubercular cases with injections of living cultures of a tubercle bacillus which he had rendered avirulent by passage, and by other means which he did not disclose. He first tested the preparation on himself, and found it harmless. For the treatment to be successful, a nodule, which remains for weeks, must form at the site of the inoculation. So long as the infiltration persists, the healing processes proceed. The remedy fails if an abscess forms at the spot. To obviate this he begins with an intravenous injection of the emulsion. He claims to have astonishing results. Bone and joint tubercular diseases heal in a few months; although they may have existed for years. Sinuses close and pulpy swellings subside. Relapses do not occur. Early tubercular lung affections recover. He stated that he had lost only six of 250 phthisical patients. The inoculations do not cause any local pulmonary reaction. Night sweats disappear and local and constitutional symptoms improve. Tubercular ulceration of the intestine is cured. He has administered prophylactic inoculations

to 335 new-born babies and infants, and has not noted any evil consequence. With such evidence before us, we are surprised to read that his animal experiments were not so convincing. The preparation is harmless to guinea-pigs, but it does not confer more than a low degree of immunity. The treated animals survived about 250 days longer than the untreated, after inoculation with a virulent tubercle growth, which killed the controls in 110 days.

In the discussion which followed, Müller related a case of advanced tubercular disease of the knee, in which six sinuses had been open for many months. Amputation appeared necessary. Nevertheless, after two injections in the autumn of 1911, the sinuses healed and the swelling subsided. He quoted other remarkable instances in which great benefit ensued. He watched the effects of prophylactic treatment of fifty-three infants in the year 1911. They were all healthy twelve months later.

Schleich was sceptical at first, but his opinion changed when he saw the good which was effected in tubercular diseases of the joints, bones, glands, and testes. He advocates the use of the remedy in every tubercular infection.

Karfunkel gave opportunities to Friedmann to treat 450 of his tubercular patients. He convinced himself of its harmlessness and its efficacy. In early pulmonary tuberculosis recovery ensues in two to four months. No bad effects were seen in 200 phthisical cases; 47 children recovered from scrofulous eczema in from ten to thirty days after receiving an injection; nineteen cases of chronic tubercular glands improved remarkably; the pain and swelling disappeared, and the sinuses closed. Twenty-two patients who were suffering from various eye affections were greatly benefited. Relapses did not occur. The success was remarkable in tubercular diseases of the joints and bones. The treatment was the means of saving limbs in several instances. Lupus underwent astonishing improvement under the influence of simultaneous intravenous and subcutaneous inoculations. He gave prophylactic injections to 45 children, among whom was his own son.

Kuster was impressed favourably with Friedmann's work, which he had been following for two years.

Heymann spoke with more constraint. His observations were confined to seventeen of his own patients, and to visits to Karfunkel's clinique. He saw there sixty patients who had been restored to health by means of the remedy. His own cases were farther advanced in the tubercular infection, and some were suffering from mixed infections; hence the benefit derived was not so striking, though improvement was marked in nearly all. He reported two recoveries from laryngeal tubercle.

Blasko was not very enthusiastic, and had seen no magic cures. His patients, however, had been treated before Friedmann had introduced his method of intravenous and intramuscular or subcutaneous injections.

Suppuration occurred at the site of inoculation. He saw marked improvement in an intractable case of tubercle of the finger. The patients whom he examined in Karfunkel's clinique had profited greatly by the remedy.

Citron deprecated the secrecy with which Friedmann shrouds the source of origin and the mode of preparation of the emulsion of tubercle bacilli. He stated that the tendency of recent investigations is towards the use of attenuated living cultures for the production of immunity; but he warned his hearers that cultures which are supposed to be avirulent are sometimes pathogenic. Pasteur's accidents with vaccines of the living fowl cholera bacillus, which he believed to be avirulent, should make us cautious. Citron conjectured that the remedy is a preparation of the tubercle bacillus of cold-blooded animals with which Friedmann experimented. He sympathized with Friedmann in his want of success in curing tubercular guinea-pigs.

Klemperer had no experience of this specific, but he had been occupied with similar researches for many years. In 1900, Koch stated that the human tubercle bacilli was not pathogenic to cattle. Behring next showed that inoculations with human cultures immunized these animals against bovine tubercle. Behring's observations were confirmed, and are now universally accepted. It was demonstrated twenty years ago by Klemperer in the pneumococic infection of rabbits, and by Brieger, Kitasato, and Wassermann in hog cholera, that an inoculation with an attenuated living culture cuts short the infection if it is running a slow course. It may be laid down as a law that inoculation with the living attenuated micro-organism tends to arrest the progress of a chronic infective disease if the immunizing blow is of sufficient force. How can this be achieved in tuberculosis? Tuberculin is unavailing. By innumerable experiments on animals of every kind, it has been found that it is impossible to confer immunity against the tubercle bacillus by means of injections of tuberculin. The anti-bodies which are elaborated by it are not concerned in the protective processes. Klemperer moreover stated that tuberculin cannot cure tubercular animals. Since it is possible to save cattle from the effects of a lethal dose of bovine tubercle bacilli by frequently repeated and increasing injections of emulsions of living human tubercle, Klemperer tested the use of the bovine bacillus on man. During the last eight or nine years he has administered about a hundred injections of living bovine bacilli to people, including himself, without ill consequences. Unfortunately, these bovine tubercle inoculations exercised no beneficial effect on the human disease. In the years 1906 and 1907 Friedmann and he investigated cultures of a tubercle bacillus derived from the tortoise. This could not be employed as a vaccine since it caused suppuration when introduced beneath the skin. Friedmann's merit lies in the fact that he has overcome this difficulty. Behring ascertained that the bacillus inoculated must retain its vitality

in the tissues in order that the immunizing processes should proceed. The experience of veterinarians proves this. For the inoculation of cattle with human tubercle protects them from the bovine infection for six to twelve months only, that is, so long as the human bacilli remain alive. When they die, the immunity ceases.

At the adjourned discussion, Friedmann (*Berl. Klin. Woch.*, December 2, 1912, p. 2329), stated that his remedy did not consist of a tubercle bacillus of human origin which had been rendered avirulent. He had experimented with many cultures of this kind, but they were of no therapeutic value. In the years 1903 and 1904 he published observations on two cultures of tubercle which he had isolated from tortoises. They produced local lesions in guinea-pigs, in which the bacilli remained alive indefinitely. They were therefore unsuitable for therapeutic use. Bandelier and Röpke were unsuccessful in their attempts to benefit tuberculous patients with cultures of batrachian tubercle bacillus. Friedmann then said that he had isolated a third strain which is quite avirulent: it is absolutely harmless to guinea-pigs; animals which were inoculated with it two and three years ago are healthy in every way. He exhibited the infant child of phthisical parents, whom he had inoculated as a prophylactic precaution when seven weeks old, in October, 1911. The baby was well nourished and free from any ailment. The Pirquet reaction was negative.

Müller said that the recoveries he had seen after Friedmann's treatment could have been obtained by no other remedy; the cures of tubercular bone disease were remarkable.

Kausch warned his hearers against too great optimism, and reminded them of the extravagant hopes which were entertained when Koch introduced tuberculin, and that salvarsan was not the certain cure which was expected. Orth's animal experiments with the preparation were not in its favour. He himself had a large experience in the use of tuberculin. He claimed that with "tuberculin Rosenbach" he obtained results as successful as Friedmann's.

Piorskowski stated that in the year 1903, Friedmann asked him to give him laboratory facilities for the purpose of investigating the tubercular infection of a tortoise which had died in the Berlin Aquarium. The bacillus was isolated without great difficulty on glycerine serum and agar. Piorskowski then fed frogs and tortoises with tubercular sputum and succeeded in infecting two frogs and a tortoise. The cultures of the tubercle bacillus resembled Friedmann's original growth. Piorskowski therefore concluded that it was of human origin. He had no knowledge of Friedmann's third strain.

Aronson said that it is well known from many thousands of animal experiments that it is not possible to immunize against tubercle by means of tuberculin injections, except to a very slight extent. On the other hand, Levy, Marxer and Blumenthal conducted a series of careful

investigations some years ago, by which they showed that inoculations with killed tubercle bacilli protect guinea-pigs. Most of the animals lived longer than the controls, and some remained healthy: results which were as good as Friedmann's.

Wolff-Eisner thought that we should not be too dogmatic in pronouncing a culture to be avirulent. He had inoculated a guinea-pig with a strain of tubercle which did not cause death until eighteen months afterwards. Hence he looked upon Friedmann's prophylactic injections with some suspicion. His experience of vaccine therapy impressed him favourably.

Meyer spoke in favour of tuberculin injections in the treatment of tubercle. Heubner, Katzenstein, and he had published recoveries under it in surgical tuberculosis and in tubercular laryngitis. He asked Friedmann how long infants harbour these avirulent bacilli? Behring's attempts to immunize cattle by means of human tubercle appeared to be successful at first; but as soon as the human bacilli died out in the animals' bodies, they nearly all became tubercular. He referred to Orth's want of success in protecting guinea-pigs with Friedmann's culture, and quoted Ruppel's researches with "tuberculin serum vaccine" "(S.B.E.)" which were much more favourable.

Bier had seen many of Friedmann's cases, and though he believed a therapeutic influence was at work, he had discovered no absolute proof of it, since the majority was composed of such tubercular affections as recover under expectant treatment. He thought that we ought to know more about the preparation, and to experiment with it ourselves, before pronouncing an opinion on it; meanwhile he could not be brought forward as a witness in its favour.

Goldberg gave details of a case of early phthisis which appeared to be cured. He had used the remedy in twenty-one cases of tubercle of the lungs, and in one of tubercular eczema, with good effect in all.

Orth repeated what he said before; though the guinea-pigs inoculated with Friedmann's culture lived longer than the controls, yet they all succumbed when their immunity was tested by inoculating them with virulent tubercle bacilli.

Schwenk reported that Friedmann's treatment had had no curative effect on a woman who was suffering from tubercular ulceration of the bladder. Friedmann had described the case as cured.

Katzenstein believed that small doses of tuberculin were very valuable in the treatment of bone and joint tuberculosis. He could not understand how Friedmann's injections would benefit advanced pulmonary phthisis, since a mixed infection always then exists.

Friedmann in conclusion promised to publish the constitution and preparation of his remedy, and also to distribute it to the public as soon as possible.