Previous Illnesses.—Dysentery, much malaria (before the rat bite), never syphilis (he was very definite as to this), no history of tick fever, but here again the possibility of this disease is not excluded, as he has been in areas where it prevailed, and some of his friends had actually suffered from it; phlebotomus fever December, 1916.

First Examination.—The patient was seen first by one of us (G. C. L.) on September 25th, 1917, having been sent by Dr. A. M. Elliot for examination. He was then fairly well, and was only complaining of getting tired easily and of headaches. He looked a little sallow, was slightly anaemic, the spleen was palpable, and the glands in the right axilla and in the posterior triangles of the neck were definitely enlarged. The urine was normal, the blood showed no malarial parasites, but there was a definite large mononuclear increase. A diagnosis of rat-bite fever and malaria was made, and the patient was instructed to present himself immediately if any signs of a relapse appeared.

Second Examination.—On December 10th, 1917, he came again. On December 3rd he had an attack of fever in the middle of the day, for which he had to go to bed; the temperature rose to 104° F. This attack responded to aspirin and quinine, but he still complained of pain in the glands and in the back of the neck with more or less constant headache. The glands in the neck areas were big and very tender to palpation. They were also easily palpable in the other areas. Dusky coloured purplish-red eruption over trunk and neck and on the arm which had been bitten, its appearance being best described by the term blotchy. It was very typical of the eruption described in papers on this disease. Bones tender, no malarial parasites in the blood, no trypanosomes, no spirochaetes. Relapse of the rat-bite disease was diagnosed.

Treatment.—He could not begin treatment that day, but came to hospital on December 17th. The rash was then fading, but the glands were still tender and enlarged. We then decided that we should give him a course of novarsenobillon, and he had 0.4 gram that afternoon. He stood the injection quite well, and went home that evening. The second injection, 0.6 gram, was given on January 3rd, 1918. The eruption was gone, and the glands were very much smaller, being difficult to palpate. There had been no more fever, and the patient expressed himself as feeling much fitter. Bearing in mind the experience of Hata with relapses after one small dose, we thought it better to give a third and final injection on January 25th (0.9 gram). This produced chilliness and a slight rigor. A careful examination on that day did not reveal any more signs of the disease, the glands could not be felt, there was no trace of any eruption, no rise of temperature, and all the pain in the neck, together with the headache, had completely disappeared. On January 28th he expressed himself as feeling all right, with the exception of getting fairly easily tired and slight pain in his legs. In view of his malarial element, he was told to take 5 grains of quinine twice a day for the next three months.

As already stated, two or at the most three injections of salvarsan or its derivatives seem to cure rat-bite disease completely. The interest in this case lies in the double infection, which rendered the diagnosis more difficult. A Wassermann test was done before the treatment was begun. It was positive, as is usually the case in other spirochaetal diseases. Clinically, there never was any suspicion of syphilis, the history of the bite, the way the symptoms developed after it, the typical nature of the eruption, and the relapses all being characteristic of rat-bite disease.³ The same remarks apply to trypanosomiasis, which had to be considered in the differential diagnosis. In addition, no trypanosomes were found in the blood, and the eruption was not the same as is met with in that disease.

REFERENCES.

¹ *Journal of Experimental Medicine*, September, 1917. ² *Muench. med. Woch.*, April, 1912. ³ *Tropical Diseases Bulletin*, vol. 1, No. 7, p. 407, describing cases by Cruickshank and others.

HOME DISINFECTION IN PULMONARY TUBERCULOSIS.

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The object of the following experiments was to indicate the simplest, cheapest, and most available means of countering the risks incurred when a sufferer from consumption shares living and sleeping rooms with others. It is doubtless the poor who run the greatest risk, more particularly because of their crowded circumstances and the greater difficulties they experience in adopting the necessary precautions; to them efficient chemical disinfectants are prohibitive in cost, and when distributed gratuitously by the local sanitary authority they are generally employed in a manner which gives but little security.

In the selection of measures to meet their needs regard must be had to the fact that, mainly owing to the increasing use of gas stoves, there is often no open fire (for at least many months of the year) for burning sputum, infected dust, paper handkerchiefs, etc. Therefore the advice here offered is based on the use of hot water, and the aim has been to define how this agent may be simply and effectively employed.

Floors.—Pieces of board were scrubbed and thoroughly disinfected and dried. They were then smeared with a thin layer of sputum containing tubercle bacilli. This was covered and allowed to dry, and on the following day one piece was scrubbed with hot water (as hot as could be borne) and yellow soap in the proportion usually employed in washing floors. This piece was then covered and allowed to dry, after which washings and scrapings of the infected surface into sterilized water were inoculated into guinea-pigs. Two out of three experiments gave negative results, the non-scrubbed board giving positive results in each case. The conditions of this experiment were those of very gross contamination, far in excess of what would occur in actual practice; and so it may be assumed that the process of good scrubbing with hot water and yellow soap will suffice in actual practice.

Experiments were made to ascertain whether soap in the proportion usually employed for scrubbing floors has any disinfectant value, since soap itself is practically sterile. The test organism employed was *Staphylococcus epidermidis* Welch, and the soapy water used was at a temperature (140° F.) well below the thermal death point of the organism. The results indicated that the soap had only a very slight effect, and that its only material value is the aid it renders in the collection and removal of dirt (with associated organisms) from infected surfaces.

Handkerchiefs, Pillow-slips, etc.—The ordinary staphylococcus of the skin (*S. epidermidis* Welch) obtained by rubbing a little broth on the skin of the hands and distributing a loopful of this over agar slopes was employed as a preliminary test organism. A pure culture was obtained on agar slopes, and it was found that the growths were killed by exposure for twenty minutes to a temperature of 75° C. in the form of moist heat; whereas the tubercle bacillus is destroyed at 70° C. in the same time. This staphylococcus is a more convenient germ to employ in preliminary experiments than the tubercle bacillus, the thermal death point of both organisms being about the same and the former germ being easy to cultivate.

Tuberculous sputum was sterilized by steaming for twenty minutes, and inoculated with growths of the staphylococcus. Sterilized strips of linen were soaked in this, then placed in cold sterilized water and gradually brought to the boiling point. Directly the water boiled the strips were removed and cultures made from the drops of fluid pressed out of them. In four sets of experiments there were no growths, while the control slips in every case furnished growths.

Boiling water was removed from the gas, and similarly inoculated strips of linen were immediately immersed and left for half an hour in the very hot water; they were then removed and efforts made to cultivate the germ. Again in four cases there were no growths on the strips so exposed, while all the control strips immersed in warm water furnished growths.

One pint of tap water was boiled and at once poured into a cold sterilized quart basin. Four strips of sterilized linen soaked in sterilized sputum which had subsequently been inoculated with the staphylococcus were immersed in the water and left there for fifteen minutes. The strips were then removed, and in no case was it possible to obtain growth from the water pressed out of the linen strip. The temperature to which the slips were exposed was at the commencement 90° to 92.5° C., and at the end 63° to 67° C. Control slips placed in warm water (50° to 60° C.) gave positive results.

Similar experiments were made with the basin filled with sterilized handkerchiefs and inoculated strips placed between them, the aim being to deal with as many handkerchiefs as practicable, provided they were just covered by a layer of water. After fifteen minutes the slips were removed and agar slopes inoculated with the water pressed from them. Controls in warm water gave positive results; but seven out of eight were negative from the slips exposed to a commencing temperature of 86° to 88° C., and an end temperature of 62° to 65° C.

For confirmatory purposes the last experiment was repeated with sputum considerably infected with tubercle bacilli. After twenty minutes the strips were removed and the material from them filtered and inoculated into guinea-pigs. In the control strips only warm water was employed. Two months after inoculation the three control guinea-pigs had enlarged caseating glands on the side of inoculation; both by *post mortem* and microscopical examination the infection was shown to be due to the tubercle bacillus. The nine guinea-pigs which had been inoculated from the strips exposed to nearly boiling water were healthy, except one, which had an enlarged femoral gland on the side of inoculation.

I desire to acknowledge my indebtedness to Professor H. R. Kenwood for valuable advice and assistance in connexion with the foregoing experimental work and the statement in which I have embodied it.