Dr. URQUHART recalled a case which occurred in Murray Asylum, and published in *J.M.S.*, of a man who had degeneration of the tip of the left temporo-sphenoidal lobe. He had amusia, although formerly a musician and a fine singer.

Dr. NEWINGTON, in reply, recalled his reference to Dr. Legge's paper in 1894, and the excellent paper read by Dr. Ireland on the pathology of the subject, as he had not purposed to discuss the relation of music to insanity. The real object of his own paper was to raise the psychological question.

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*Tuberculosis in the Insane; its Prophylaxis.** By ERIC FRANCE, M.B., Assistant Medical Officer, Northumberland County Asylum.

In venturing to read before you a paper on "Tuberculosis in the Insane; its Prophylaxis," I am deeply conscious of the responsibility of my position. The very mention of tuberculosis seems to reopen long vistas of investigation and research, which stretch far away into the distance of the earliest medical times. Since the days of Galen and Mangetus the learned in medical science have with unwearying persistence investigated and studied the pathology and treatment of this disease. To the work of these I fear I have little to add, but I submit that neither the presentment of old truths in a new light, nor the adaptation of past experiences to present needs, is without its value. It is from this point of view, then, that I have ventured to approach so vast a subject.

In the short time at my disposal I do not intend to do more than refer in the most incidental way to the pathology or the treatment of tuberculosis. The pathology of the tubercle bacillus, its products and its effects upon the tissues remains practically the same as Professor Koch described it 15 years ago.†

With regard to cure, I believe I express the opinion of scientific men, when I say that up to the present no such thing exists. That recovery takes place is certain, but all we can do in this direction is to place the patient in an environment, and his tissues in a condition best calculated to bring about the death of the tubercle bacillus. I do not refer in this connection to Koch's latest preparation of tuberculin, the "Tuberculin Residuelle" (T.R.) for which

* Read before the Annual Meeting of the Medico-Psychological Association held at Newcastle-on-Tyne, July 29th, 1897.

† *Berliner Klinische Wochenschrift*, 1882.

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he claims immunising properties, and which has been too recently introduced for a definite opinion to be formed about it.

It seems to me that to prophylaxis we must turn as affording practically the only chance of reducing the death-rate from phthisis in our asylums, and it is to this subject that I wish particularly to invite your attention. That the death-rate is terribly high, no one, I take it, will dispute. My attention was first directed to this subject by the high and increasing death-rate from tubercle in the Northumberland County Asylum.

In 1894 deaths due to tuberculosis were				30·4	per cent.
„ 1895	„	„	„	27·6	„
„ 1896	„	„	„	37·2	„
6 months ending June 30, 1897	„	„	„	46·6	„
For 18 months ending June 30, 1897	„	„	„	40·2	„

Before coming actually to the subject of prevention, will you allow me to recall to you, very briefly, the modes of infection of man by the tubercle bacillus? These are indeed deserving of the closest study if we are to hope by prophylaxis to diminish the mortality of the disease. They may be considered under four heads.

1st. Conveyance of infection from mother to fœtus in utero. 2nd, Inoculation. 3rd, Ingestion. 4th, Inhalation. The first may be neglected for present purposes. The second, *Inoculation,* may be dismissed with the remark, that it has been suggested with propriety, that lupus may in some cases be a form of inoculation tuberculosis with tubercular material not virulent in degree. It has been conclusively proved by inoculation experiments on animals that the results as regards extension from the local lesion vary exactly as the dose of tubercular material.

Experiment I.—One c.c. of virulent milk from a tubercular cow injected into the peritoneal cavity of a guinea pig produced in 16 days, besides the local lesion of the peritoneum, tuberculosis of all the internal lymphatic glands, of the cervical glands and of the liver and spleen. Whereas one c.c. of a 10 per cent. dilution of same milk produced in the same time a local lesion limited to the omentum.

The third form of infection is *Ingestion.* Speaking generally, this is a disease of childhood. The watchful eye which is kept upon the sanitary conditions of the dairies

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and slaughter-houses of the asylums of Great Britain renders ingestion tuberculosis in the ordinary sense extremely rare in the insane. Before leaving this subject, however, I may quote a couple of feeding experiments on animals which illustrate important points.

Experiment II.—A healthy pig was fed *once* with 120 grammes of virulent tubercular lung from a cow. It was killed in 57 days, and a small tubercular ulcer, ¾in. by ½in., was found in one of the Peyers patches in the middle of the ileum. Otherwise the alimentary tract was normal. Nearly all the mesenteric glands were tuberculous, as well as the posterior mediastinal and the glands in the lesser omentum, while the liver, spleen, and lungs showed extensive miliary tuberculosis.

This experiment emphasises the fact that the local lesion may be out of all proportion to the magnitude of the tubercular disease found in the organs of the body.

Experiment III.—Four guinea pigs were fed in the course of two days with 200 c.c. of tubercular milk which was not very virulent. Each animal got about 50 c.c. of the milk. One died in 25 days, and showed *no tubercular lesion.* The other three died in 49, 53, and 67 days respectively. In these tubercle was found only in the intestines and mesenteric glands of the first two, and only in the mesenteric glands of the third. All three animals, therefore, showed a limitation of the disease in accordance with dilution of dose, analogous to that found in the inoculation experiments referred to before. These experiments have been already mentioned by Dr. Sydney Martin.*

The last animal showed a point which is of great importance in the study of the mode of infection of tuberculosis. There was no local lesion in the intestines, yet the disease was present in the mesenteric glands. The conclusion is clear, therefore, that the bacilli had passed through the intestinal wall without producing the characteristic lesion, and had stopped and grown in the mesenteric glands.

We now come to the fourth and, as regards the insane, by far the most important mode of infection, viz., *Inhalation.* The source of inhalation tuberculosis, as has been conclusively proved by Koch,† Villemin,‡ and Nocard §

* Article "Tuberculosis," Clifford Allbutt's *System of Medicine*, Vol. ii.
† "Die Ætiologie der Tuberculose," *Berlin. Klin. Woch.*, 1882.
‡ *Gaz. Hebdom.*, No. 50, 1865; *Comptes Rendus*, lxi., 1886.
§ "La Tuberculose des Animaux—Domestiques," *Dict. Vet. Pratique*, p. 413.

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in inhalation experiments on animals, is tuberculous sputum. Tubercular disease may be communicated by direct infection of sputum in a moist condition, as shown by the disastrous results produced by a tuberculous midwife who was accustomed to blow down the mouths of newly-born children. No fewer than ten of these became tubercular. But the most fertile source of infection is the tuberculous dust into which tuberculous sputum is so readily converted when dry.

Osler states that patients with advanced pulmonary tuberculosis throw off in their expectorations countless millions of the bacilli daily. From a patient with moderately advanced disease, whose daily expectoration was from 70 to 130 c.c., Nuttall* estimated by his method that there were in 16 counts, extending over two months, from $1\frac{1}{2}$ to $4\frac{1}{3}$ billions of bacilli thrown off in the 24 hours.

Cornet has pointed out† that the dust taken from a room in which a tubercular woman had lived and died was infective after being kept six weeks.

Bacilli may even be detected in the sputum before the establishment of physical signs, and for their identification in the sputum, at this or indeed at any time, the centrifugation method described by Ilkewitsch is the best.‡ His method is as follows:—Sputum $\frac{1}{2}$ c.c., distilled water 20 c.c., 8 to 10 drops of a 30 per cent. solution of caustic potash are well mixed in a porcelain capsule and heated till vapour forms. When the sputum is dissolved a little casein is added. One or two more drops of caustic potash are added, the mixture further heated till it becomes of a translucent milky appearance. It is poured into a test tube and a few drops of acetic acid added until the first signs of clotting of the albumen appear. The remainder is then submitted to the action of the centrifuge for 5 or 10 minutes, and the resulting deposit collected, stained, and examined in the usual way.

I now come, after what I hope has not been an unwarrantable or unduly tedious delay, to the subject of prophylaxis.

Against a foe so numerous and so formidable as the tubercle bacilli our most formidable weapons must be arrayed. The time I believe has passed when the physician based his hopes of victory over the tubercle bacillus on vapours of creosote and casual sprinklings of carbolic lotion.

* *Johns Hopkins Hosp. Bulletin*, May, 1891.
† *Ueber Tuberculose*, Leipsig, 1890.
‡ *Centralblatt für Bakt.*, February 5, 1894.

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Quite recently a movement has arisen in the community at large, directed towards the prevention of tuberculosis on more scientific grounds. In this movement the Medical Officer of Health for Manchester (Dr. Jas. Niven) is one of the leaders. Among many other admirable suggestions he goes so far as to advocate compulsory notification of tuberculosis. But we, as medical officers of asylums, have no need to wait for such a thing before we can hope to cope successfully with tuberculosis. The individual units of the communities in our charge are under our constant observation in a way that is impossible in the world outside. The opportunities afforded us of detecting the *first* departure from physical health are such as might well cause the envy of the general practitioner.

Ought not these advantages to stimulate us to lead the van of scientific prophylaxis in this matter? Much has already been done, I know, in asylums in this direction. Can nothing more be done? In talking over this matter with an eminent member of our specialty he said to me: "'The prophylaxis of tuberculosis in the insane may be summed up in one word, 'Ventilation.'" If this be true, if ventilation is to be regarded as the ultima thule of our aims and endeavours in this direction we find ourselves in the unfortunate position of those who have leaned too heavily on a slender support, and we must forthwith lay aside any hopes we may entertain of materially reducing the mortality from tuberculosis in our asylums.

Two years ago, in the Northumberland County Asylum, a system of ventilation was introduced at considerable cost, and in the confident hope of a lowered phthisical death-rate.

Have the results justified this hope?

The statistics, already mentioned, seem to me to afford conclusive evidence to the contrary, and I cannot believe ours to be a solitary experience.

In making these remarks I trust I shall not be taken to have in any sense a dislike to ventilation. On the contrary, for ventilation, as ventilation, I have the profoundest respect. I would like to see every asylum fitted with the most perfect of the many imperfect systems in existence, but for ventilation, as a preventive of the dissemination of tuberculous dust, I have but slight regard. And after all, the prevention of the dissemination of this deadly dust in the wards is the key of the situation.

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In the autumn of 1893 an enquiry was instituted by the authorities of the *British Medical Journal* into the method adopted by the principal consumption hospitals in the kingdom for the limitation or prevention of the spread of the disease in their wards. In all cases the chief efforts were naturally directed to the prevention of the dissemination of tuberculous dust.

Of the many instructive suggestions to be gleaned from the report of this enquiry * one is compelled regretfully to face the fact that those which depend for their success upon the intelligent co-operation of the patients are likely to be of but slight service to us in the war we have to wage on a battle-field so much in favour of the foe.

Have we no weapon with which to fight? I think we have. It is powerful, but none too powerful for the work we wish to do.

If the prophylaxis of tuberculosis in the insane is to be summed up in one word at all, that word, I submit, is "*Isolation.*" That this subject is surrounded by difficulties could be denied only by the thoughtless or the ignorant, but difficulties have never prevented us in the past from doing our best for our patients and for the furtherance of scientific method.

Shall they deter us now?

It would be beyond the scope of this paper to do more than suggest the *principles* of a scheme of isolation of tubercular patients, which I believe would be applicable to all asylums. With the details, structural or otherwise, of the necessary isolation wards, it would be presumptuous of me to attempt to deal. They must of course be left in the hands of those Medical Superintendents who think it advisable to adopt this means of prophylaxis.

With regard to the few general principles of the scheme, by far the most important, and one I take it in which the entire value of isolation consists, is *early* and *absolutely accurate* diagnosis.

In the insane we have had in the past to rely for diagnosis, in the great majority of cases, upon physical signs, which, even in the sane, are unreliable, misleading, and frequently paradoxical in the early stages; often in fact until the disease is thoroughly established, and the value, therefore, of isolation largely annulled.

The cases among the insane in which the sputum can be

* *B. M. Journal,* Sept. 16th, 1893.

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collected in the first or indeed in any stage, are so few that the valuable diagnostic method of microscopical demonstration of the bacilli is seldom possible.

The same remark applies to the method of diagnosis advocated by Professor Sheridan Délepine,* viz., inoculation experiments on guinea pigs with suspected sputum, or cultures therefrom.

Moreover, the length of time occupied by each experiment (an average of about 30 days—Arloing's† experiments give a still longer time) renders this unsuitable for our purpose.

The only method of *accurate* early diagnosis that I know of, is the subcutaneous injection of single minute doses of Koch's original tuberculin. With regard to its value I cannot do better, I think, than quote a short extract from Koch's latest paper describing his new tuberculin—T. R.‡ Referring to his original tuberculin brought out in 1890§ he says: "We know that tuberculin has the valuable property of producing a characteristic reaction in persons or animals tainted with tuberculosis when injected subcutaneously into the tissues. This property may be utilised to demonstrate the presence of tuberculosis in its earliest stages, that is to say at a time when physical signs are unreliable and when treatment would have the greatest chance of success.

"The diagnostic value of tuberculin, on which I laid great stress in my earliest communication on the subject, has received definite confirmation during the last few years. Tuberculin is at the present time used in the majority of civilised states for the early diagnosis of tuberculosis in cattle, and it is through its means that we are able to successfully combat this widespread disease. The thousands of injections of tuberculin performed on animals have shown how causeless was the fear that the tubercular reaction would stimulate the bacilli and lead to their dissemination throughout the tissues. This is fully in accord with my own observations extending over more than 1,000 cases in which tuberculin was used for the early diagnosis of tuberculosis in man. As a matter of fact, in not one of these cases could one ever demonstrate the least indication of the dissemination of the disease. These reasons should

* *B. M. J.*, Sept. 23rd, 1893.
† *Congres pour l'etude de la Tuberculose*, 1888, p. 404.
‡ *Deut. Med. Woch.*, April 1, 1897.
§ *Deut. Med. Woch.*, Nov. 14, 1890.

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suffice to make us once for all abandon the absurd idea of the possible stimulation of the tubercle bacilli and should encourage us to apply tuberculin to the diagnosis of tuberculosis in the human subject.

"I can only repeat here, what I have before emphasised, that prophylaxis is infinitely more advantageous and efficacious than therapeutics."

It now merely remains for me to briefly indicate the plan I have adopted in the Northumberland County Asylum.

1. Every patient is carefully weighed at the beginning of each month.

2. The results are carefully inspected, and every patient who has lost more than 5lbs. in the month, or in whom gradual loss of weight over a longer period has occurred, is examined and the cause of loss of weight minutely enquired into. If this cannot be readily accounted for by some obvious mental or physical cause, such as refusal of food, &c., the patient's name is placed upon the "suspected" list. The same thing is done in the case of any patient giving at any other time the faintest cause of suspicion of the presence of tubercle.

All those on the suspected list are then injected with tuberculin in the following way:—

The temperature of these patients is taken.

The next day, with rigidly aseptic precautions, 1 c.c. of a ·001 solution (made by diluting 1 c.c. of Koch's Original tuberculin with ·5 per cent. solution of carbolic acid) is injected subcutaneously and the temperature taken every 3 hours. If the temperature rises 2° or more within the next 12 hours tubercle is diagnosed.

I have up to the present time injected 40 cases. Of these 18 were non-suspects, and were regarded as control experiments; in none of these was a reaction obtained. Twenty-two were "suspected" patients. Reaction was obtained in 15, and no reaction in 7. Of the 22 cases in which tubercle was suspected 4 were cases of enlarged cervical glands, in 3 of which suppuration had taken place. In all of these cases typical reaction took place.

Of the remaining 18 in which pulmonary tubercle was suspected, a typical reaction was obtained in 11. No reaction in 7.

Of the 11 reaction cases, definite physical signs in chest were wanting in 6 at the time of injection: suspicion being aroused by loss of weight (in some cases comparatively

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sudden—in others more progressive), cough or emaciation (or the three combined).

Of the remaining 5 cases the various physical signs which are usually regarded as conclusive of tubercle in the lungs had already been discovered.

With regard to the subsequent history of the 11 reactions occurring in cases suspected of pulmonary tubercle, and speaking first of the 6 cases which presented no definite physical signs upon injection, one has died. Her lungs on post-mortem examination showed extensive tubercular apical destruction.

Two are rapidly going down hill with pronounced physical signs. Three have been so recently injected (24th July) that no change has taken place.

The five reactionaries in which it will be remembered definite physical signs, some of an advanced character of phthisis, were recognised before injection, I regard practically as control experiments at the other end of the line, showing indeed the accuracy of its action in the *tubercular*, just as the absence of reaction in healthy persons proved its absolute harmlessness in the *non-tubercular*.

Of the seven suspected cases in which injection produced no reaction, there is little to say about five of them, except that one has been discharged recovered, and that the other four have not as yet presented any further indications of phthisis.

The remaining two (a general paralytic and a chronic maniac) demand special notice inasmuch as they were both, at the time of injection, not only suspected of having phthisis, but its presence had previously been confidently diagnosed by two or three of my colleagues. So sure was I myself of the presence of tuberculosis, that I selected them as cases from which I was confident of obtaining typical reactions.

To my dismay and consternation no reaction was produced in either case, and I began to fear that perhaps tuberculin was not as diagnostically infallible as I had been led to believe. My relief was great when, on my return after a fortnight's absence, I learnt that post-mortem examinations in these cases had revealed patches of pneumonia, bronchial catarrh, and some pleuritic effusion, but no *tubercle*.

To the result of these experiments I have nothing to add, save the remark that tuberculin has been employed for the early diagnosis of tuberculosis in men and its use strongly

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advocated for this purpose by Koch,* Dr. Springthorpe,† Dr. P. Krause,‡ and Dr. O. Maln.§

Discussion.

The CHAIRMAN said they were much indebted to Dr. France for the interesting facts he had brought before them. No doubt in the English asylums the great curse was tubercle. How the death-rate was to be diminished was a problem for the most serious consideration. Already they had, by improving ventilation, by heated dormitories, and by other means, endeavoured to make the lives of the patients more healthy, but, instead of getting a good result, they had got a worse result. He still believed that tubercle in asylums would in the long run be prevented. Last winter he amused himself by making experiments with regard to the ventilation at Morpeth Asylum, and was not at all satisfied with it. As they were aware, the question of the effect of bad ventilation was solved years ago at the Wellington Barracks in London, where the Guards were attacked in terrible proportions by tubercle. The ventilation was improved, and the disease disappeared. He was very much obliged to the reader of the paper for the notice he had given to the subject.

Dr. CLOUSTON said that his attention had been drawn thirty years ago to the excessive prevalence of tubercle in asylums then under his notice. He believed that where this was the case the food was less good than now, but that locality also exercised a definite influence. He remarked that it was found that the most heated asylums tended towards the increase of tubercle. In the Edinburgh Asylum they had reduced the average from 26 per cent. down to the present 13 per cent., and that, he believed, was mostly attributable to improved hygienic conditions. They could always keep this in mind, that the danger could be reduced by keeping the patients stout, strong, and fat, with plenty of exercise in the fresh air, but yet, with plenty of milk, eggs, and other good food, they found patients still subject to attacks of tubercle. With regard to prophylaxis, a great object should be the prevention of germ dust accumulation. Turpentine and wax were most beneficial in preference to the old system of scrubbing. The turpentine and wax application made a germicide which they, in their wards, had found most beneficial. No scrubbing was now allowed in any circumstances. He thought they should all commend the example set them by the Morpeth Asylum, by the injection of tuberculine for diagnosing the disease.

The CHAIRMAN said they thanked Dr. France very much for his paper, which no doubt would stimulate research.

Dr. FRANCE did not deny that tuberculine, as originally used in this country by way of experiment, did stimulate the disease it was supposed to check, but there was, he felt assured, not the slightest danger in the system adopted for diagnosing cases. He had never had a failure. There was no danger in using such a small dose as that which was used.

* *Loc. cit.*
† *B. M. J.*, July 7th, 1894.
‡ *Deutsche Med. Wochen.*, 1895, Nos. 6, 7 and 8.
§ *Centralblatt für Bakteriolog.*, xvii., 1895.

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