

had a strong interest in agriculture in India and helped to start the Scientific Agricultural and Forestry Lectures at Balliol, Oxford. So agricultural chemistry was introduced into the curriculum of the I.C.S. in 1887.

Miss Nightingale's health was now not too good and most of her work was done by writing.

In 1898 the Head of a religious institution visited her (she was now 78 years old). She tried to teach him sanitation—'but'—she said 'I never understood before how really impossible it is for an eastern to care for material things. By improving, he meant believing more in God. To him sanitation is unreal and superstitious religion and spirituality is the only thing.'

From 1900 Florence gradually failed and on August 13th 1910 she died. She died peacefully and was buried at the Church in Embley Parish along with her father and mother. The writer has seen the grave and it is so simple she had difficulty in finding it. Just a simple obelisk with the letters F.N. She who might have been buried in Westminster Abbey occupies a little green grass plot in the heart of the country she loved. Her spirit still lives—love for the sick, love for little children, order, sanitation, method, religion, holding quietly a very strong place in her life. She began the real Nursing of today and as long as women live, her spirit will go forth just as the rays of the lamp did 'lightening the darkness' of humanity, through Nurses, the world over.

(These notes are taken from the *Life of Florence Nightingale* by Sir Edward Cook, published 1925.)

THE SIGNIFICANCE OF TUBERCULIN SENSITIVITY IN NURSES

Results of the Intra-Dermal Test in Trainees in a General Hospital, with a Note on Ten Cases of Erythema Nodosum occurring in the Tested Group

By O. J. MERCER

From the Wellington Hospital. New Zealand

Increasing attention is being paid to the use of the tuberculin skin test in elucidating the difficult practical problems of preventive hygiene in tuberculosis. It is a proved and satisfactory index of infection, and the division of groups of healthy individuals into tuberculin positive and tuberculin negative reactors has come to have much more than an academic interest. Particularly does this apply in the case of nurses, the vast majority of whom are in the age group which is most prone to tuberculous infection of a clinical nature. Statistical and experimental evidence is accumulating to prove that a trainee who gives a positive tuberculin reaction, and who is in normal health, is much less likely to contract tuberculosis than one who is negative to the test.

Clinical tuberculosis usually manifests itself very soon after the primary infection, i.e., within a short time of a person developing skin sensitivity and becoming tuberculin positive. Therefore, those who are Mantoux or Pirquet positive, and are healthy, have passed through this stage of primary infection without clinical symptoms of tuberculosis. They have weathered the storm, and, from a statistical point of view, are unlikely to manifest clinical tuberculosis during their lifetime. On the other hand, negative reactors have not yet made contact with the tubercle bacillus, and their "salting," which, in the case of hospital trainees, will inevitably occur at some stage of their training, will be attended with the danger of contracting the disease in an active form. Heimbeck, whose investigations of sanatorium nurses at Oslo cover a period of eleven years, has published the following figures:—Of 800 nurses with 3,502 observation years who were tuberculin positive, i.e., who have been

primarily infected without becoming ill, 30 afterwards became tuberculous and only one has died. This represents a morbidity rate of only 8.5 per 1,000 observation years. Of 38 (7) nurses who were negative by the Pirquet test, with 76 (5) observation years, 118 developed clinical tuberculosis in some form or other and many have died. In this group the morbidity rate is 153 per 1,000 observation years. The difference between the two groups is striking, and illustrates forcibly the extent to which the negatively reacting trainee is at a disadvantage.

The present investigation has been carried out on a limited scale. For upwards of two years nurses commencing their training at the Wellington Hospital have been subjected to the Mantoux test. Those who were negative have had the test repeated every six months until a positive reaction had been obtained. From the results an attempt has been made to determine, for this particular institution, the rate at which trainees make contact with the tubercle bacillus. Further, the rate of contact of nurses in the tuberculosis wards has been contrasted with the rate in the general wards of the hospital. This scope of the enquiry has been widened to include the facts in relation to ten nurses in the tested group who developed erythema nodosum. The present communication is made in the nature of an interim report. Though the number of nurses as yet tested is relatively small and though they have been followed for a maximum period of only two years, the conclusions which can already be reached invite publication.

Technique and Results.—The skin sensitivity has been tested by the intracutaneous method of Mantoux. Madsen and Holm have shewn that this method is far superior to the cutaneous (Pirquet) test, which gives reactions in less than 50 per cent. of people who are actually tuberculin positive. All nurses were tested with 1/100 milligramme of old tuberculin (Commonwealth Serum Laboratories). Those shewing no reaction were re-tested with 1/10 milligramme. The tests were read 48 hours after injection. Contrary to general experience, it was very rare for a nurse who had given no reaction to the first test dose, to react positively with 1/10 milligramme. Two hundred and fifty nurses have been tested on commencing their training. The results from the first few batches are not included as, during this time, the technique and reading of the test were standardised.

Of the remaining 212 probationer nurses, 76 gave positive reactions to the first test, i.e., 36 per cent. were positive before they had done any nursing.

Eighty of the 136 negative reactors have been nursing long enough to have had the tests repeated at six-monthly intervals. Of these, 29 (36 per cent.) were Mantoux positive to the second test at the end of six months. Only two of these positives had had a spell of duty in the tuberculosis wards. The remaining 27 had trained for three months in the preliminary school, without contact with patients, and had then commenced work in the general wards. Thus 36 per cent. of the negative reactors made contact with the tubercle bacillus during the first six months of their training.

Forty-one of the nurses negative at the end of six months have had further tests. At the third test 32 of these gave a positive reaction. This particularly high percentage of positives is accounted for by the fact that 28 out of the 32 had been nursing for two months in the tuberculosis wards since their last negative result. Of the 9 residual negative reactors, 3 have since given a positive reaction after doing a tuberculosis duty.

112 of the original group of 212 have now been nursing for more than a year, but for less than two years. Only 4 of these remain tuberculin negative, and only one of these 4 has done a full tuberculosis duty of 8 weeks.

Altogether, 41 nurses in the group have commenced their tuberculosis duty before giving a positive reaction, i.e., their previous test was a negative

one. Following this duty, 38 gave positive reactions and 3 negative. Of these later, 2 had been in the tuberculosis wards one and three weeks respectively, and one had done the full duty. Therefore, of 39 negative Mantoux reactors who did eight weeks' nursing in tuberculosis wards, only 1 returned negative to the general hospital. Six of these 39 were tested during the course of the tuberculosis nursing and all were positive.

A summary of these results is as follows :—

1. In a group of 212 prospective nurses, 76 or 36 per cent., were tuberculin sensitive before commencing their training.
2. Of 80 negative reactors, 29, or 36 per cent., gave positive reactions at the end of six months' training.
3. Of 39 previously negative reactors who were on duty for eight weeks in the tuberculosis wards, only 1 returned negative to the general hospital.
4. Of 112 nurses in the original group who are in their second year of training, only 4 are now negative.

Discussion.—It is obvious from these figures that, in the Wellington Hospital, the majority of uninfected trainees make contact with the tubercle bacillus, and undergo their primary infection, early in the course of their training. In the tested group, 3 out of every 10 were infected in the first six months of training and without nursing in the tuberculosis wards. By the end of two years nearly all nurses have developed skin sensitivity. The rapidity with which 'salting' occurs in the tuberculosis ward is startling. Nearly all susceptible nurses are infected in the course of an eight-weeks' duty. Heimbeck states that all nurses in the Oslo Sanatorium are tuberculin, at the end of three years. Thus, under sanatorium conditions, a maximum period of three years is allowed for a process which, in an acute tuberculosis ward, is accomplished in a few weeks. **DESPITE THIS, THE TUBERCULOSIS RATE AMONG NURSES IS MUCH GREATER AMONG THOSE WORKING IN GENERAL HOSPITALS THAN IT IS IN THOSE WHO NURSE IN SPECIAL TUBERCULOSIS WARDS AND SANATORIA.** It is probable that in general hospitals where nurses do a tuberculosis duty as part of their training, the rapid sensitising of trainees in special tuberculosis wards tends to increase the number of positive reactors in the general wards. This is an advantage, as it means a higher percentage of nurses are fortified against the more nebulous but greater dangers of infection which are present in the general wards. There is an increasing body of opinion that prospective trainees for sanatoria should be accepted only when they give a positive skin sensitivity test. This does not apply to trainees in general hospitals. A general hospital contains a large number of nurses who are tuberculin negative, and it can be argued that the carefully controlled and regimented tuberculosis ward is the safest place for these nurses to undergo their primary infection. A case can thus be made out for sending tuberculin negative nurses to nurse in the tuberculosis wards, where they will develop their allergic state under conditions which are most likely to ensure that it will be subclinical.

In this connection it must be remembered that one factor in determining whether or not a primary infection remains subclinical is the size of the infecting dose. It is fair to assume that the isolated, and perhaps undiagnosed, case of active tuberculosis in the general wards is more likely to be the source of a massive and dangerous dose than similar cases in carefully disciplined special tuberculosis wards. The risk of clinical infection in undiagnosed cases in general wards in this country has been emphasised by Professor Carmalt Jones. In the present series, the results show that a by-no-means

negligible percentage of nurses pass through the dangerous period of primary infection in the general wards. It is during this period that they require such protection as can be given. If it is held necessary that nurses working in the tuberculosis wards should have less onerous duties and shorter working hours than those in general wards, then it is logical that these concessions should be extended to negative tuberculin reactors in the general wards. This is not suggested as a practical measure, but to focus attention on the fact that one of the larger problems in reducing the tuberculosis rate among nurses lies in protecting tuberculin negative nurses in general wards. From this group will come the majority of cases of tuberculosis. Precautions should be directed, not so much towards preventing infection, which is practically inevitable, as towards ensuring that the primary infection shall be subclinical.

Erythema Nodosum.—Ten nurses in the original group of 212 have developed erythema nodosum in a severe and unmistakable form. In 9 of these the condition arose within six months of a Mantoux test. The tenth was tuberculin positive eight months before the infection. 7 of the 10 gave a positive tuberculin reaction during the course of the illness. The other 3 were not tested. The only one subsequently tested was positive six months later. One of these ten nurses has developed a pleural effusion. No sign of active tuberculosis has, as yet, arisen in any of the others.

In the figures quoted by Heimbeck there were 57 cases of erythema nodosum, of which 49, or 86 per cent., had previously given negative Pirquet reactions.

Whatever the causes of erythema nodosum may be in the general population, there is overwhelming evidence that, in the vast majority of nurses, it is a primary manifestation of tuberculosis, occurring during the development of allergy. Positive blood cultures for the tubercle bacillus have been obtained in reported cases, and histological examinations of portions of nodes removed during the active stage of the disease leave but little doubt as to its nature. In the present series, the fact that 9 of the 10 cases gave a negative Mantoux reaction within a few weeks or months of developing the condition suggests that it appeared at their first contact with the tubercle bacillus. All of those tested during the illness gave a positive reaction.

7 of the 10 nurses affected had never nursed in the tuberculosis wards, and one came from the preliminary school and had no contact with patients. Most of the cases were junior nurses who had graduated from the preliminary school and had done a few months' work in the general wards. This supports the previous contention that the susceptible trainee is likely to receive her primary infection in whatever part of the hospital she may nurse.

Summary and Conclusions

1. The results of tuberculin tests repeated at six-monthly intervals on a group of 212 nursing trainees are stated.
2. It is shown that, in one particular institution, primary subclinical tuberculosis infection occurs in nearly all nurses within two years of commencing training.
3. Susceptibles who nurse in the tuberculosis wards make contact with the tubercle bacillus in a few weeks.
4. It is argued that for trainees' infection is inevitable, and that massive dosage, which may result in clinical tuberculosis, is more likely to occur in the general wards than in special tuberculosis wards.
5. A plea is made for more general recognition of the fact that prophylactic measures in general hospitals with tuberculosis wards should be

directed, not towards preventing infection, which is inevitable, but towards protecting tuberculin negative nurses in the general wards.

6. Of 10 cases of erythema nodosum occurring in the tested group, 9 were tuberculin negative less than six months previously. During the course of the disease the 7 tested were positive. This supports the contention that erythema nodosum in nurses is a manifestation of primary tuberculosis, occurring when the individual first makes contact with the tubercle bacillus.

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THE MALE NURSES' SECTION

The Training of Male Nurses

By MISS W. NOORDYK, *Nursing Superintendent,*
Scudder Memorial Hospital, Ranipet

The Scudder Memorial Hospital is a general Hospital and both Male and Female nurses are being trained here. Since 1921 we have been training Male Nurses. This was not a matter of choice but of necessity as we could not get Indian girls to nurse men patients. In fact it was difficult at first to get Indian girls to come for training in the Women's Department of a General Hospital.

Our classes have always been small, never more than six men at a time—a few years only two, and usually four. This met the needs of our work and therefore our classes were limited to a few. All of our students, both men and women, must have completed their S. S. L. C. studies before they can be admitted to our training classes; and preference is given to those who have succeeded in passing their S.S.L.C Examination.

In the beginning of our training school and for a number of years, separate classes were held for the boys and the girls but since 1934 they have been in the same classes, except for some of the demonstrations which are given to each group separately. All our demonstrations are first done in the classroom and we find this works very well. The practical nursing classes—Surgical and Medical Nursing and Bandaging—are taught by nurses. Dietetics, is taught by a qualified instructor in that subject. Bacteriology with Laboratory demonstration is taught by the Laboratory Technician who is a nurse with laboratory training. Medicines and their administration is taught by the Head Compounder. Lectures in Anatomy and Physiology, Hygiene, Surgery and Medical, Venereal and Tropical diseases as well as Anæsthetics, are given by doctors.

Our Nurses are on duty eight hours during the day and ten hours when on night duty. When there are emergencies they are expected to work as long as is necessary. Some of the classes are within the eight-hour day and some are in addition to the eight hours of duty on the wards.

Our Male Nurse graduates now number some forty odd and they are all employed as far as I know. Some of them are on our own staff in the following capacity—Registrar; Laboratory Technician; Operating Room Supervisor; Ward Supervisor; Anæsthetist; and one is at present in charge of our Out-patient Department. Occasionally one or two of the new graduates do General Ward Duty. Others are working in the Venereal Departments of Government Hospitals in Madras; T. B. Sanatoria and as Operating Supervisors and Head Nurses in various hospitals. One or two have been acting