TUBERCULOSIS AS A PROBLEM FOR THE ROYAL ARMY MEDICAL CORPS.

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Most people who have studied the subject are aware of the debt which hygiene and tropical medicine owe to the work of officers in the Army Medical Services. Even the most hardened critic of military medical work is unable to deny the contributions to malaria of Laveran and Ronald Ross, and to other branches of protozoology by Lewis, Bruce and Leishman; while the work of hygienists such as Notter, Firth, Horrocks and many others, though less widely known, is a great contribution to preventive medicine, the value of which is never questioned by experts. But it is not so universally recognized that the whole trend of modern thought on tuberculosis owes its direction to the work of an Army medical officer, J. A. Villemin, who was a Professor at the Ecole Impériale du Val-de-Grâce, Paris, in 1868, when he published his classical work "Études sur la Tuberculose," proving the infectivity of tuberculosis. This conclusive demonstration of the infectivity of tuberculosis by carefully executed animal experiments preceded the discovery of the tubercle bacillus by Robert Koch by nearly twenty years. So convincing were the experiments of Villemin that, although opposed by a section of the profession, his conclusions soon gained wide confirmation and general acceptance. They were early endorsed, for instance, by Sir John Simon, of the Local Government Board, as is pointed out by Dr. Coutts in a recent monograph. It may fairly be claimed then, that as in the case of malaria, trypanosomiasis, leishmaniasis and sandfly fever, it is to an Army medical officer that we owe the fundamental observations on which modern views about tuberculosis are based.

If our knowledge of the infectivity of tuberculosis is a debt to the French
army, the American army may fairly claim that in Colonel Bushnell they produced an investigator whose work has thrown a flood of light upon the epidemiology of this disease. And the traditional interest of the French Army Medical Service in tuberculosis found further expression during the Great War in the fact that a definite organization was brought into existence for the study of tuberculosis and cognate conditions amongst the colonial troops imported by France to supplement her standing army in Europe. The result of this wise measure was that A. Borrel, a medical scientist of great distinction, was delegated to this work, and was enabled to produce a record second to none in importance upon the epidemiology, pathology and clinical type of tuberculosis amongst the Senegalese levies (Ann. de l'Institut Pasteur, vol. xxxiv, No. 3, March, 1920).

It is to be regretted that with all the wonderful developments which took place in the zone of the British armies in France and Flanders this question of the tuberculosis of colonial contingents received but scant attention. The opportunity might have been entirely lost had it not been for the careful records of mortality from infectious diseases, including tuberculosis, kept by Colonel (now Major-General Sir) W. W. O. Beveridge, and which were later available for study. The fact must, I fear, be admitted that so far the British Royal Army Medical Corps, an organization which has been, perhaps, more fruitful than the medical service of any other army in its contributions to medical science, has made no addition of first-rate importance to our knowledge of tuberculosis, and this, perhaps, because it is our policy to discharge as soon as possible all soldiers diagnosed as tuberculous in the interests of the patients and of their comrades. There is much to be said for this procedure from many points of view, and I propose to discuss it later in this paper. But even with this loss of clinical material there remain a great many possibilities for the investigation of tuberculosis, which can be better carried out in the Army than anywhere else.

Four important lines of investigation may be formulated under headings as follows:—

(1) The recording of clinical types on a definite system of classification.

(2) Examination of post-mortem material on pre-arranged and systematic lines.

(3) The application of von Pirquet tuberculin tests for the study of the distribution of infection as opposed to disease amongst recruits.

(4) Investigations into the tuberculosis of native troops, and, where possible, native civilians by medical officers serving in our colonies and dependencies.

Investigations under these four headings are calculated to throw much light on tuberculosis in general, and might furnish information of the highest value. Let us turn for a moment to consider them in greater detail.
THE STUDY OF CLINICAL TYPE ON A DEFINITE SYSTEM OF CLASSIFICATION.

Tuberculosis is a general disease and manifests itself in many different tissues and organs. There are mysteries connected with its distribution throughout the body which still await solution. Why, for instance, does it so rarely attack muscular tissues and so frequently attack bones and joints? There is no mystery about its predilection for glands, since these are interposed along the lymphatic channels between the portals of entry of the bacillus and the deeper tissues and organs; nor is it difficult to understand why the lungs are so frequently affected, since these organs represent in themselves the main portal of entry for air-borne infection as well as containing a vast capillary network in which may be arrested the bacillary emboli which enter the venous circulation from caseating foci throughout the body. But apart from these obvious sites of infection there remain many problems as yet unsolved relating to the location of secondary tuberculosis in the various organs.

Why is it, for instance, that, although myriads of tubercle bacilli are constantly being swallowed by persons suffering from pulmonary tuberculosis, the intestine so often escapes infection? How does it happen that certain patients get tuberculous laryngitis quite early in the course of tuberculosis of the lungs, while others continue to expel myriads of germs from vast lung cavities and yet the larynx, though exposed to constant contamination, remains healthy? These are only a few of the puzzling features which present themselves when one begins to study variation in clinical type. But apart from varieties dependent on differences of localization throughout the body there remain the problems of variation in clinical type in the tuberculosis of any given organ. Tuberculosis of the lungs, for instance, presents an infinite series of types ranging from the unrecognized focus at an apex accompanied by great enlargement of the bronchial and mediastinal glands to the widely distributed, easily recognized, and too often progressive phthisis affecting the greater part of both lungs and yet with relatively slight disease of the bronchial and mediastinal glands. Much interest attaches to these varieties of clinical type in tuberculosis because they tend to vary on the one hand with the age of the patient and on the other with his previous history. It is common, for instance, to find in adults, such as the Senegalese soldiers already referred to, when brought into contact with infection for the first time, a clinical type comparable in many ways with what is normally met with in infants and young children in European communities.

This consideration suggests that the study of clinical type may prove to have a bearing not only on prognosis and treatment but also upon the epidemiology of the disease.

I have attempted to discuss this matter in a short paper, "The Clinical Differences in the Course of Tuberculosis seen in various Age-groups and
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Races" (Journal of State Medicine, May, 1922, vol. xxx, No. 5, p. 203), which may be referred to by those interested in the matter. I then formulated my views as follows:—

"That when, in a given community, the percentage of positive von Pirquets tends to be high, the clinical type in that community tends to be localized and chronic, and the death-rate of the middle-age type; and that when the percentage of positive von Pirquet tests is low, the prevalent clinical type tends to be acute, generalized, and characterized by the 'young adult' type of mortality."

A classification intended to throw light on these questions has been devised by me for use in Wales and is now being applied by my colleagues throughout the principality; the results being sent in for analysis on an inquiry card. The classification itself has been described in detail in the British Journal of Tuberculosis, vol. xviii, No. 2, April, 1924, p. 43.

There are many other classifications, some much simpler than that referred to and at the same time of great utility. That, for instance, devised by Sir Robert Philip of Edinburgh and well known to his students, is to be highly commended for clinical purposes; while a classification recently set forth by the Ministry of Health in Circular 37/T is easily applied and covers a considerable field.

In order to make full use of the opportunities for the study of the disease throughout the British Army, there is need for a standard scheme of classification for pulmonary and other forms of tuberculosis as they occur in a population of military age drawn from every section of the general male population.

POST-MORTEM EXAMINATIONS.

An example of the value of careful post-mortem records in tuberculosis applied to a colonial community will be found in a recent paper by Dr. H. H. Scott in the Annals of Tropical Medicine and Parasitology, vol. xv, No. 3, of September 30, 1921, and when post-mortem examinations are made the investigator could not do better than adopt the system of records utilized by Dr. Scott in this research, which extended to 300 consecutive cases of death from tuberculosis in Hong Kong.

The post-mortem findings of Borrel in relation to tuberculosis of the Senegalese troops in France are given in his paper already referred to and speak for themselves.

Another recent paper of the highest interest is by Dr. A. Powell, of Bombay, in which he bases his conclusions on over 8,000 post-mortems on Indians. His paper, which includes clinical data, appeared in the Proceedings of the Royal Society of Medicine, Section of Tropical Diseases and Parasitology, September 1922, vol. xv, No. 11, and repays careful study. But the opportunity afforded for post-mortem investigation by our Army medical officers is not confined to the examination of those dying of tuberculosis. A still more fruitful field is to be found in the careful search.
for tuberculous lesions in the cadavers of those dying from other diseases, wounds and injuries.

In this direction, the classical investigations of Naegeli (Archiv f. Path. Anat., Berlin, T. 160, p. 426) and Burghardt (Zeit. f. Hyg. u. Infect., Leipzig, T. 53, p. 139) indicate a line of research which needs to be applied widely throughout an army such as ours and would be sure to enlighten us about the distribution of tuberculosis in our adult population.

A significant observation by Opie (Opie and Anderson, American Review of Tuberculosis, 1920, col. 4, p. 29), for instance, in which, during the examination of cadavers of British soldiers in France, he found, out of 66 cases, 18 or 27 per cent with caseous or calcified mesenteric glands, indicates how military post-mortems may serve to throw light on the prevalence of mesenteric infections in early life.

**Tuberculin Tests.**

It is now universally realized that the von Pirquet cutaneous tuberculin test is too sensitive to be of real value in clinical diagnosis, except that a negative in an adult or a positive in an infant is so exceptional as to be significant. Its value, however, as an index of the distribution of infection throughout a population is extreme.

If we are to understand the problems of tuberculosis in a given community we require to set against the incidence, mortality and clinical type of diagnosed tuberculosis, statistics as to the distribution of infection as shown by cutaneous tuberculin tests. This need has been fully realized by the French colonial services. In 1911 Calmette inaugurated an extensive investigation into the "tuberculin index" amongst the various races in the French colonies and statistics of the highest interest have steadily accumulated since that date.

In spite of our colonial possessions, we can point to no comparable investigation to enlighten us about the tuberculosis of our subject and dependent races. But it is safe to say that a just appreciation of the significance of the tuberculin index would be invaluable in connexion with measures for the health of native labour contingents either in our colonial industrial developments or in the course of military operations.

But it is not only in the colonies that such investigations are required. Differences of the most interesting and significant kind underlie the variations in incidence and mortality of tuberculosis in these islands and these too await systematic investigation.

If it were possible to carry out a cutaneous tuberculin test on every recruit joining his depot and to record the result on his medical history sheet, we should be able, in the course of years, to accumulate facts of the highest interest bearing on the clinical types of tuberculosis subsequently arising; while it would be of great utility to ascertain the percentage of positive and negative tuberculin tests in the different recruiting areas of England and Wales.
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In no other organization except the Army are there similar facilities for gleaning information on a point which is of fundamental importance.

Tuberculosis in Our Colonies and Dependencies.

The importance of tuberculin tests applied to colonial troops and to the natives of tropical dependencies has already been mentioned and not much remains to be said.

The almost complete absence of tuberculosis amongst the majority of primitive tribes in their natural surroundings and the intense susceptibility of these people when brought for the first time in contact with the tuberculized populations of the West has long been recognized. Wm. Budd in suggesting the infectivity of tuberculosis on the grounds of its distribution and natural history called attention to this susceptibility of primitive tribes in the Lancet of 1867, vol. 2, p. 451. Villemin, already quoted, devoted a whole chapter to the subject and attributed the appearance of tuberculosis in almost epidemic form amongst such communities to contact with Europeans. The point need not be laboured as it is now generally admitted, and yet the susceptibility of such races to tuberculosis is often forgotten when it is a question of raising labour for industrial developments or for recruitment during critical periods in the course of wars.

The very high mortality amongst the men of our Native Labour Corps in France and Flanders in 1918 has been described in the Pathological Volume of the "Medical History of the War." While everything possible was done to ameliorate the conditions of life in these Corps during their service in France, and while it is admitted that they enjoyed far greater comfort in their locations behind the line than did our own troops under trench conditions in contact with the enemy, their susceptibility was such that many of them contracted tuberculosis of a progressive and fatal type; and doubtless many others developed it later as the result of infection contracted during the war.

Wastage of this kind ought to be avoided in future and this means that the problems of prevention must be studied in advance.

The future is not without hope that it may be possible to immunize susceptible persons by means of the B.C.G. vaccine of Calmette and Guerin. This procedure cannot safely be applied to persons already infected with tuberculosis and it is, therefore, restricted to the immunization of newborn infants in European countries; but there seems no reason why it should not be tried on the non-reactive adults of primitive races upon their being engaged for industrial or military purposes.

The experiments on apes at the Pasteur Institute Monkey Farm at Kindia have been so strikingly successful as to justify the warmest hopes for ultimate success ("Expériences de Vaccination des Singes contre la Tuberculose par le B.C.G.", J. Wilbert, Annales de l'Institut Pasteur,
and there undoubtedly exists the fullest justification for tentative trials of this living vaccine amongst primitive adults, such as the natives of the Bahr-el-Ghazal and other isolated areas. And there should be many opportunities of applying it to newly born infants in India, Burma, the Sudan and many other places where tuberculosis is claiming an increasing number of victims amongst native populations and where any reasonably safe procedure designed to render them more resistant is urgently wanted and merits a thorough trial.

Tuberculosis is, undoubtedly, one of the most important diseases with which the medical profession has to deal, and as I look back on my time of service in the Army I cannot help feeling that a great opportunity for adding to our knowledge lies at the disposal of the Royal Army Medical Corps.