

## Section of Epidemiology and State Medicine.

President—Dr. A. K. CHALMERS.

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### Experiences with the Schick Test and Active Immunization against Diphtheria.

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A SYSTEM of diphtheria prevention, based on the use of the Schick test, as a means of recognizing susceptibility to diphtheria, coupled with the method of conferring active immunity by inoculations of a standardized toxin-antitoxin mixture, has recently been adopted on an extensive scale in America, especially in New York and Boston, where prevalence of diphtheria has been greater, and the mortality from this disease considerably higher, than in this country.

It would be premature at present to advise that in English communities general immunization of persons susceptible to diphtheria should be attempted on the New York scale. More information and experience is necessary before this could be recommended. At the same time, there are already circumstances in which the evidence available may be considered to warrant full trial of the Schick reaction, and toxin-antitoxin immunization, particularly in the case of certain institutions, such as schools, in which the method appears capable of affording results of the utmost value and importance and especially perhaps in the case of nurses and other persons likely to come much into contact with diphtheria. And it is with an account of a specially detailed investigation of this preventive method in all its bearings, recently carried out at the schools belonging to the Guardians of one of the Metropolitan Unions, that the present communication is mainly concerned.

[*Description of Schick test and its results, illustrated by colour process lantern slides.*]

During prevalence of a severe outbreak of diphtheria which occurred at Bristol about a year ago, the Ministry received a communication from the Medical Superintendent of the Southmead Infirmary of the Bristol Union, reporting the sudden occurrence of an exceptionally virulent type of the disease in the children's ward of that institution, in circumstances which seemed to call for special investigation of the conditions under which the disease was spreading.

In course of a local inquiry which was consequently undertaken, occasion arose of utilizing the Schick reaction, and of immunizing certain of the susceptible children by toxin-antitoxin inoculations. There were, however, difficulties as to the preservation of the full activity of the standard toxin, when transmitted through the post in hot weather, and in arranging for the necessary technical and laboratory work.

Subsequently the medical officer of the Mitcham Poor Law Schools belonging to the Holborn Guardians intimated that in view of the prevalence of diphtheria, he was anxious to apply this test to the children in the schools,

and was also anxious to receive any technical advice and assistance which the Ministry could give.

The Mitcham schools contained a resident population of 329 children, ranging in ages from 3 to 16 years, all of whom until quite recently not only lived, but received their education, in one or other of the three adjoining institutions. The average weekly rate of admissions and discharges is so small that the population is a remarkably stable one. Before November, 1920, these schools had been practically free from infectious disease, for a period of about five years; but since then, they have suffered invasion from diphtheria, scarlet fever and tonsillitis, more or less continuously.

As regards diphtheria, notified as such, twenty cases occurred during the past year (1921), between March 24 and August 4. It is worth noting that considerable intervals of time elapsed during which the Institution was apparently free from the disease, more especially from April 14 to June 3 and again from June 20 to July 8, 1921. On the other hand, cases diagnosed as tonsillitis had occurred more or less continuously since September, 1920; in five of these the patients eventually proved to be carrying the diphtheria bacillus in their throats (two of them during the month of June, 1921, developing diphtheria in clinical form). It therefore became a point of interest to determine to what extent this was happening in other cases of tonsillitis, and also among the apparently healthy members of the community.

With this object in view all the children, as well as the teachers in the schools, were "swabbed" late in June, 1921, but as regarded their throats only. The "swabs" were examined by Dr. Cave, Superintendent of the Mitcham Infectious Diseases Hospital, who was able to demonstrate the presence of the Hoffmann bacillus in many cases, although he did not succeed in any instance in isolating the specific Klebs-Loeffler bacillus.

Subsequently at the suggestion of Dr. Fegen, the medical officer of health, "swabs" were also taken from the noses of all the children in the Infants' Department, from one of which, derived from F. A.—a boy aged 6, Dr. Cave isolated the Klebs-Loeffler bacillus in pure culture. As it seemed important to determine whether the organism was virulent, or not so, further "swabs" taken from this boy's nose and throat were forwarded to Dr. Eastwood at the Ministry's Pathological Laboratory, local facilities for carrying out the necessary work not being available. Cultures obtained from both of these "swabs" proved, however, in each instance, to be non-virulent on being submitted to the necessary tests.

Subsequently to July 21, 1921, when this boy was removed to the isolation block, in consequence of the positive result obtained *qua* presence of the diphtheria bacillus in the nose, two cases of diphtheria broke out (both in the Infants' Department) which were notified on July 22 and on August 4 respectively. From August 4 onwards, to the present time, no further case of the disease has occurred in these schools—in regard to which I desire to place on record our appreciation of the valuable assistance afforded by Dr. Morrish, the Medical Officer; Mr. Drury, the Superintendent; Mrs. Drury, the Matron, and the resident Sister and Nurses of the Schools' Infirmary, in arranging the practical details of the work.

*The plan of investigation* initiated at this point was briefly as follows:—

Commencing with the Infants' Department, lists of the children giving name, age, and date of diphtheria attack (if any) were made out. Taken in their order on these lists, batches of children, the number of which increased daily as the work progressed, were "swabbed" as to both nose and throat

by Dr. Eagleton, and subsequently they underwent the Schick test at the hands of Dr. O'Brien. The actual Schick test was invariably carried out on the *left* forearm, while a control test with toxin which had previously been heated to 75° C. was carried out at the same time on the *right* forearm. In a few instances, both test and control had to be carried out on the same arm owing to the presence of sores, or gnat-bites on one forearm. No special difficulty, however, in subsequently reading the results was encountered as the outcome of this procedure.

As a general rule all the children who had undergone the Schick test were examined daily for the first week, and at irregular intervals afterwards up to as much as a month from the date of performance of the test. In most instances, thanks to the fact of a control injection having been made in each case, little difficulty was experienced in correctly interpreting the result, each "reading" confirming those that had been made previously. On the other hand, in a few instances, it was found not only difficult, but also impossible, to be certain as to the correct interpretation, while very occasionally, the opinion, based on an early reading, had to be modified at a later stage. This was a confirmation of earlier experience derived from work carried out on similar lines at Bristol, that it is inadvisable to express a definite opinion as to the ultimate interpretation of the result following on performance of the Schick test until after the lapse of a period of at least ninety-six hours.

Occasionally it was found desirable to repeat the test owing to difficulty in determining the correct reading of the result in the first instance. In these cases, as in others of more definite character, confirmation was sought by direct estimation of the antitoxin content of the blood, the small quantity necessary for this purpose being withdrawn from a vein at the elbow.

*Result of Schick Test at Mitcham Schools.*—Of the total population of 329 children all have been submitted to the Schick test. Including "combined" reactions under the heading of "positive" and "pseudo-" reactions under the "negative" section, 102, or rather less than one-third of the total were proved to be non-immune, i.e., susceptible to attack by diphtheria. These have now all been immunized by means of at least three separate inoculations of T.A. at intervals of about one week. The technical work of the investigation was carried out by Dr. O'Brien and his colleagues, who will present for discussion the details of the work, which, in respect of the care, skill and thoroughness devoted to its accomplishment, constitutes an advance on any investigation on the subject previously recorded in this country at any rate.

(*Postscript.*—This technical work is published in full in the *Journal of Experimental Pathology* for February, 1922.)||

## Schick Test: Bacteriological Examination of 300 School Children.

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(ABSTRACT.)

DURING the wane of a diphtheria epidemic in an institutional school at Mitcham nose and throat swabs were taken by Dr. C. C. Okell and Dr. Eagleton from all the inmates: 329 children were so examined (Series I) and the process