

ANTI-TOXIC IMMUNITY TO DIPHTHERIA AMONG A GROUP OF INDIANS IN NAINITAL DISTRICT, U. P., INDIA, AS EVIDENCED BY THE SCHICK TESTS

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DIPHTHERIA as an epidemic disease is comparatively infrequent in tropical countries. There is evidence, however, that the disease is endemic in India and in other equatorial zones.

From studies made in a number of countries, the epidemiology of the disease has become more easily understood than before. Certain features may, therefore, be now fitted into the epidemiological conception of this and other similar diseases. For example, it is known that diphtheria is more concentrated among children under four years of age in tropical than in temperate countries. Thus Doull (1928) gives the proportions of deaths in the 0-4 years age group to the total at all ages as 45.55 per cent in England and Wales during 1919 to 1920, as 71.99 per cent in Italy during 1915 to 1921, 60.91 per cent in London during 1910 to 1919, 71.58 per cent in New York during 1917 to 1924, 80.95 per cent in Rio de Janeiro during 1908 to 1916 and as 91.79 per cent in Manila during 1917 to 1924.

(Continued from previous page)

With regard to the origin of the cilia in the anterior chamber the most plausible explanation is that they must have been driven inside the anterior chamber at the time of the injury. This view is hard to accept in this case as the eye was carefully examined several times, before, at the time of and after the operation. There is no recollection, however, that the lid margins were specially examined for the purpose of ascertaining whether any cilia were torn away from them or not, on the first day of the injury.

O. L. Sharpe (1925) in a review of this subject states that 75 such cases have been reported within the last 100 years. The period of time these cilia remained inside varies immensely, from some months to 33 years; in my case it was about 5 years. For some time the cilia cause no trouble or symptoms, but eventually symptoms of irritation and later on of inflammation in the eye arise—such as the feeling of a foreign body, ciliary injection, photophobia, lachrymation and pain. Purulent inflammation of the globe may also occur, but it is rare.

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Results of the Schick tests done in some tropical countries, in Manila by Gomez, Navarro and Kapauan (1922), in the Federated Malay States by Fletcher (1927), in Rio de Janeiro by Doull, Ferreira and Parreiras (1927) and in India by Rambo (1929), indicate that, at corresponding age periods, anti-toxic immunity to diphtheria is more common among the residents of these places than among those of England or the United States. Significantly enough, however, carriers of virulent diphtheria bacilli have been found to be quite as common by Vardon in India (1923) and by Gomez and Navarro in Manila (1923) as in the temperate climates.

Age distribution of diphtheria cases has been known to vary also with the aggregation of population: it is concentrated in the younger age groups more in the cities than in the rural areas.

The statistics, therefore, show that diphtheria as an infection is quite as prevalent in the tropical or sub-tropical countries as in the temperate, but that as a disease it is less prevalent and is more concentrated in early childhood. This would indicate that host-parasite relationship is more advanced, approaching closer to commensalism, in the tropical than in the temperate zones, the ratio of clinical diphtheria to immunizing infections being lower in the former than in the latter. In other words, sub-clinical infections are more common in the tropics than in the colder climates.

With a view to finding out the status of anti-toxic immunity against diphtheria in an unselected group of Indian children in Nainital district which lies on the foot-hills of the Himalayas in latitude 28° to 29°N. it was decided to perform the Schick tests.

Diphtheria toxin was imported for the writer by Messrs. Mulford and Co. from the U. S. A. For control tests the heated toxin was also imported by them. The tests were read both at the end of 24 hours and 4 days. The pseudo-reactions were classed as negative, unless accompanied by positive reactions as well. The following table gives the results of the tests done in the months of March and May 1933:

Age group (in years)	Total tested	Per cent positive	REMARKS
0-4	17	47.1	Four cases in which results were not known have not been included.
5-9	150	12.7	
10-14	81	4.9	
15-19	13	0.0	
20 and over	23	4.3	
TOTAL ..	284	11.2	

This table shows that susceptibility to diphtheria rapidly decreases with advance of age.

Clinical cases of diphtheria in these parts of the country are almost unknown among Indians; the writer saw only one case of diphtheria during the five years of his stay in Nainital district. It is not, of course, suggested that this was the only case that occurred from the disease during that period. It does appear, however, that the probable explanation of the phenomenon is that sub-clinical infections of the disease are quite common.

Frost (1928) while discussing the epidemiology of diphtheria stated that ratios of infection to immunity and of infection to disease vary widely, in the same population, with age, race, circumstances of known exposure, and, in different populations, with difference in latitude. Certain unpublished studies made by the writer on acute poliomyelitis, a disease epidemiologically very similar to diphtheria, seemed to suggest that these ratios may vary in the course of the same epidemic. Statistics are available on the results of Schick tests done in India on Indians by Rambo (1929) and on Europeans and Anglo-Indians by Fox, McDonald and McCombie Young (1923). These are given below :

RAMBO'S STATISTICS		FOX'S <i>et al.</i> STATISTICS	
Age group	Per cent positive	Age group	Per cent positive
Under 3 years	72.2	1-5 years	54.5
3-6	10.7	5-10 "	51.5
7-10	14.0	10-15 "	41.6
11-14	2.6	Over 20 "	66.6

These statistics indicate that, age for age, the Anglo-Indians and Europeans have a higher susceptibility to diphtheria than Indians. The results are similar to those obtained in the U. S. A. where the white population have at corresponding ages a greater susceptibility than the coloured.

There were only four pseudo-reactions noticed by the writer among Schick tests made. Rambo had 2 such among 197 cases, whereas Fox *et al.* had 12 pseudo-reactions among 271 tests done on Anglo-Indians and Europeans. These reactions have been ascribed to local anaphylactic response to the protein of autolysed diphtheria bacilli in the broth. The statistics at our disposal are inadequate, but if the figures indicate a general law regarding racial variation, some explanation will have to be sought for the phenomenon. The question will then be: How do the Europeans and Anglo-Indians get sensitized to the diphtheritic protein to a greater degree than do the Indians?

#### Summary

1. There are reasons to believe that diphtheria is endemic in India.

2. The morbidity from diphtheria is, for some obscure reason, not high among Indians.

3. The susceptibility to diphtheria rapidly decreases with advance of age in this country, in spite of the fact that as a disease it is not so prevalent. This suggests that infections incapable of producing clinical manifestation of disease are common.

4. More extensive Schick-testing among various races in India are required to elucidate certain important phenomena of the disease.

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## A Mirror of Hospital Practice

### TOXIC EFFECTS OF EMETINE ON THE CARDIOVASCULAR SYSTEM

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S. D., a European female, 48 years old, was admitted into the Carmichael Hospital for Tropical Diseases, under the senior author on 23rd January, 1934, with irritation of the skin all over the body and a general feeling of weakness, depression and debility. The patient suffered from malaria five years ago and was treated with quinine. A year later she had an attack of acute amoebic dysentery and was treated at the School of Tropical Medicine, London, where a large number of *Entamoeba histolytica* were found in her