

epidemic outbreaks in the districts through which they pass. The villages through which the pilgrims pass have little or no provision of good and protected water supply nor any conservancy arrangements. The lanes and bye-lanes of a village which has been the night halt of a *palki* and its accompanying pilgrims form a repulsive sight next morning on account of indiscriminate use of these places as temporary latrines by the pilgrims. Under these circumstances, no wonder that an infection among the pilgrims is soon likely to be the cause of severe cholera epidemics not only among themselves but also in the areas through which they pass.

For a long time anti-cholera inoculation was followed on a voluntary basis but in many places response from the public and particularly from the pilgrims was not encouraging. The deliberations of the Central Advisory Board of Health at its second meeting held in Madras in 1938 gave an impetus to this question and at present some provinces and states do adopt the indirect compulsory inoculation method with very encouraging results. In Pandharpur in Bombay Presidency and in several important fairs and festivals in Hyderabad State, this method is adopted and it is the experience of the public health authorities in these places that opposition to inoculation is gradually dying out, and cholera inoculation is taken by the general public almost as a routine procedure before going to a place of pilgrimage.

Sanitary arrangements at fairs and festivals generally are the responsibility of the municipalities or district boards concerned, but in any way it is one single administration that has to deal with such matters. The *palkies* under discussion have to pass through more than one administration, as several of these *palkies* have their origin in Central Provinces and Berar and pass through more than two or three districts in the Hyderabad State and then through the districts of Ahmednagar and Sholapur in Bombay Presidency. For good managements and efficient sanitary arrangements, a close co-operation between the public and the health administrations of the different provinces and states concerned is necessary. Such an arrangement exists at least between Hyderabad and Bombay Presidency, and information of any cholera infection is immediately telegraphed to the Directors of Public Health of both Governments as well as to the district health officers of the districts through which the infected *palki* has to pass.

Whenever cholera breaks out in a pilgrimage procession, which is moving on foot at a fast speed and has a long distance to travel, the management of a cholera case becomes a difficult problem. This is particularly so when the route does not lie along the railway or roads but along cart-tracks. The patient, if left behind, will be without proper medical aid and it is also not possible to carry the patients and their contacts along with this large procession without risk to the others. It is always advisable to have one

or two bullock carts to serve as improvised ambulances, so that the patients and their contacts can be immediately isolated and sent to the nearest hospital or dispensary to be properly attended to.

There is no doubt that in this particular *palki*, which started from a place which was having a severe cholera epidemic and with few infected villages along the route, it is this protection of the pilgrims by mass anti-cholera inoculation that prevented a severe outbreak among the pilgrims themselves and also prevented the infection from spreading to hitherto uninfected villages that were on the route and which formed the places of day and night halts for a large number of pilgrims.

Summary and conclusion

1. A type of moving religious fair (*palki*) has been described. These processions passing to and from important places of pilgrimage have been the cause of spread of cholera in the past.

2. These *palkies* travel a long distance, sometimes more than 300 miles and pass through different administrations, making their management particularly very difficult when there is an epidemic of cholera outbreak, unless very close co-operation exists between the public health departments of the different administrations.

3. Sri Eknath Maharaj *palki* in the year 1941 started from Patan, a town heavily infected with cholera, and its route lay through the area in which some villages were already affected.

4. As a result of adoption of compulsory (indirect) inoculation against cholera among the pilgrims, this *palki* did not witness any severe outbreak of cholera among its own followers nor was any of the hitherto uninfected villages on the route affected as a result of the procession.

5. Suggestions have been made to select with care villages that serve as night halts and also for the provision of bullock carts which can be improvised as ambulances to shift the cases to the nearest dispensary or hospital where they can be attended to.

In conclusion, I have to mention that without the active co-operation and help of the district health officers of Aurangabad, Bhir and Osmanabad districts and their staff, it would not have been possible for me to manage the cholera infection successfully.

A PLEA FOR WATER POLLUTION RESEARCH

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A LARGE proportion of the population in India still do not have an adequate supply of safe water and mortality due to water-borne epidemics is high. While other countries in the world have expert committees and centralized

research laboratories to administer their needs in regard to providing safe water and abatement of water pollution, we have not even made a beginning in this direction.

India is now on the threshold of a new era and many plans are afoot for her future scientific development. The Board of Scientific and Industrial Research is to expand its activities on a grand scale and many National Research Laboratories are being established. The Bhole Committee has made a very comprehensive plan to take care of the health of the nation. These plans, however, do not envisage immediate creation of any centre for research on water, sewage, industrial wastes and stream pollution. Establishment of Central and Provincial Water Boards have been considered in the Bhole plan but sufficient emphasis has not been placed on research as the mainstay of the Board's activities. There is no nucleus of water pollution research at the centre now. The facilities available in the small number of provincial and state public health laboratories are indeed meagre both in regard to men and equipment and hardly adequate to cope with routine work. Modern trends in public health engineering are unknown in the existing engineering colleges in India and they have very limited facilities for conducting investigations in this field.

Let us examine the status of water pollution research in other countries. Water pollution research is primarily the function of the Federal and State Health Services in the United States of America where most of the recent developments in this field have taken place. In England, it is part of the activities of the Council of Scientific and Industrial Research. Judging from the results achieved the developments in U.S.A. have been more fruitful both in regard to the advancement of knowledge in this field and providing better sanitation.

As early as 1913, an Act of the Congress empowered the United States Public Health Service to extend its activities to investigations of stream pollution and other allied sanitation problems. In July the same year the Service opened a laboratory at Cincinnati (Ohio), which was devoted exclusively to the study of streams used for water supplies in regard to pollution by wastes and their natural and artificial purification. A well-balanced team of experts in Sanitary Engineering, Chemistry, Bacteriology and Biology was stationed in this laboratory. During the last 30 years a large volume of very useful work has been carried out at this station. Apart from solving the immediate problems on hand a great deal of fundamental work on problems of self-purification of streams and lakes, sewage oxidation and water treatment have also been carried out; general laws have been formulated in regard to natural purification under various conditions of pollution load, stream flow and temperature. A variety of sanitation problems have been investigated with most fruitful results and it is hardly possible to

review them here. Suffice it to say, the publications from Cincinnati Laboratory have ranked very high in the world's literature on the subject and many of them are used in the teaching of Public Health Engineering all over the world. Reviewing twenty-five years' activities of the Cincinnati Laboratory the Medical Director of the United States Public Health Service says in 1938 that 'the activities of this laboratory have constituted one of the best investments of not only the Public Health Service but of the Nation'.

Among the State Health Laboratories of America, that have made significant contribution, mention may be made of the Lawrence Experiment Station. This was established as early as 1887 by the Massachusetts State Board of Health in order to carry out an act of the legislature to protect the purity of inland waters. One section of this act authorized the Board 'to conduct experiments, to determine the best practicable methods of purification of drainage and sewage or disposal of the same and to employ such expert assistance as was necessary'. The contributions made by the Lawrence Experiment Station have laid the foundations of some aspects of modern sanitary engineering. Allen Hazen's fundamental investigations on filtration and Sedgwick's work on water microscopy were carried out from this station. Experiments carried out at Lawrence as early as 1912 formed the basis for what is now known as the activated sludge process of sewage treatment. Apart from these, much useful work on trickling filters and treatment of trade wastes have also been carried out in recent years. The achievements of Lawrence and Cincinnati gave the necessary incentive for a nation-wide development in water pollution research in America and to-day everyone of the State Health Departments has a team of experts and well-equipped laboratories to investigate their water, sewage and trade waste disposal problems.

In the early days, County and Municipal Drainage Board and their laboratories carried out much useful work on water pollution problems in England. The Royal Commission on Sewage Disposal and more recently the River Boards have made very notable contributions—some of their data and findings are even to-day considered classic in this field of studies. It was not until 1927 that the Water Pollution Research Board was established in England. Its terms of reference were as follows: 'To report to the Privy Council for Scientific and Industrial Research from time to time, schemes for research on pollution of rivers and other sources of water supply by industrial effluents and sewage and on any relevant matters affecting purity of inland waters and to supervise execution of approved investigations'. Simultaneously with the formation of Board an organization for research was also set up as part of the activities of Department of Scientific and Industrial Research. During the last two decades the Board has carried

out many useful investigations on treatment of water, sewage and trade wastes, effects of pollution of surface waters and allied problems. During the last war, when there were great changes in the industries of the country, the Board has tackled successfully in their laboratory many serious problems of pollution of surface water by industrial wastes.

America is more advanced than England in the application of newer knowledge to water treatment, sewage purification and abatement of pollution. English practices have lagged behind theory and old-fashioned treatment plants operated on empirical basis are not uncommon in England to-day. One of the factors responsible for this state of affairs is that organized research was encouraged in America much earlier and on a bigger scale than in England. Water pollution research was linked on to health of the State in America and the Federal and State Health Services were made responsible for it. But, in England, it was left to the encouragement of small municipal and county bodies and to the Council of Scientific and Industrial Research. Industrial research thinks in terms of benefits to industry and the public health viewpoints are therefore of secondary importance to them. More recently, however, there has been a tendency in England too to bring these activities under the administrative control of the Ministry of Health.

Water pollution problems in India are somewhat unique. When people congregate in large numbers in places of pilgrimage for purificatory baths, the water in these localities is grossly polluted and the same water is also devoutly swallowed by everyone. Commission of nuisance in public thoroughfares, village roads and tank bunds is common in many parts of rural India and all these filth find access to the neighbouring tanks and streams which are also used as sources of drinking water. With the impetus for industrialization in the New India many new industries will come into existence very soon. The disposal of industrial wastes, which hitherto was not of much consequence, will have, now, to be studied with due consideration to proper utilization of our waterways.

No work has been carried out in India on the foregoing aspects of water pollution. American and English experiences may not be directly applicable to Indian conditions without actual data. How the natural purification process will operate under conditions of high water temperatures, bulkier Indian sewage and industrial wastes, it will be hard to figure out without actual investigation. Basic data on these and allied problems is a necessary prerequisite for any scientific planning for the protection and proper utilization of our water sources. Anticipatory control measures are often necessary in handling water pollution problems and research in this field cannot await other developments. It is time that a nucleus for water pollution

research is set up at the centre and along lines suggested by the Bhore Committee.

I wish to thank Professor K. Subrahmanyam for his valuable criticism in the preparation of this article.

SCRUB TYPHUS (TSUTSUGAMUSHI DISEASE) IN BOMBAY

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THE occurrence of scrub typhus (Syn.: rural typhus, tsutsugamushi disease) in Bombay is of more than ordinary interest. In the literature all the cases hitherto recorded, in areas principally outside India, had been from clearing areas bordering on the jungle, plantations of sugar, of cocoanut and of oil-palm, open grassy terrain, camping sites, on banks of inundated rivers—in general exclusively from rural as opposed to urban areas, where the cases of typhus, when they occur, are OX19 in type. In the present series, the diagnoses were made in the first instance during the course of routine examination of sera from pyrexial cases for evidence of typhus infection. A review of the clinical course of the disease confirmed the serological diagnosis. The presence of the dermal lesion—the eschar—characteristic of tsutsugamushi disease, noted in two out of the five cases, and the isolation of one strain in the mouse and demonstration of *Rickettsia tsutsugamushi*, and cross-immunity tests with known strains, proved beyond all possible doubt the nature of infection.

The criterion of a positive serological diagnosis was a minimum agglutination titre of 1/250 against a suspension of Proteus OXK killed by alcohol. Eight cases were found in six months between June to December 1945. Three of the eight were residents of the Bombay suburbs; the rest had been permanent residents of Bombay, who had, for a period of not less than four weeks, never been outside city limits. Short notes on four of the latter five, whose case records were available, are given below:—

Case 1.—A boy, aged 9 years, was admitted to the B. J. Wadia Hospital for Children for continuous fever of five days' duration. The parents gave a history of a pimple on the right axillary fold, four days before the onset of fever. A painful glandular enlargement in the axilla was noted two days after the appearance of the 'pimple' but two days before the onset of pyrexia. On admission, this pimple, which had