WORLD HEALTH ORGANIZATION

الهيئة الصحية العالمية
المكتب الاقليمي لشرق البحر الأبيض

ORGANISATION MONDIALE DE LA SANTÉ

REGIONAL OFFICE FOR THE EASTERN MEDITERRANEAN

BUREAU RÉGIONAL DE LA MÉDITERRANÉE ORIENTALE

REGIONAL COMMITTEE FOR THE EASTERN MEDITERRANEAN

EM/RC11/Tech.Disc./7
15 July 1961

Eleventh Session

ORIGINAL: ENGLISH

Agenda item 14

TECHNICAL DISCUSSIONS - POLIOMYELITIS

THE EPIDEMIOLOGICAL BACKGROUND FOR USE OF POLIOVACCINES IN THE MIDDLE EAST

by

John R. Seal, M.D., F.A.C.P.
Director, United States
Naval Medical Research Unit No.3
Cairo, Egypt, U.A.R.

I INTRODUCTION

Opinion is divided as to the present importance of poliomyelitis in the Middle East and most use of poliomyelitis vaccines is in connection with the private practice of medicine. One can anticipate, however, that the industrialization and urbanization which is taking place in the Province of Egypt, UAR, will greatly increase the importance of the disease as a public health problem in this area within the next decade or so. With this, decisions on when and how to initiate control programs will become necessary. Optimum use of vaccines against poliomyelitis, either in clinical practice or mass control programs, must depend on knowledge of circumstances of occurrence of the disease in the population. The epidemiology of the disease differs markedly in the Middle East from that which has influenced vaccine programs in countries from which most publications on vaccination have so far emanated. It is important that every physician understand these differences since they must be taken into account in the design of vaccine schedules and programs suitable to this geographic area.

In this paper most of the available information on occurrence of poliomyelitis in the Middle East will be reviewed, the use of the Salk inactivated poliovaccine under these epidemiological circumstances will be discussed, and the current status and applicability of live virus vaccines will be commented on. Little of the information is new and much of it is ably summarized in the recent book on Epidemiology of Communicable Diseases of Professor Ahmed M. Kamal (1).

My interest in poliomyelitis in the Middle East preceded my arrival two years ago at the United States Naval Medical Research Unit No. 3. For the preceding four years I was assigned as Communicable Disease Control Officer in the United States Navy Bureau of Medicine and Surgery in Washington, D.C. This spanned the period when Salk vaccine was introduced and national programs for its use developed in the United States. In that capacity I attended many of the conferences relating to the civil programs and was among those responsible for development of military programs. Available information indicated that military personnel and their families located in many overseas areas, of which the Middle East was one, were at a much greater risk of contracting poliomyelitis than while in the United States. This led to the early advocacy of vaccination for all members of such families. The result of the United States Navy program is reflected in the reduction in poliomyelitis which has occurred since 1955.

This experience is cited not only because it establishes in some degree my qualifications to discuss poliomyelitis but also because it was the experience of troops from countries with highly developed sanitary standards during World War II which stimulated the studies leading to present knowledge of the epidemiology of the disease in the Middle East.

Before World War II it was generally considered that poliomyelitis was rare in the Middle East as well as in other tropical and subtropical areas of the world. Small numbers of cases of paralytic poliomyelitis were reported annually to Ministries of Health. Practitioners of medicine stated they infrequently encountered the acute paralytic disease or its sequela. The occasional outbreaks which occurred were usually attributed to introduction of poliomyelitis from areas of the world where epidemics more frequently occurred. During the war years, however, it became evident that United States, British and New Zealand troops located in Egypt, Libya and the Palestine contracted poliomyelitis much more frequently than did troops of the same age stationed in the United States or Europe. Also that attack rates in these troops was very much higher than the reported attack rates in natives of the countries in which they were located. Reasoning that this experience of military units indicated an increased exposure to polioviruses circulating in the indigenous population, Doctor John R. Paul of Yale University School of Medicine, began studies on poliomyelitis in the

Middle East in 1944 with a review of hospital records in Cairo (2). These records indicated that many cases of paralytic poliomyelitis occurring in the civil population were not being reported to health authorities because they arrived at the hospital late in the course of illness and were no longer regarded as infectious. Returning to Cairo in 1950, Paul and his associates began more extensive studies with the cooperation of the United States Naval Medical Research Unit No. 3 and the Ministry of Health. These studies marked the beginning of accumulation of scientific data derived from virus isolation and immunologic diagnosis upon which our present knowledge is based.

Before proceeding it is desirable that poliomyelitis as viewed by the epidemiologist be clearly defined.

The infection is primarily of the alimentary tract where the virus first appears and where it persists for the longest time (3). Early in the course of the infection it is usually recoverable for a short interval from the blood and from the pharynx. If clinical illness occurs, it is usually during or very shortly after the period during which viremia occurs. Antibodies capable of neutralizing the virus appear soon after the alimentary infection is first demonstrable and persist throughout life. Complement-fixing antibodies also appear but gradually disappear during the next few years. To summarize our present understanding of the pathogenesis of the disease polioviruses are spread from person to person usually by fecal contamination and possibly by oropharyngeal secretions. When ingested by a susceptible person, the virus begins multiplication in the alimentary tract. Before the appearance of antibodies in the circulation there is a period during which the virus is widely distributed in the body with multiplication probably taking place in tissues other than the intestine. Febrile illness may be a manifestation of this phase. If the virus is able to establish itself in the central nervous system sufficiently well to cause major damage to cellular components, paralytic manifestations appear in close sequence. The infection stimulates formation of specific antibodies which persist and serve as evidence of past infection throughout the balance of the individual's life.

It is also known that only a small percentage of poliovirus infections give rise to clinical disease.

In naturally occurring infections caused by any of the known polioviruses the ratio of inapparent and nonparalytic infections to paralytic infections may vary markedly. During epidemics caused by virulent viruses, susceptible populations where adults and older children are involved, the ratio may be as low as 1:50. In other epidemics caused by less virulent strains it may be 1:100 to 1:200. In endemic areas where infants form the major susceptible population, the ratio may be 1:2000 to 1:5000(4). With attenuated viruses such as are being used in the current live virus vaccines all infections are believed to be inapparent or subclinical. Clinical illness or paralysis has not been demonstrated in man as a result of these induced infections(4).

All polioviruses so far identified belong to one of three serologically distinct families designated only as types 1, 2, or 3. Each type stimulates the appearance of specific antibodies in man which will neutralize all polioviruses of the same serologic type. While there is some evidence of cross neutralization between types, it is not germane to the present discussion. Within a type there have been demonstrated viruses with widely varying pathogenicity for both man and animals. The Mahoney strain of type 1 poliovirus currently used in Salk vaccine produced in the United States is an example of a strain with considerable neurotropism and pathogenicity. This was demonstrated in 1955 when some lots of Salk vaccine containing small amounts of live virus were released under the then existing safety controls. The other extreme is represented by the attenuated strains of type 1 polioviruses used in live virus vaccines. It is this variation in neurotropism and pathogenicity that, at least in part, accounts for the varying ratio of inapparent to clinical infections.

Both man and animals which have been infected with a strain of virus belonging to one of the types of poliovirus become relatively resistant to reinfection with all strains of that particular type although remaining susceptible to infection with strains belonging to other types. If alimentary infection is re-established by the same type of poliovirus it tends to be of much shorter duration, the quantity of virus excreted is much reduced, and clinical evidences of infection do not appear. Accordingly, it is possible to state with reasonable certainty that an individual is immune to poliovirus of a given type if neutralizing antibodies to the particular type are present in his blood and he has not received Salk vaccine. The presence

of neutralizing antibodies against all three types of polioviruses in an individual who has not received Salk vaccine can thus be interpreted as meaning he has already been infected with, and will in the future be immune to, all known strains of poliovirus.

From the epidemiological standpoint, therefore, the important feature of poliomyelitis is the virus infection itself, whether clinically manifest or not, with its resulting durable immunity. Susceptibles of any age may become infected and spread the infection to others. Immunes are resistant to infection and limit the spread. The ratio of immunes and susceptibles in the population together with the virulence of the virus spreading among it will determine the age distribution and incidence of paralytic poliomyelitis. Decisions on vaccination will depend on the known status of immunity of the different age and socio-economic groups in the population.

II POLIOMYELITIS IN THE MIDDLE EAST

Studies on poliomyelitis in the Middle East and contiguous areas during the past decade indicate that strains of all three types of polioviruses are continuously circulating in indigenous populations, that infants are heavily exposed and become infected, and that a high percentage of persons over the age of three to four years have been infected with all three types of polioviruses and are now immune. Strains of polioviruses isolated in the Middle East have not been shown to be significantly different from strains isolated in other areas of the world.

Paul in 1950 (2) from study of records at The Children's Hospital in Cairo, estimated that attack rates for paralytic poliomyelitis in Cairo for the period 1948-1950 were as great or greater than attack rates in the United States during the period 1932-1946. In Cairo more than two-thirds of the paralytic cases were under two years of age. This was in contrast to observations in Miami, Florida, during the same years when more than 85 per cent of cases were over age two, and 45 per cent were over age nine. Blood samples were collected from 248 persons living in villages in Qalyub Province and tested for neutralizing antibodies against the three types of polioviruses.