REPORT ON THE MEETING ON MENINGOCOCCAL DISEASE

São Paulo - Brasília, Brazil
23-28 February 1976

(Summary)
SUMMARY OF SCIENTIFIC DISCUSSIONS AND RECOMMENDATIONS
PAHO-WHO MEETING ON MENINGOCOCCAL DISEASE*
São, Paulo - Brasília, Brazil
23 - 28 February, 1976

The first regional meeting on cerebrospinal meningitis organized by
PAHO in cooperation with the Government of Brazil and the Member States had
the following three objectives:

1. To review the subject of cerebrospinal meningitis in general
and the situation in Brazil in particular;

2. To analyze the experience gained in Brazil with regard to
laboratory diagnosis, treatment, and factors influencing
mortality among hospitalized patients; and

3. To review scientific knowledge and techniques, and on this
basis to develop prevention and control strategies.

Previous WHO seminars in the African and Eastern Mediterranean region
and the 1975 report of the WHO Study Group on Cerebrospinal Meningitis Control
were taken into consideration in formulating the specific recommendations.

The experience during the Brazil epidemic of 1971-1975 emphasized the
need for public information and effective surveillance. Effective surveil-
ance should be based upon disease patterns rather than carriers and requires
sound laboratory support, particularly during periods of low incidence. Every
health service should routinely perform gram stains on clinical material and
seek to isolate Neisseria meningitidis from suspected cases. Counterimmune
electrophoresis to detect meningococcal polysaccharides in spinal fluids from
which no organisms are grown should be encouraged. Serologic testing of bac-
teriologically negative cases or vaccinees utilizing the passive hemaggluti-
nation test or the radioimmune antibody assay has more epidemiologic than
clinical application at present. Reference laboratories should include facil-
ities for isolation, grouping, and drug resistance testing of meningococci.

*Prepared by Dr. Karl A. Western, Department of Communicable Diseases, Division
of Disease Control, Pan American Health Organization, Washington, D. C., USA.
Prevention and control of cerebrospinal meningitis became possible with the development of the sulfonamides and antibiotics for chemoprophylaxis and treatment of cases and, more recently, polysaccharide vaccines against serogroups A + C. There is some evidence from Brazil that, during an epidemic, immunization may prevent disease in a major proportion of the expected patient population and reduce the severity of the disease in the remainder. Because it is not presently possible to predict when and where an epidemic of meningococcal meningitis will occur, routine use of the vaccine is a debatable practice and is not recommended at the present time with currently available vaccines. Early epidemiologic identification of outbreaks, possibly through such indicators as shifts in the age-specific incidence of disease, introduction of new serogroups, and the presence of "virulent" strains would provide the optimal situation for vaccine usage. Environmental methods of control (e.g., isolation and housing sanitation) lack quantitative documentation of their relative effectiveness.

The role of chemoprophylaxis should be reassessed. Although Rifampin and minocycline are effective in eradicating meningococci from the nasopharynx, their wide-spread use in civilian populations is likely to be ineffective. Cost, untoward side-effects of the drugs, and inconvenience may be critical determining factors. Treatment of any clinical case should be initiated with intravenous penicillin or ampicillin within an hour after the patient is seen. Steroids and vasopressors are of questionable value.

The Group developed specific strategies for prevention and control in both endemic and epidemic situations. These recommendations are best read in their entirety (item 5.4). Simple methods of cost-benefit analysis in Brazil indicated that prevention of epidemic meningococcal disease by vaccination was beneficial. Cost-benefit should not be the sole consideration in making decisions about control programs and should be reevaluated in the light of changing epidemiologic circumstances. In its recommendations the Group stated that "... regional and national research programs aimed at solving meningococcal disease problems of regional and worldwide importance should be expanded, and should be initiated where none already exist. To this end, closer contact should be established between the personnel of national laboratories and
FIFTEENTH MEETING OF THE
ADVISORY COMMITTEE ON MEDICAL RESEARCH

Brasília, D.F., Brazil
14-17 June 1976

REPORT ON THE MEETING ON MENINGOCOCCAL DISEASE

São Paulo - Brasília, Brazil
23-28 February 1976

The issue of this document does not constitute formal publication. It should not be reviewed, abstracted, or quoted without the consent of the Pan American Health Organization. The authors alone are responsible for statements expressed in signed papers.
1. INTRODUCTION

1.1 Purpose

The aims of the meeting, as defined by the Government of Brazil and the Pan American Health Organization (PAHO), were:

1) To review the subject of cerebrospinal meningitis in general and the situation in Brazil in particular;

2) To analyze the experience gained in Brazil with regards to laboratory diagnosis, treatment, and factors influencing mortality among hospitalized patients;

3) To review scientific knowledge and techniques available for prevention and control of meningococcal disease, and on this basis to develop prevention and control strategies.

1.2 Present Meeting

This is the first regional meeting on cerebrospinal meningitis organized by PAHO in cooperation with the Government of Brazil and the Member States to combat this disease -- which is of great public health importance, which has in recent years become rampant in Brazil, and which poses a threat to other countries of the Americas. The meeting was divided into two parts. The first part was a practical workshop held in São Paulo on 23 and 24 February 1976 under the Chairmanship of Professor Walter S.P. Leser, M.D., Secretary of Health of the State of São Paulo. Through field visits, demonstrations, and group discussions, the participants were able to acquaint themselves with the past experience and present epidemiologic situation of São Paulo State, which was most seriously affected during the epidemics of cerebrospinal meningitis in Brazil.

The second part of the meeting took place in Brasilia on 25 through 28 February, during which formal sessions, presentations and discussions took place at the Federal Ministry of Health. His Excellency Dr. Paulo de Almeida Machado, the Minister of Health of Brazil, opened the meeting by welcoming the participants to Brasília. The Minister emphasized the public health importance of cerebrospinal meningitis for Brazil and the determination of the Government and the population to combat this disease. Dr. Paulo de Almeida Machado also expressed support for the group in its deliberations, and expressed hope that its recommendations would contribute to the development of effective control programs.
Dr. Federico Bresani, Chief, Zone V, addressed the meeting on behalf of PAHO and wished it success. Professor Walter Leser was appointed Chairman and Drs. B. Cvjetanovic and J.B. McCormick rapporteurs. The agenda of the meeting was approved and implemented. The participants took an active part in presentation of the papers (see Annex II, Section 9.2) and in the discussions which followed. The report of the meeting was adopted at the closing session on Saturday, 28 February 1976.

1.3 Earlier Meetings

In view of the fact that cerebrospinal meningitis has long posed a great health problem for Africa and other regions of the world, the World Health Organization has in past years held several seminars on cerebrospinal meningitis in its African and Eastern Mediterranean Regions.

In 1975 a Study Group was convened which reviewed the progress made in control of cerebrospinal meningitis in general and development of vaccines in particular. The report of the Study Group served as a scientific and technical background for the present gathering.

Participants at the present meeting were also informed about the requirements formulated by the Study Group for the recently developed meningococcal polysaccharide vaccines - recommendations approved by the PAHO Expert Committee on Biological Standardization.

2. INCIDENCE OF MENINGOCOCCAL DISEASE

2.1 Worldwide Incidence

In the world as a whole, cerebrospinal meningitis (CSM) seems to have been on the increase over the last ten years. This can be seen in the available (though incomplete) statistics presented in Table 1.

2.1.1 In Africa, specially in African countries of so called "CSM Zone" south of the Sahara and north of the Equator, outbreaks of considerable magnitude occurred in 1969 and 1970. Nevertheless, these outbreaks were of a significantly lesser magnitude than others which had occurred two or three decades before. Group A N. meningitidis has continued to be the cause of these large outbreaks, although a few cases due to Group C have also been noted.

2.1.2 In Asia, outbreaks of Group A CSM occurred in years 1966-1969 in Iran and Iraq. (There, as in the world as a whole, another rise of incidence was observed in recent years).
Also, an increase of meningococcal disease, due mainly to Group A, was observed in Scandinavia and Europe as well as the Asiatic parts of the USSR and Mongolia. In some other European countries a somewhat increased incidence due to other serogroups was also observed.

2.2 Incidence in the Americas

Like other parts of the world, the Americas have experienced an increase in CSM incidence which cannot be fully appreciated because of inadequate reporting. The incidence remained low and unchanging in Middle America; but it rose slightly in part of North America—namely, in Canada; and in South America there was a considerable increase (see Table 1) reaching epidemic proportions of particular severity in Brazil. Variations, however, were great from year to year and from country to country; this is shown in Figure 1, which gives data for 11 selected countries.

During the last decade (1965-1975) 73,147 CSM cases were reported in the Western Hemisphere as a whole. Of these, 26,793 cases occurred in Northern America, 2,897 in Middle America, and 43,457 in South America. Younger age groups were more affected than older ones, but the fatality rates were higher for both young and old than for middle age groups.

In the United States of America, where information on serogroups is available, Group A has been replaced, first by Group B and then by Group C. Group Y has also been identified as a cause of the disease, especially in the last few years.

In addition, N. meningitidis Group C has been identified in recent years as causing outbreaks in Argentina, Paraguay, Peru, and Uruguay, while in Brazil Group A outbreaks have predominated.

2.3 Incidence in Brazil

An increased incidence due to Group C was observed in São Paulo State in 1971, and more cases occurred in 1972. A very high incidence was observed in the State of Rio Grande do Sul in 1973. The disease made further progress in 1974 and also spread to other states.

In 1973 Group C meningococci were predominant in São Paulo and elsewhere; but in 1974 group A N. meningitidis became more frequent, so that finally in 1974 and 1975 combined about 80% of all cases were due to Group A. The A:C serogroup ratio varied from state to state.

A National Commission for Meningitis Control, which was set up in January 1974, established a program of meningitis surveillance and control and introduced mass immunization in 1975. This latter step was taken in the month of April, when the seasonal curve of CSM usually rises.
In São Paulo the CSM incidence dropped sharply after immunization, reaching the level observed before the catastrophic outbreaks of 1974. Although at the moment the epidemiologic situation seems to have greatly improved, it is uncertain whether it has stabilized or reached endemic levels.

CSM requires continuous surveillance and vigilance. The evolution of meningococcal disease outbreaks in Brazil -- including their epidemiologic and clinical aspects, as well as other features of the disease and its control -- have been discussed in detail; information on this subject is presented in summary form in Annex 1.

3. **SURVEILLANCE**

3.1 **Epidemiologic Surveillance**

Epidemiologic surveillance has only been instituted in Brazil after large outbreaks occurred and after the need for it became evident. Some other countries have not yet established such surveillance, and therefore may not be in a position to detect epidemic trends of the disease in a timely manner, a situation which could result in loss of precious time and failure to institute appropriate control measures early. However, some countries have communicable disease surveillance systems which are well equipped with telecommunications, radio and laboratory facilities, and which could incorporate surveillance of cerebrospinal meningitis into their program without too much difficulty.

Surveillance should always include elements of epidemiologic investigations aimed at providing data useful for control of the disease. For control of meningococcal disease, it is essential to obtain information on high-risk groups in order to concentrate on their protection.

Surveillance of meningococcal disease must include surveillance of all other types of meningitis. It therefore requires investigations and laboratory tests in addition to those aimed at identification of *N. meningitidis*. Professional staff members are clearly best-qualified to conduct surveillance; nevertheless, in view of their scarcity, a well-informed and properly motivated general public could greatly facilitate the task of early case detection.

The experience gained in Brazil during critical moments of the last epidemic point out the need to keep the public continually informed in order to obtain its collaboration - both in surveillance and in control of the disease - and to avoid untoward effects, brought on by such actions as indiscriminate public use of antibiotics and other drugs, especially when the prevalent strains of *N. meningitidis* are resistant to some of them. Surveillance should be organized and carried out so as to be of direct assistance in formulation and execution of the
control programs. Besides monitoring disease incidence and the drug resistance of meningococci, it can also be helpful in evaluating the effectiveness of such control program measures as immunization and chemoprophylaxis.

3.2 Laboratory Investigations

Surveillance greatly depends on the availability of laboratory support; this is especially true during periods of low incidence, when neither the medical profession nor the public are conscious of the disease and when cases may not be reported to the hospital or may possibly be misdiagnosed.

While every health service should perform gram stains on clinical material and seek to isolate N. meningitidis from suspected CSM cases, laboratory investigation of such cases requires maximum speed and should not delay initiation of treatment.

Mueller-Hinton Agar containing 3-5% defibrinated sheep blood should be inoculated immediately with blood and/or cerebrospinal fluid and incubated in a moist candle jar at 37°C (15% CO₂) for 12-17 hours. (Prewarmed media may result in growth within 5-6 hrs). Colony clones should be selected for gram stain, oxidase reaction, and acid production in sugar (glucose, maltose, and sucrose).

Adequate growth should be removed for agglutination tests and for plating on Mueller-Hinton Agar for antibiograms. Spinal fluids from which no Neisseria are isolated should be subjected to counterimmunoelectrophoresis in order to determine whether or not meningococcal polysaccharides are present.

There are occasions when the serologic detection of meningococcal antibodies in sera from patients and vaccinees is of assistance in bacteriologically negative cases. In patients a crude antigen could be used in the passive hemagglutination test, whereas in vaccinees it is preferable to use the purified polysaccharide which was used in immunization. When the necessary personnel and equipment are available, the Radiimmune Antibody Assay technique is more sensitive and quantitative than hemagglutination for evaluation of response to polysaccharide vaccine. When bacteriologic diagnosis of suspected cases, isolation and serogrouping of N. meningitidis, and drug resistance testing are not possible, and in situations where facilities are not available, simple gram staining could be of considerable assistance. Also, if a bacteriologic laboratory is not available, counterimmunoelectrophoresis carried out on cerebrospinal fluid could substitute with a great deal of accuracy for isolation of N. meningitidis.
3.3 Reference Activities

Establishment of a network of laboratories and reference centers should constitute part of the surveillance system program. These laboratories should include facilities for isolation, grouping, and drug resistance testing of meningococci.

WHO can provide assistance (namely, grouping sera and reference strains) through its collaborating laboratories, especially the Neisseria Repository of the University of California School of Public Health at Berkeley (USA), and the WHO International Reference Center for Meningococci, Service de Santé des Armées, Parc du Pharo, 13.998 Marseille, France. Facilities also exist at WHO collaborating centers on bacterial vaccines for testing the quality and safety of polysaccharide vaccines which may have been exposed to adverse conditions.

4. DIAGNOSIS AND TREATMENT

4.1. Clinical Diagnosis

Since each case of meningococcal disease represents a true medical emergency, it is urgent that the diagnosis be made rapidly in order for proper treatment to be instituted. During an epidemic, clinical diagnosis may be relatively simple; it is the sporadic case which is apt to present a problem.

The disease may take the following clinical forms: (a) bacteremic (with or without a mild, rubella-like, maculopapular rash); (b) septicemic; (c) meningitic. The rash of the last two is petechial, often with considerable infarction of the skin. There may be shock, with disseminated intravascular coagulation, arthritis, pneumonia, myocarditis, etc. Headache, nausea and vomiting are indicative of meningitis. Occasional cases of conjunctivitis and arthritis may be encountered, especially during an epidemic. But any petechial rash should be considered a manifestation of meningococcal disease until proven otherwise. Blood and spinal fluid cultures and blood counts should be obtained, if possible, before treatment.

Smears of spinal fluid and petechial smears examined by gram stain can serve as useful diagnostic aids.

4.2. Treatment

Treatment of any patient with rash should be instituted less than an hour after the patient is seen. Penicillin or ampicillin are the preferred drugs for treatment. Patients allergic to the penicillins must be treated with
chloramphenicol. When it is known that organisms sensitive to sulfadiazine are predominant causes of disease in the area, this drug may be considered for treatment. The cephalosporins must not be used for the treatment of meningococcal disease.

Drugs should be administered by the intravenous route (20,000,000 units of penicillin per day for adults and proportionally less for children). The ampicillin dose for adults is 10-12 grams per day and at least 150 mgs/kg/day for children. Treatment should be continued until the patient has been afebrile for four days and should then be stopped abruptly. Benzathine penicillin must not be used for either treatment or prophylaxis. Patients in shock require central venous monitoring and general support procedures. Steroids are of questionable value; in addition, they (and vasopressors as well) may accentuate the adverse effects of endotoxin.

5. CONTROL AND PREVENTION

Prevention and control of CSM became possible with the discovery of the sulfonamides. New possibilities for control became available with development of polysaccharide vaccines against serogroups A and C.

5.1. Immunization

Group-specific polysaccharide vaccines from N. meningitidis Groups A and C are currently available. Group C vaccine has been shown effective in U.S. Army recruits and in children over two years old, but not in children below that age. Group A vaccine has been effective in several trials and is currently being evaluated in young infants. Studies are in progress on a vaccine for Group B meningococcal meningitis, and presumptive evidence has been presented which indicates that the type 2 protein antigen may be a vaccine candidate.

Group A and C vaccines are currently licensed in several countries. These vaccines are controlled for quality by physico-chemical methods and for toxicity by the rabbit pyrogen tests. The vaccines are currently being produced in several countries and others are at the point of initiating production. Production and quality control methods can be found in the Annex to the report of the WHO Study Group on Cerebrospinal Meningitis (Study Group on Cerebrospinal Meningitis Control, WHO Technical Report Series, 1976, Geneva, in press); and the requirements can be found in the Annex to the Report of the WHO Expert Committee on Biological Standardization (Expert Committee on Biological Standardization, WHO Technical Report Series, 1976, Geneva, in press).

There is some evidence that immunization during an epidemic may prevent disease in a major proportion of the expected patients and reduce the severity of disease in the remainder.
It is not possible at the present time to predict when and where an epidemic of meningococcal meningitis will occur. Therefore it is not clear when and where preventive immunization should be carried out. It has been suggested that increased incidence of meningococcal disease among certain age groups and socioeconomic sectors, in addition to the presence of "virulent" strains, may be useful parameters for prediction of an impending epidemic. Such early epidemiologic identification of an epidemic would provide an optimal situation for use of the vaccines. Routine use of vaccine in the population at risk is a debatable practice and is not recommended at the present time with currently available vaccines. The critical limitation is lack of information on vaccine effectiveness in very young children following one injection of polysaccharide A and C vaccine. Besides investigating this matter through further epidemiologic studies, it has been suggested that the effectiveness problem might be overcome by coupling the polysaccharide to a carrier protein of a still undetermined nature.

5.2. Chemoprophylaxis

In the absence of other effective control measures, sulfonamide prophylaxis was widely used in the past. With the development of vaccines and the widespread emergence of sulfonamide resistance, the use of chemoprophylaxis should be reassessed. Rifampin and minocycline are two other drugs effective in eradicating meningococci from the nasopharynx. The mass use of one of these agents in a closed population, such as an army unit, to halt an epidemic caused by a sensitive strain may still be helpful. Such use in open civilian populations is likely to be ineffective, however, because of the rapid reintroduction of the infecting strain.

Chemoprophylaxis of case contacts in households and in closed communities has reduced the secondary attack rate of meningococcal disease in these groups. Factors that should be considered in choosing the proper chemoprophylactic agent for family contacts are discussed in section 5.4.1.

In view of the costs, possible untoward effects of some drugs, and inconveniences involved in mass prophylaxis, it is important to weigh the possible benefits against the risks and costs.

5.3. Non-specific Control Measures

5.3.1. Isolation

Respiratory isolation of meningococcal disease patients from other patients and from the hospital staff is generally practiced, but the value of this measure has not been proven. A few hours after starting adequate therapy, nasopharyngeal cultures no longer yield meningococci. When isolation was not practiced at the Emilio
Ribas Hospital in 1971-1975, four cases of meningococcal disease occurred among about 500 hospital staff members (0.8%), while among the general São Paulo population the attack rate in those years was 0.3%. This observation and anecdotal information from other sources indicates that the risk of nosocomial meningococcal disease is small, but prudence suggests that for the first 24 hours of therapy the patient with meningococcal disease should be placed in respiratory isolation.

5.3.2. Housing sanitation

It has been shown that populations belonging to lower economic classes which are exposed to overcrowding, poor housing, and poor environmental sanitation, and which have low levels of personal hygiene, are the populations most affected. Improvement of living conditions, housing and personal hygiene - which should be coupled with general education and health education - would certainly be beneficial, although the effectiveness of such improvement has not been definitively assessed in quantitative terms.

5.4. STRATEGY FOR CONTROL

The strategy for control of the disease should differ as the endemic or epidemic situation changes. However, various studies and observations suggest some general principles. Surveillance of the incidence of meningococcal cases, and of the serogroups and sulfonamide sensitivity of disease-causing strains, is required for the recognition of outbreaks, the planning of control measures, and the measurement of these measures' impact. Epidemics characteristically are associated with a shift in the patient age distribution toward older children and adults, and away from infants. Also, serotype II is often associated with Group B and C epidemics. Therefore, monitoring the age distribution of cases and the serotypes of case isolates may prove useful as part of a surveillance program.

5.4.1. Epidemic situation

Polysaccharide vaccines have been used successfully to control meningococcal epidemics caused by serogroups A and C in civilian and military populations of Brazil, Finland, the United States, and other places.

Serogroup A vaccine is effective in infants one year of age and over. Serogroup C vaccine is effective in children over 2 years of age. The safety and general effectiveness of the vaccines make them the most important control measure for serogroup A and/or C epidemics.
Secondary cases occur in 1.4-4.8% of household contacts of meningococcal cases in epidemics, so chemoprophylaxis of household contacts may be of modest importance in controlling outbreaks caused by all serogroups. School and hospital contacts of cases are at little or no increased risk of disease.

Three drugs eradicate meningococci from the nasopharynx and may be useful for chemoprophylaxis: sulfonamides, minocycline and rifampin. Sulfonamides are 96% effective in eradicating sulfonamide-sensitive strains and have been shown in military camps to provide effective chemoprophylaxis against such strains. Minocycline and rifampin are 85-90% effective in eradicating strains from the nasopharynx. Resistant strains develop in some 10% of the carriers given rifampin, and (depending on the prevalence of active tuberculosis in the population receiving prophylaxis) there may be a small theoretical risk of selecting for rifampin-resistant *Mycobacterium tuberculosis*. Minocycline causes vestibular side-effects in about one-third of the persons receiving the drug, but it may be preferred for chemoprophylaxis of sulfonamid-resistant meningococci in populations with a significant risk of making indiscriminate use of rifampin and with a high prevalence of active tuberculosis.

One-half of all secondary cases in families occur five or more days after the index case. This interval may permit vaccination, as well as chemoprophylaxis, to be useful if given to contacts of meningococcal cases caused by serogroups A or C.

### 5.4.2. Endemic situation

The use of vaccination against the endemic disease when prevalence is relatively high should depend on careful consideration of epidemiologic and other factors. The secondary case-rate in family contacts approximates 0.4% in the endemic situation. Chemoprophylaxis with sulfonamides (against sulfonamide-sensitive strains), minocycline, or rifampin reduces the risk considerably. Untoward side-effects and other consequences of the chemoprophylactic agents are similar to those experienced in the epidemic situation.
6. ECONOMIC ASPECTS OF MENINGITIS AND ITS CONTROL

6.1 Disease and Treatment Costs

The cost of the disease and its treatment varies from country to country, depending on the methods of treatment used, standards of medical care, and other factors. It is of course desirable to treat patients in hospitals where high standards of both patient care and medication may be available.

6.2 Cost of Preventive Measures

This perhaps varies less than the cost of treatment, but numerous factors will still come into play. For example, the cost of vaccination will be affected by such things as the distances involved, transport costs, public participation rates, volunteering of services, etc. There are various ways to decrease costs through improved use of resources, and these should always be explored.

6.3 Benefits of Preventive Measures

The benefits of effective preventive measures are multiple. Besides direct health benefits occasioned by preventing cases, there are other benefits such as prevention of the adverse economic effect on international tourism and trade that occurs during a meningitis outbreak.

Although the economic ramifications of an epidemic are difficult to measure, it is important to consider them when justifying a request for the resources which are needed to control the disease.

6.4 Cost-Effectiveness and Cost-Benefit Analysis

This is useful for planning control programs which will be both effective and economically sound. Such analysis is helpful in achieving the best results with the least expenditure.

A study that was carried out in Brazil using simple methods of cost-benefit analysis developed evidence that besides being effective, prevention of epidemic meningococcal disease by vaccination was also economically beneficial. Because the balance between costs and benefits varies with changes in meningitis incidence, treatment costs, prevention expenditures and other factors, regular review of the costs and benefits of control programs is desirable.

Besides simple cost-benefit evaluation methods, there are more complex methods (such as use of epidemiologic-mathematical models) which permit long-term projection and critical examination of both the costs and the benefits of various alternative control programs.
While economic benefit should not be the sole consideration in making decisions about control programs, economic aspects of the disease and its control must not be neglected, and all efforts should be made to see that the best possible results are obtained at the least possible expense.

7. **NEED FOR FURTHER STUDIES AND RESEARCH**

7.1 **Stability**

The stability of both meningococcal polysaccharide vaccines remains a problem, particularly with regard to Group A vaccine. The practical problems of vaccine transport to the field or peripheral centers and of vaccine storage requires that further studies be conducted on this subject of vaccine stability.

7.2 **Group B Vaccine**

This vaccine needs to be developed, because outbreaks due to this serogroup do occur. It is therefore recommended that further studies in this direction be promoted.

7.3 **Grouping and Typing of N. meningitidis**

The necessity of accurately identifying the particular N. meningitidis serogroup found in the population, both during an epidemic and on a routine basis, is obvious.

Serogrouping is routinely accomplished by the agglutination technique. The precipitation technique, in which antibodies adhere to the specific soluble substance of the meningococcus, is currently being studied. The method requires larger amounts of antiserum than agglutination, but it is simple and easy to perform.

Evidence has been presented that meningococci of serogroups B, C, and Y contain a protein antigen in the outer cell wall which may be associated with strains that cause outbreaks. The particular subgroup, termed type 2, is one of 10 types previously identified with Group B organisms.

This recent work indicates that not only will the meningococci eventually be serogrouped, but that they may also be typed to indicate virulent strains.

7.4 **Revaccination with Polysaccharide Vaccines**

This matter has not yet been studied to such an extent that clear guidance could be provided for following optimum immunization schemes in public health practice. Serologic and other studies should be promoted in order to solve this important practical problem.
7.5 **Housing and Sanitary Conditions**

It has been reported that these are important factors determining the incidence of disease. Studies are indicated to elucidate the role of crowding, poor ventilation, and the presence of large numbers of airborne bacteria of the respiratory tract in affecting disease rates. The extent to which improvement of housing and air hygiene might be effective in controlling meningococcal meningitis should also be studied.

8. **RECOMMENDATIONS**

8.1 **International Cooperation in Surveillance and in Reference Activities** should be promoted in order to facilitate exchange of information and detection and control of outbreaks. PAHO/WHO reference centers and collaborating laboratories should assist national laboratories by making grouping sera and reagents available upon request.

8.2 **Training of Health Workers** in methods of control and prevention of the disease, including diagnostic techniques and the handling of vaccines, needs to be promoted in order to make Member States self-sufficient in combating meningococcal disease.

8.3 **National Programs** should be developed for emergency action in the case of outbreaks, as well as for dealing with endemic situations. Due attention should be given to defining policies so as to ensure the most effective use of control measures:

8.3.1 **Surveillance.** A nationwide coordinated system for surveillance of meningococcal disease cases, sulfonamide-sensitivity, and serogroup identity of all the isolates from cases is necessary for adequate control. A clear definition of a case of meningococcal disease is required, but this definition will depend on the diagnostic facilities available.

In rural areas, a clinical diagnosis together with a finding of gram-negative diplococci in the cerebrospinal fluid may suffice. In urban centers, isolation of *N. meningitidis* from the blood or spinal fluid should be sought. The reporting of cases from the local to the district level should be sufficiently frequent. Clusters of cases should be investigated promptly and appropriate control measures instituted without delay.

Rapid reporting of cases at the local level is required in order to implement appropriate prevention and control activities. The establishment of at least one reference laboratory in each country, together with an adequate
system for the shipment of specimens, is necessary for characterization of the etiologic agent of cerebrospinal meningitis.

8.3.2 Chemoprophylaxis. This should be carried out as early as possible among close contacts of meningococcal disease cases in households and selected closed communities, except among persons who have previously been immunized adequately against the serogroup causing the disease. Sulfonamides are to be preferred if the infecting strain is known to be sensitive, or if the prevalence of sulfonamide resistance in the region is less than 10 per cent.

In other circumstances, rifampin is usually the drug of choice. Preference may be given to minocycline in populations with high rates of active tuberculosis if there is an indiscriminate use of rifampin, in view of the fact that this drug is recommended for the contacts of tuberculosis cases in some countries. Chemoprophylaxis is not indicated for less intimate contacts of meningococcal cases, such as contacts at school, at work, or in the hospital, except for the rare person who has been in direct contact with the oral secretions of the patient. PAHO/WHO should promote the development of chemoprophylactic agents that are safe, efficacious, and inexpensive.

8.3.3 Use of vaccine. In epidemics caused by serogroups A or C, vaccine should be administered for control purposes. In large outbreaks, the initial vaccination campaign should include all persons in the affected region except for children under six months of age. In small outbreaks, the surveillance system should be used to identify the group experiencing significantly increased risk, and that group should be vaccinated (with the exception of infants, as stated above). If the epidemic continues despite the initial vaccination campaign, provision should be made to give reinforcing doses of vaccine against the appropriate serogroup(s) to the population groups shown by the surveillance system to be at high risk, and to immunize persons missed in the initial campaign. In epidemic situations the household contacts of cases should be immunized if they have not previously received vaccine. This latter measure may also be of value in endemic situations. The use of routine vaccination in areas with a relatively high endemic level will depend on careful consideration of epidemiologic and other factors. When cases of *N. meningitidis* caused by a serogroup for which there is a vaccine appear with significantly increased frequency over a period of time, vaccination should be undertaken immediately.
8.3.4 Carrier surveys. Surveys of populations for nasopharyngeal carriage of meningococci are not generally helpful for predicting meningococcal outbreaks, identifying persons who should receive chemoprophylaxis, or controlling epidemic disease. Such surveys are not essential for disease control.

8.4 Regional and National Research Programs aimed at solving meningococcal disease problems of regional and worldwide importance should be expanded, and should be initiated where none already exist. To this end, closer contact should be established between the personnel of national laboratories and PAHO/WHO collaborating laboratories. In addition to applied studies on the pathogenesis and mechanisms of meningococcal disease immunity and the development of vaccines, a long-range program of basic research in the Americas needs to be established. The goal of these efforts should be the control of all causes of bacterial meningitis.

8.5 Information on meningococcal disease and its control should be made available to the medical profession in order to obtain its effective cooperation. In addition, it is recommended that information be provided to the public through health education campaigns, in order to obtain support for the control program and increase its chances of success.

8.6 Other Recommendations. It is strongly recommended that PAHO make arrangements for a regional program for meningitis control, including expert advice, dissemination of information, and assistance in the immediate acquisition of vaccines and selected antimicrobial agents in cases of emergency.

It is also recommended that PAHO/WHO establish a regular system for reporting the incidence of meningococcal disease in the Americas, in a form similar to the monthly surveillance bulletins published by the Organization on other selected diseases.

These recommendations and the report of the meeting should be placed on the agenda for discussion by the appropriate PAHO advisory and governing bodies in order that they may consider how best to promote studies and research on this disease and its control.
REFERENCES

1. Epidemiological Surveillance and Control in Epidemics of Meningococcal Diseases
   PAHO, Washington, D.C., 1975

2. Study Group on Cerebrospinal Meningitis Control Report
   Technical Reports Series (impress)
   WHO, Geneva, 1976

3. Export Committee on Biological Standardization
   Technical Reports Series (impress)
   WHO, Geneva, 1976


### TABLE 1

REPORTED CASES OF CEREBROSPINAL MENINGITIS, 1966-1974

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AFRICA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algeria</td>
<td>-</td>
<td>-</td>
<td>1330</td>
<td>1356</td>
<td>1939</td>
<td>1657</td>
<td>1739</td>
<td>1257</td>
<td>996</td>
</tr>
<tr>
<td>Angola</td>
<td>95</td>
<td>83</td>
<td>107</td>
<td>104</td>
<td>147</td>
<td>215</td>
<td>133</td>
<td>132</td>
<td>138</td>
</tr>
<tr>
<td>Cameroon,</td>
<td>395</td>
<td>1708</td>
<td>532</td>
<td>248</td>
<td>264</td>
<td>114</td>
<td>3071</td>
<td>2171</td>
<td>26</td>
</tr>
<tr>
<td>United Republic Chad</td>
<td>-</td>
<td>657</td>
<td>785</td>
<td>287</td>
<td>3721</td>
<td>927</td>
<td>4866</td>
<td>1927</td>
<td>2289</td>
</tr>
<tr>
<td>Dahomey</td>
<td>414</td>
<td>847</td>
<td>1222</td>
<td>1767</td>
<td>1366</td>
<td>892</td>
<td>430</td>
<td>374</td>
<td></td>
</tr>
<tr>
<td>Gabon</td>
<td>34</td>
<td>31</td>
<td>42</td>
<td>30</td>
<td>13</td>
<td>51</td>
<td>64</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Gambia</td>
<td>85</td>
<td>668</td>
<td>154</td>
<td>73</td>
<td>52</td>
<td>60</td>
<td>31</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td>122</td>
<td>79</td>
<td>27</td>
<td>28</td>
<td>415</td>
<td>629</td>
<td>912</td>
<td>603</td>
<td>834</td>
</tr>
<tr>
<td>Guinea</td>
<td>71</td>
<td>173</td>
<td>26</td>
<td>77</td>
<td>24</td>
<td>179</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ivory Coast</td>
<td>216</td>
<td>341</td>
<td>275</td>
<td>341</td>
<td>81</td>
<td>86</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mali</td>
<td>329</td>
<td>276</td>
<td>752</td>
<td>13228</td>
<td>4573</td>
<td>1706</td>
<td>628</td>
<td>1005</td>
<td>416</td>
</tr>
<tr>
<td>Morocco</td>
<td>6336</td>
<td>1876</td>
<td>945</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mozambique</td>
<td>30</td>
<td>33</td>
<td>93</td>
<td>139</td>
<td>89</td>
<td>75</td>
<td>108</td>
<td>83</td>
<td>43</td>
</tr>
<tr>
<td>Niger</td>
<td>947</td>
<td>453</td>
<td>2231</td>
<td>3074</td>
<td>9907</td>
<td>3793</td>
<td>2233</td>
<td>408</td>
<td>1</td>
</tr>
<tr>
<td>Nigeria</td>
<td>5799</td>
<td>2116</td>
<td>1879</td>
<td>4291</td>
<td>9712</td>
<td>7897</td>
<td>5095</td>
<td>1717</td>
<td></td>
</tr>
<tr>
<td>Rwanda</td>
<td>56</td>
<td>36</td>
<td>30</td>
<td>41</td>
<td>15</td>
<td>75</td>
<td>55</td>
<td>59</td>
<td>41</td>
</tr>
<tr>
<td>Senegal</td>
<td>351</td>
<td>1655</td>
<td>1477</td>
<td>1363</td>
<td>2624</td>
<td>1323</td>
<td>1131</td>
<td>368</td>
<td>445</td>
</tr>
<tr>
<td>South Africa</td>
<td>1994</td>
<td>2135</td>
<td>1934</td>
<td>1490</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sudan</td>
<td>6607</td>
<td>5662</td>
<td>2774</td>
<td>4339</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>211</td>
<td>316</td>
<td>254</td>
<td>264</td>
<td>391</td>
<td>234</td>
<td>134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Togo</td>
<td>123</td>
<td>199</td>
<td>145</td>
<td>112</td>
<td>87</td>
<td>526</td>
<td>524</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tunisia</td>
<td>96</td>
<td>215</td>
<td>167</td>
<td>162</td>
<td>480</td>
<td>536</td>
<td>657</td>
<td>376</td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>51</td>
<td>41</td>
<td>46</td>
<td>32</td>
<td>24</td>
<td>16</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Volta</td>
<td>1254</td>
<td>1075</td>
<td>962</td>
<td>3045</td>
<td>19960</td>
<td>5561</td>
<td>2921</td>
<td>2301</td>
<td>1293</td>
</tr>
<tr>
<td><strong>EUROPE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>182</td>
<td>146</td>
<td>124</td>
<td>103</td>
<td>128</td>
<td>126</td>
<td>97</td>
<td>81</td>
<td>93</td>
</tr>
<tr>
<td>Belgium</td>
<td>41</td>
<td>50</td>
<td>39</td>
<td>131</td>
<td>352</td>
<td>518</td>
<td>519</td>
<td>418</td>
<td>228</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>77</td>
<td>76</td>
<td>67</td>
<td>79</td>
<td>75</td>
<td>46</td>
<td>52</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>136</td>
<td>111</td>
<td>255</td>
<td>646</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>614</td>
<td>516</td>
<td>782</td>
<td>910</td>
<td>1105</td>
<td>1360</td>
<td>1440</td>
<td>1542</td>
<td>1073</td>
</tr>
<tr>
<td><strong>Germany, Fed. Republic</strong></td>
<td>1285</td>
<td>1331</td>
<td>1070</td>
<td>1151</td>
<td>1800</td>
<td>1683</td>
<td>1577</td>
<td>1400</td>
<td>1112</td>
</tr>
<tr>
<td>Greece</td>
<td>198</td>
<td>374</td>
<td>1075</td>
<td>540</td>
<td>639</td>
<td>383</td>
<td>482</td>
<td>765</td>
<td>313</td>
</tr>
<tr>
<td>Hungary</td>
<td>99</td>
<td>91</td>
<td>84</td>
<td>82</td>
<td>95</td>
<td>69</td>
<td>73</td>
<td>65</td>
<td>63</td>
</tr>
<tr>
<td>Ireland</td>
<td>17</td>
<td>19</td>
<td>22</td>
<td>17</td>
<td>17</td>
<td>22</td>
<td>29</td>
<td>29</td>
<td>40</td>
</tr>
<tr>
<td>Italy</td>
<td>943</td>
<td>1604</td>
<td>2714</td>
<td>2412</td>
<td>2912</td>
<td>2971</td>
<td>1567</td>
<td>1243</td>
<td>790</td>
</tr>
<tr>
<td>------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Netherlands</td>
<td>516</td>
<td>303</td>
<td>253</td>
<td>211</td>
<td>183</td>
<td>202</td>
<td>248</td>
<td>171</td>
<td>162</td>
</tr>
<tr>
<td>Norway</td>
<td>41</td>
<td>54</td>
<td>63</td>
<td>92</td>
<td>104</td>
<td>73</td>
<td>82</td>
<td>112</td>
<td>167</td>
</tr>
<tr>
<td>Poland</td>
<td>915</td>
<td>951</td>
<td>1102</td>
<td>1163</td>
<td>246</td>
<td>202</td>
<td>228</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>346</td>
<td>301</td>
<td>253</td>
<td>196</td>
<td>525</td>
<td>734</td>
<td>663</td>
<td>709</td>
<td>348</td>
</tr>
<tr>
<td>Spain</td>
<td>675</td>
<td>766</td>
<td>857</td>
<td>753</td>
<td>1510</td>
<td>3661</td>
<td>2651</td>
<td>2244</td>
<td>2089</td>
</tr>
<tr>
<td>Sweden</td>
<td>164</td>
<td>106</td>
<td>118</td>
<td>107</td>
<td>98</td>
<td>107</td>
<td>92</td>
<td>99</td>
<td>160</td>
</tr>
<tr>
<td>Switzerland</td>
<td>104</td>
<td>62</td>
<td>67</td>
<td>96</td>
<td>139</td>
<td>148</td>
<td>142</td>
<td>107</td>
<td>113</td>
</tr>
<tr>
<td>United Kingdom:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>England &amp; Wales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>51</td>
<td>30</td>
<td></td>
<td></td>
<td>211</td>
<td>266</td>
<td>155</td>
<td>258</td>
<td>249</td>
</tr>
<tr>
<td>Scotland</td>
<td>137</td>
<td>101</td>
<td>141</td>
<td>109</td>
<td>108</td>
<td>168</td>
<td>116</td>
<td>122</td>
<td>216</td>
</tr>
<tr>
<td>Yugoslavia</td>
<td>1078</td>
<td>1497</td>
<td>1367</td>
<td>1733</td>
<td>2608</td>
<td>2387</td>
<td>1727</td>
<td>1541</td>
<td>1196</td>
</tr>
<tr>
<td><strong>AMERICAS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>85</td>
<td>108</td>
<td>94</td>
<td>153</td>
<td>205</td>
<td>209</td>
<td>361</td>
<td>436</td>
<td>352</td>
</tr>
<tr>
<td>Chile</td>
<td>171</td>
<td>99</td>
<td>134</td>
<td>58</td>
<td>91</td>
<td>92</td>
<td>80</td>
<td>48</td>
<td>35</td>
</tr>
<tr>
<td>Colombia</td>
<td>273</td>
<td>254</td>
<td>327</td>
<td>311</td>
<td>360</td>
<td>315</td>
<td>402</td>
<td>322</td>
<td>276</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>7</td>
<td>10</td>
<td>5</td>
<td>9</td>
<td>13</td>
<td>120</td>
<td>32</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>Cuba</td>
<td>15</td>
<td>23</td>
<td>15</td>
<td>37</td>
<td>40</td>
<td>38</td>
<td>27</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Haiti</td>
<td>94</td>
<td>162</td>
<td>3616</td>
<td>110</td>
<td>70</td>
<td>31</td>
<td>26</td>
<td>56</td>
<td>9</td>
</tr>
<tr>
<td>Peru</td>
<td>103</td>
<td>72</td>
<td>50</td>
<td>70</td>
<td>101</td>
<td>89</td>
<td>60</td>
<td>68</td>
<td>185</td>
</tr>
<tr>
<td>USA</td>
<td>3373</td>
<td>2166</td>
<td>2516</td>
<td>2951</td>
<td>2505</td>
<td>2176</td>
<td>1323</td>
<td>1355</td>
<td>1327</td>
</tr>
<tr>
<td><strong>ASIA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hong Kong</td>
<td>10</td>
<td>57</td>
<td>32</td>
<td>23</td>
<td>10</td>
<td>5</td>
<td>10</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Iran</td>
<td></td>
<td>5977</td>
<td>3585</td>
<td>285</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>165</td>
</tr>
<tr>
<td>Iraq</td>
<td>1206</td>
<td>1177</td>
<td>1087</td>
<td>925</td>
<td>643</td>
<td>487</td>
<td>1005</td>
<td>1345</td>
<td></td>
</tr>
<tr>
<td>Israel</td>
<td>47</td>
<td>41</td>
<td>64</td>
<td>28</td>
<td>45</td>
<td>21</td>
<td>33</td>
<td>41</td>
<td>32</td>
</tr>
<tr>
<td>Japan</td>
<td>145</td>
<td>117</td>
<td>122</td>
<td>93</td>
<td>72</td>
<td>50</td>
<td>58</td>
<td>45</td>
<td>25</td>
</tr>
<tr>
<td>Jordan</td>
<td>275</td>
<td>212</td>
<td>104</td>
<td>80</td>
<td>73</td>
<td>129</td>
<td>159</td>
<td>297</td>
<td></td>
</tr>
<tr>
<td>Lebanon</td>
<td>146</td>
<td>196</td>
<td>132</td>
<td>85</td>
<td>69</td>
<td>62</td>
<td>48</td>
<td>39</td>
<td>52</td>
</tr>
<tr>
<td>Philippines</td>
<td>762</td>
<td>816</td>
<td>840</td>
<td>1212</td>
<td></td>
<td></td>
<td>1031</td>
<td>1092</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>412</td>
<td>268</td>
<td>388</td>
<td>336</td>
<td>331</td>
<td>263</td>
<td>716</td>
<td>3178</td>
<td>3923</td>
</tr>
</tbody>
</table>
FIGURE 1

REPORTED CASES OF MENINGOCOCCAL INFECTIONS IN SELECTED COUNTRIES IN THE AMERICAS 1965-1975
LIST OF WORKING PAPERS

1. Cerebrospinal Meningitis in the World
   Dr. B. Cvjetanovic

2. Meningococcal Infection in the Americas
   Dr. Ruperto Huerta

3. Meningococcus Meningitis in Brazil
   Dr. Edmundo Juarez

4. Epidemic Control of Meningococcal Meningitis in Brazil
   Dr. Clovis Heitor Tigre

5. Epidemic Surveillance of Meningococcal Meningitis in Brazil
   Dr. João B. Risi Jr.

6. Doença Meningocócica - Experiência Clínica Brasileira
   Dr. Paulo Ayrosa Galvao

7. Laboratory Diagnosis of Meningococcal Meningitis Typing of *Neisseria Meningitidis* and Test of Sensitivity to Antibiotics
   Dr. Augusto de E. Taunay

8. Custo do Programa de Prevenção e Controle da Meningite Meningocócica no Brasil
   Dr. Edilberto Antezana

9. Medidas Sanitárias Gerais em Casos de Meningite Meningocócica
   Dr. David W. Fraser

10. Análise da Administração da Vacina Meningocócica no Brasil
    Dr. Joseph B. McCormick

11. Studies Carried out in Brazil concerning the Effectiveness of the Anti-Meningococcal Vaccines
    - a contribution of the Adolfo Lutz Institute
    Dr. Augusta Kiyomi Takeda


    Dr. David W. Fraser

14. Report on the Meeting on Meningococcal Meningitis
    Pan American Health Organization
15. Cerebrospinal Meningitis Control
   Report of a WHO Study Group

16. Guidelines for Release of Meningococcal Vaccine, Group A, C, and
   A and C combined Polysaccharides
   Bureau of Biologics, Food and Drug Administration

17. The Immune Response to Bacterial Polysaccharides in Man
   Emil C. Gotschlich, M.D., Irving Goldschneider, M.D.,
   Martha L. Lepow, M.D., and Ronald Gold, M.D.

18. Technical Note on the Treatment of Cerebrospinal Meningitis in
   Endemo-Epidemic Regions
   Dr. Michel Rey

19. Análise de Administração da Vacina Meningócica no Brasil
   Dr. Joseph B. McCormick

20. Campanha de Vacinação Contra a Meningite Meningócica
    Dr. Ernani Motta

21. Resultados Observados com a Campanha de Vacinação contra a
    Meningite Meningócica
    Dr. José da Silva Guedes

22. Meningite Meningócica. O Papel do Hospital Emilio Ribas
    Dr. Carlos de Oliveira Bastos
LIST OF PARTICIPANTS

ARGENTINA

Dr. Gianni Mateo Villani
Sub-Secretario de Salud Pública
Defensa 120
Buenos Aires

Dr. Rubén Bergel
Asesor Epidemiológico de la
Secretaría de Estado de Salud Pública
Defensa 120
Buenos Aires

BOLIVIA

Dr. Glicerio Rojas Caballero
Director General de Salud
Ministerio de Previsión Social y Salud Pública
La Paz

Dr. Joaquin Salcedo
Jefe Nacional de Epidemiología
Ministerio de Previsión Social y Salud Pública
La Paz

BRAZIL

Dr. Augusto E. Taunay
Director Instituto Adolfo Lutz
Av. Dr. Arnaldo 355
São Paulo, S.P.

Dr. Augusta Kiyomi Takeda
Chefe de Seção de Biologia
Instituto Adolfo Lutz
Av. Dr. Arnaldo 355
São Paulo, S.P.

Dr. Carlos de Oliveira Bastos
Diretor do Hospital Emílio Ribas
Avenida Dr. Ronaldo 165
São Paulo, S.P.

Dr. Clovis Heitor Tigre
Coordenador, Unidade de Vigilância Epidemiológica
Av. Borges de Medeiros 308-104
Porto Alegre, R.G.Sul

Dr. Carlos Eduardo Benezath Couto
Assessor Médico
Central de Medicamentos - CEME
Brasilia
Dr. Edmundo Juarez
Assessor do Ministro
Ministério da Saúde
Brasília

Dr. Ernani Guilherme Fernandes da Motta
Superintendente da SUCAM
Ministério da Saúde
Brasília

Dr. João Baptista Risi Junior
Chefe Setor de Epidemiologia
Fundação SESP
Av. Río Branco, 251 - 13º andar
Rio de Janeiro, GB

Dr. José da Silva Guedes
Assessor Sec. Saúde S. Paulo
Rua São Luiz 99 - 10º andar
Gabinete do Secretário da Saúde
Brasilia

Dr. José Vital
Médico e Secretário de Bem-Estar do INPS
Av. Nilo Peçanha, No. 31, 2º andar
Rio de Janeiro, GB

Dr. Luciano Thebano Barreto Lima
Assessor do Ministro
Ministério da Saúde
Brasília

Dr. Paulo Augusto Ayroza Galvão
Diretor do Serviço Médico
Hospital Emílio Ribas
Avenida Dr. Arnaldo, 165
São Paulo, S.P.

Dr. Vinicius Wagner
Diretor da Divisão Nacional de Epidemiologia e Estatística da Saúde
Ministério da Saúde, Bloco II - 8º andar
Brasília

Dr. Walter Leser
Secretário de Saúde do Estado de São Paulo
Rua São Luís, 99
São Paulo, S.P.
CHILE

Dr. Hermán Venturino Ponce
Médico Ayudante Sección Epidemiología
Dirección General
Servicio Nacional de Salud
Monjitas 689, 6° piso
Santiago

COLOMBIA

Dr. Hernando Groot
Director, Instituto Nacional de Salud
Avenida Eldorado, Carrera 50
Bogotá

COSTA RICA

Dr. Enrique de la Cruz
Profesor Asociado
Departamento de Microbiología
Universidad de Costa Rica
San José

ECUADOR

Dr. René Calle Cabrera
Director General de Salud
Ministerio de Salud Pública
Quito

MEXICO

Dr. Humberto Nava Contreras
Director Médico
Av. Chapultepec No. 480 - 7° piso
Mexico D.F.

Dr. Samuel Quan Kiu
Jefe del Departamento de Sanidad Internacional
Av. Chapultepec No. 480 - 7° piso
México, D.F.

PARAGUAY

Dr. Luis Scura Battilana
Director, Servicio Nacional de Epidemiología y Zoonosis
Ministerio de Salud Pública y Bienestar Social
Asunción

Dr. Rubén Matías Cáceres
Director General de Salud
Ministerio de Salud Pública
Asunción
PERU

Dr. Joaquín Roberto Cornejo-Ubillos
Director Superior
Ministerio de Salud
Lima

URUGUAY

Dr. Leonel Pérez Moreira
Director, Departamento de Epidemiología
Ministerio de Salud Pública
Montevideo

Dr. Orestes Vidovich
Director General de Salud
Ministerio de Salud Pública
Montevideo

VENEZUELA

Dr. Eriberto Echezuria
Jefe, División Epidemiología
Ministerio de Sanidad y Asistencia Social
Caracas

CONSULTANTS

Dr. David W. Fraser
Chief, Special Pathogens Branch
Bureau of Epidemiology
Center for Disease Control
Atlanta, Georgia, USA

Dr. Emil C. Gotschlich
Professor
The Rockefeller University
New York, N.Y. 10021, USA

Dr. Harry A. Feldman
Chairman Dept. of Preventive Medicine
State University of New York
Upstate Medical Center
Syracuse, N.Y., USA

Dr. Joseph McCormick
Bureau of Epidemiology
Center for Disease Control
Atlanta, Georgia, USA
Dr. John Robbins
Director, Division of Bacterial Products
Bureau of Biologics
Food and Drug Administration
Rockville, Maryland, USA

Dr. Neylan Vedros
Professor of Medical Microbiology and Immunology
School of Public Health
University of California
Berkeley, California 94720, USA

WORLD HEALTH ORGANIZATION

Dr. B. Cvjetanovic
Chief Medical Officer
Bacterial Diseases

PAN AMERICAN HEALTH ORGANIZATION

Dr. Edilberto Antezana
Epidemiologist

Dr. Federico Bresani
Chefe, Zone V

Dr. Louis Greenberg
Regional Advisor on Biologic Production and Control

Dr. Ruperto Huerta
Asesor Regional en Enfermedades Bacterianas

Dr. Cesar Mendizábal Morris
Epidemiologist

Dr. Karl A. Western
Chief, Department of Communicable Diseases