

WORLD HEALTH
ORGANIZATION

ORGANISATION MONDIALE
DE LA SANTÉ

INDEXED

IQ/WP/69.6

ENGLISH ONLY

COMMITTEE ON INTERNATIONAL QUARANTINE

Geneva, 10-15 March 1969



THE WHO SURVEILLANCE PROGRAMME

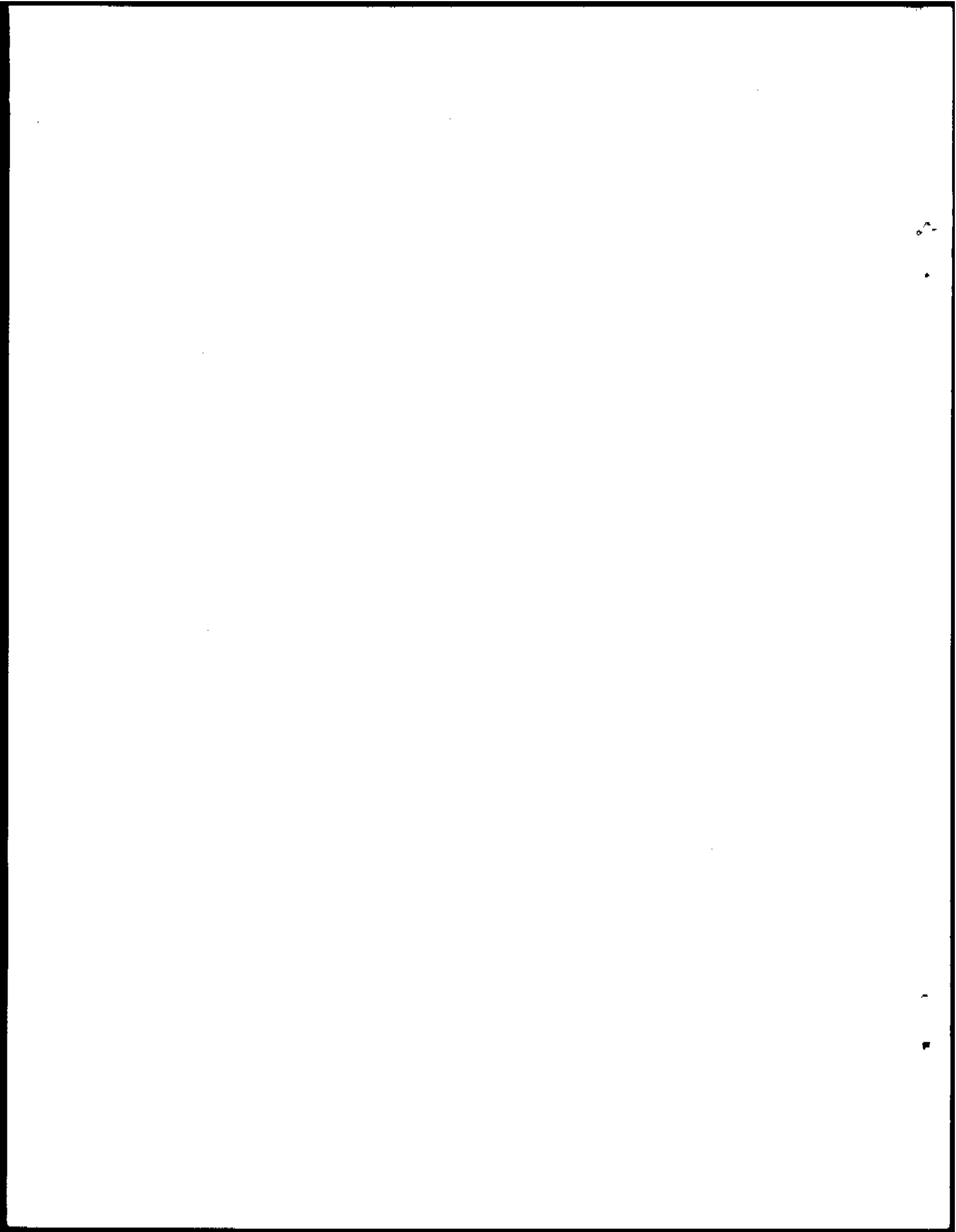
by

K. Raska, M.D., D.Sc.

Director, Division of Communicable Diseases

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The International Health Regulations are intended to ensure the maximum security against the international spread of disease with the minimum interference of world traffic. Past experience has shown that these Regulations do not constitute a sufficient deterrent against the introduction of the diseases under the Regulations into any given country. Efficient national health services therefore will always be of primary importance in the protection of populations against these diseases. Of all the elements that constitute a good health service, that of "epidemiological surveillance" is the most important in this connexion.

Epidemiological surveillance is a prerequisite to modern, effective control and prevention of communicable diseases. It means the epidemiological study of a disease as a dynamic process involving the ecology of the infectious agent, the host, the reservoirs, the vectors and the environment, as well as the complex mechanisms concerned in the spread of infection and the extent to which this spread occurs.¹ This implies following up specific diseases, or rather, infections, in terms of morbidity and mortality in time and place, and keeping track of the circulation of the etiological agent in man and, where certain diseases are concerned, in animal populations. This involves all kinds of laboratory investigations such as isolation, identification and typing of etiological agents (serological, phage typing), investigations of the biological properties of etiological agents (i.e. changes in antigenic structure, resistance to drugs, etc.), and different serological studies of individual cases or population samples (immunological surveys).

In diseases with natural foci of infection (tularemia, plague, Q fever, rabies, arbovirus infections, etc.), it is important to study the conditions which favour the spread of infection, e.g., over-multiplication of animal reservoirs or of vectors, as well as their biological properties (resistance to infection in the reservoirs or to insecticides in the vectors).

Attention should also be paid to any other factors which may influence the spread of infection and the incidence of disease, such as social and economic changes in the country, population movements, large industrial and agricultural investment projects (the building of dams, irrigation systems, etc.) or international trade (export and import of live animals, meat and meat products, eggs, etc.).

The collection of epidemiological information from a variety of sources requires the full use of existing knowledge and involves co-operation with several other scientific disciplines (depending on the infection, available resources and stage of control of the infection). An epidemiologist co-operates in a multidisciplinary approach with microbiologists, statisticians, clinicians, pathologists, biochemists, biologists, zoologists, entomologists, veterinarians, hygienists, ecologists, sociologists, economists, and so on.

It is clear that neither the term surveillance nor the individual elements of surveillance are new or unknown in epidemiology. With the progress in epidemiology and the availability of new laboratory procedures in biology and microbiology, the concept of surveillance was extended creating a scientific basis for the planning, implementation and evaluation of control and prevention of communicable diseases. In the context of the diseases under the Regulations and the diseases under international surveillance, the most important aspect of epidemiological surveillance is the quick identification of a disease, the follow-up of contacts and immediate recommendations to prevent further spread of the disease among the population into which it has been introduced.

In 1964 the Director-General of WHO approved the further development of the surveillance of communicable diseases of international importance and in 1965 an Epidemiological Surveillance unit was established in the Division of Communicable Diseases at WHO Headquarters.

The global surveillance of communicable diseases began in a practical way with the six quarantinable diseases, (plague, cholera, yellow fever, small-pox, louse-borne typhus and relapsing fever). Surveillance is an integral part of the world-wide malaria eradication programme. During the last 20 years surveillance of influenza has also been developed, based on the co-operation of the WHO Reference Centres and national influenza laboratories, and finally surveillance has become an important part of the international campaign against endemic treponematoses.

In 1958 a Study Group on Immunological and Haematological Surveys,² besides their elaboration of methodology for multipurpose immunological surveys and their use in epidemiological studies, recommended the creation of WHO Serum Reference Banks where blood samples collected from human

and animal populations in various parts of the world could be stored, processed and investigated in co-operation with other WHO Reference Centres or co-operating research institutes. At the present time two WHO Serum Reference Banks are active (one at Yale University in New Haven, USA, and the other at the Institute of Epidemiology and Microbiology, Prague). It is hoped to establish a third one in the near future.

Several hundred thousand aliquots of human sera and a limited amount of animal sera have been stored in the WHO Serum Reference Banks during the last eight years and serological investigations of sera from Afghanistan, Brazil, Kenya, Mongolia, Nigeria, Philippines, Samoa Islands, Thailand, Togo and some other parts of the world have resulted in findings of great importance for recognition of problems pertaining to public health decisions, (vaccination),³ and evaluation of health measures. Some of these findings have opened up or are stimulating further research. In addition, these collections are also available for haematological, biochemical and genetical investigations.

The national and global surveillance of communicable diseases was discussed at the Twenty-first World Health Assembly in 1968 and the concept and implementation of epidemiological surveillance⁴ was recommended to all Member States and national health services.

In addition, each year WHO Headquarters organizes inter-regional seminars on surveillance methodology and individual WHO Regional Offices also participate in such training by organizing regional courses.

Systematic and prompt dissemination of pertinent epidemiological information is an important part of surveillance activities. The WHO Weekly Epidemiological Record is now becoming a most important and useful instrument for this purpose.

All units in the Division of Communicable Diseases, in close co-operation with Vector Biology and Control and other units in the Organization, are actively using and further developing surveillance methodology for individual infections in different ecological conditions and stages of the control of disease.

In the interests of improving the efficiency and quality of the services offered to its Member States, the Director-General of WHO decided in 1968 to

merge the unit of International Quarantine with the unit of Epidemiological Surveillance with the emphasis on the scientific and technical as opposed to the legalistic and regulation minded approach to the problems of the international spread of infections.⁵

The last Committee on International Quarantine in 1967 reviewed a number of diseases of international importance and recommended that louse-borne typhus and louse-borne relapsing fever should be transferred from the group of quarantinable diseases to the group of diseases under surveillance in which were also included viral influenza, poliomyelitis and malaria.

A draft document has therefore been prepared by individual units of the Division of Communicable Diseases, in co-operation with the Division of Malaria Eradication and the Vector Biology and Control unit, dealing with surveillance methodology of quarantinable diseases and of malaria, influenza and poliomyelitis, for the consideration of the Committee.

It is obvious that surveillance activities have to be implemented differently for different infections. In addition, the methodology used (elements of surveillance) depends very much on the existing knowledge of the ecology of the infection in a given geographical area, and last but not least on the availability of personnel and equipment, (laboratories, etc.). The relative importance and time sequence in the use of individual surveillance elements may change with different stages of the control measures applied.

The implementation therefore of epidemiological surveillance of communicable diseases under the International Sanitary Regulations will depend very much in the future on the technical advice and assistance of WHO and on the further development of international co-operation.

The document presented in draft form for your review needs considerable editing and possibly the rearrangement of individual chapters. The methodology of surveillance of some diseases, for example yellow fever, depends in addition very much on the improvement of our knowledge of ecology and on acquired experience with its implementation.

Plague still represents a potential danger. The ecology of this infection was systematically studied and has been sufficiently elucidated only in some

parts of Asia, the Americas and South Africa. However, the natural foci of plague, especially in equatorial Africa, Asia and South America, are not yet sufficiently known and ecological conditions of plague foci in some countries therefore make the control of this disease rather difficult. Recent experience from the Vietnam war clearly illustrates the still existing potentialities of this infection.

National surveillance of plague and its natural foci should be built up as a multidisciplinary approach and requires the team-work of epidemiologists, microbiologists, ecologists, entomologists and zoologists. However, considering the lack of both personnel and material resources in many countries where natural foci of plague exist, (as known or not yet recognized), it is clear that without continuous and systematic international assistance a rapid improvement of the existing situation cannot be expected. The Bacterial Diseases and Epidemiological Surveillance and Quarantine units, in close co-operation with Vector Biology and Control, will continue in the mapping of natural foci, reservoir animals, fleas and their resistance to insecticides.

The key point in control measures is the use of insecticides against fleas and only under special ecological situations should the use of systematic vaccination be recommended for the immunization of a population at risk. The establishment of WHO Plague Reference Centres to facilitate laboratory diagnosis and methodology of ecological studies needed for effective surveillance and control of natural foci of plague, is essential.

Cholera - The danger of the further spread of cholera to countries with a low standard of living and environmental conditions from neighbouring endemic countries still persists.

One of the weaknesses of the International Sanitary Regulations was that the role of the oldest type of international travel - the movement of nomads - was not sufficiently considered in the continuous spread of cholera. In addition, political developments during the last few decades, resulting in the creation of many new frontiers dividing relatives or tribes, have inevitably increased uncontrolled international traffic.

Experience over the last few years shows that the International Sanitary Regulations are not always respected by individual countries, which are afraid that excessive measures may be taken by their neighbours if they report the introduction of cholera. The serious consequences of hiding cholera from neighbouring countries are also very well known. The introduction of cholera to a receptive country from a neighbouring endemic country should therefore always be considered a possibility. The best defense against such a spread of cholera from endemic areas is:

- (a) surveillance, and
- (b) co-operation between neighbouring countries.

I should like to give examples of two incidences which occurred last year:

Following the advice of WHO, one country which had experience of repeated introduction of cholera from a neighbouring country organized a surveillance programme in 1967/68 whereby clinical and laboratory diagnosis and the treatment of cholera would be immediately available, and set up three mobile teams trained and equipped for a simple system of control measures. When there were rumours of the further spread of cholera in the neighbouring country two medical officers visited their colleagues in several hospitals of a large city in this country and found a considerable number of typical cases of cholera (reported only as diarrhoeal infection).

This was the moment for the immediate commencement of systematic surveillance of cholera, especially in the border area, and for sending the cholera mobile teams to the field. The introduction of cholera into two villages in border areas of this country was recognized a few weeks later, two days after the appearance of symptoms in the first patient. Vibrio cholerae Inaba was isolated in eight patients out of twelve, one case being due to contaminated stream water. The outbreak of cholera in the two villages was thus successfully controlled and further spread prevented.

The national health service co-operated with WHO and isolated strains were also sent to the WHO Reference Laboratory for confirmation. However, the Government was reluctant to report this introduction of cholera officially because of fear of economic repercussions and also because the country from which

it had originated had also not reported large and newly infected areas.

Our standpoint was that the immediate recognition of the introduction of cholera and successful control of its further spread, in co-operation with WHO, is far more important and also more in the interests of other countries than concern about official reporting of the disease.

The other example refers to the outbreak of gastro-enteritis caused by non-agglutinable vibrios in the Sudan, investigated by Dr Barua from WHO Headquarters, members of the WHO Inter-Regional Cholera Team and other experts invited by the Regional Office in Alexandria.

A large outbreak of diarrhoea with rice water stools, vomiting and marked dehydration was reported at the beginning of November 1968 in the district of El Gedaref, Kasala Province, in the Sudan. This occurred in a disorganized camp of straw huts and shacks with no sanitation around the recently opened artesian tube well (1160 feet deep), the water of which was considered as unfit for human consumption because of excessive alkaline content (8.2 - 8.4%) and a high proportion of sulphates and ammonia. However, the water of this well acquired the reputation of having miraculous cures for various incurable diseases and about 25 000 - 36 000 people gathered around it.

The physician suspected cholera and in a Khartoum laboratory a vibrio of doubtful agglutinability with anti-vibrio sera was reported. The Ministry of Health immediately established a camp hospital and a laboratory started functioning on 11 November. It was not possible to ascertain exact figures of morbidity and mortality, but 89 deaths were recorded in the camp among persons who did not report to any hospital.

Non-agglutinating vibrio of Heiberg group I was isolated in 29 out of 97 faecal specimens from sick people, in 14 rectal swabs from 79 dead bodies, in 94 out of 2 951 stool specimens from healthy persons in the camp, as well as in the well water. The possible and relative role of other factors which facilitated this outbreak is of course open to discussion.

The prompt action taken by the Government of the Sudan to obtain WHO and bilateral assistance made it possible to investigate and stop this cholera-like outbreak with a minimum of delay.

Therefore, the development of continuous surveillance in all receptive areas and conscious co-operation between endemic and receptive countries, in collaboration with WHO, are essential for the successful control of the further spread of cholera.

Yellow fever - The characteristics of the man-mosquito cycle differ in the Americas and in Africa. In addition, the concept of the control of the disease, especially in its urban form, has developed in both continents in very different ways.

The eradication of Aedes aegypti in considerable areas of the American continent has eliminated the danger of severe and large epidemics in most countries of the Americas. However, reinfestation has occurred after eradication in certain areas of Central America, Brazil and Argentina.

Careful surveillance, therefore, must be maintained in the countries which have eradicated Aedes aegypti to avoid possible reinfestation, and measures should be taken to eliminate the mosquito where it has been reintroduced.

Surveillance of jungle yellow fever, (virological, serological and entomological studies), is extremely difficult and expensive. Jungle yellow fever occurs every year among individuals living in or entering the forest, but accurate figures of the number of people exposed or infected are unobtainable and the only evidence we have for the past few years are fatal cases, confirmed after histopathological investigation of the liver.

The sufficiency of existing surveillance methodology may well be questioned if Aedes aegypti reinfestation of countries such as Brazil is not controlled and eradication of Aedes aegypti in the Americas has other complications in the future.

The system of yellow fever surveillance in West Africa is based on detection of cases and collection of specimens in so-called "sentinel" hospitals and histopathological, virological and serological investigations in national laboratories.

The WHO Reference Centre for Arboviruses in Dakar provides international assistance in laboratory investigations, virus identification and immunological surveys. The WHO International Reference Centre for vector control in Upper Volta is collecting data on vector mosquito distribution and provides advice

on vector control procedures. Detailed maps on the presence and distribution of Aedes aegypti in countries of West Africa are being prepared.

In East Africa the Regional Reference Centre for Arboviruses at Entebbe, Uganda, is constantly carrying out virological, entomological and serological studies to determine the presence of circulation of yellow fever virus in different areas.

A surveillance system similar to the one established in West Africa will be organized as soon as the necessary facilities are made available. The World Health Organization and the East Africa Aedes Research Unit, located at Dar-es-Salaam in Tanzania, are carrying out surveys of Aedes aegypti in East Africa.

The results of studies of the Regional Reference Centre for Arboviruses in Entebbe are very interesting. The findings that the presence of some other viruses of the B group might interfere with yellow fever virus circulation and spread (Zika, Wesselsbron viruses) are extremely interesting and of possible practical importance. They might explain some as yet unclear aspects of the ecology and epidemiology of yellow fever in Africa and elsewhere. The Regional Reference Centre, Entebbe has also found yellow fever protecting antibodies in the human population in the northern part of Kenya, evidently connected with the constantly active focus of yellow fever in the south of Ethiopia.

In spite of all these efforts a danger of unexpected small or large outbreaks of yellow fever in Africa cannot be excluded, especially if we consider the rapidly growing, uncontrolled urbanization with heavy infestation by Aedes aegypti and the agglomeration of non-immune populations.

Smallpox - Surveillance of smallpox in the context of the global eradication effort is considered to be as important as systematic vaccination of the population. The clinical and epidemiological behaviour of smallpox lends itself particularly well to this type of approach.

Prompt reporting and equally prompt institution of containment measures, determination of the source of infection, search and detection of other cases in the area, vaccination of household contacts and other groups at risk (schools, hospitals, etc.) systematically applied since 1967 in the WHO eradication

programmes in different parts of the world have been very successful.

WHO emergency assistance is available within 48 hours following a request. Vaccine, vaccination equipment, consultants, laboratory diagnostic material and technical assistance are also available if necessary. A network of diagnostic centres is now being established and in addition information pertaining to small-pox occurrence in all countries throughout the world is presented in detail every two weeks in the Weekly Epidemiological Record.

Louse-borne typhus and louse-borne relapsing fever have lost much of their former importance, especially with regard to international traffic.

Long-term persistence of R. prowazeki in man (Brill-Zinsser disease) facilitates the continuous spread of infection in populations where body lice infestation persists. Therefore, louse-borne typhus and, to a lesser extent, louse-borne relapsing fever still flourish in many countries in Asia, Africa, America and also in a few areas in Europe.

The results of studies of body lice resistance to insecticides throughout the world carried out by the WHO Vector Biology and Control unit show that the successful control of body lice is feasible if national health services give sufficient attention to this question.

With regard to the very limited importance of both these infections to international traffic, the last Committee on International Quarantine considered that louse-borne typhus and louse-borne relapsing fever should be excluded from the group of Q diseases and included in diseases under surveillance. It is believed that this change will improve the reporting of incidence of both infections in many countries which are often reluctant to be exposed to dissemination of information by broadcasting.

Malaria - Surveillance is an integral part of the global malaria eradication programme and I would like to refer to the recommendations of the last Committee on International Quarantine in 1967 with regard to this question.

Influenza is a truly international disease. It is well recognized that the disease is preventable only in a very limited way, because of the plasticity and constantly changing antigenic properties of influenza viruses.

Effective epidemiological surveillance of influenza has to be made on a world-wide scale and the co-ordination of this activity is undertaken by the World Health Organization in co-operation with the health authorities of Member States and their national influenza centres as well as with two International Centres in London and Atlanta.

The main emphasis in the WHO influenza programme is on the swift collection and dissemination of epidemiological information, rapid isolation of strains in individual countries and their speedy characterization in the WHO International Influenza Centres. It is also important that regular immunological surveys be made in inter-epidemic periods by national laboratories, which permit a better understanding of the world spread of the disease. In addition, continuous investigations into the spread of influenza in animals are very important in the study of the ecology of these viruses.

WHO also provides national influenza centres with diagnostic reagents for use in their programmes and strains for the production of vaccine.

The Weekly Epidemiological Record is used for prompt dissemination of epidemiological information pertaining to influenza.

Poliomyelitis - It is considered that poliomyelitis should be given priority on the list of infectious diseases needing extension and strengthening of regional and global surveillance.

Fifteen years ago it was the most dangerous disease in temperate climates, (40 000 mainly paralytic cases in 24 European states, the USA and Canada), but in these areas of the world it is now under very effective control, due to polio vaccines.

This favourable situation is of course not stable and systematic surveillance is required. Every effort must be made to prevent an accumulation of non-immune persons in various age groups, which would represent a serious risk of an epidemic outbreak should virulent polioviruses be introduced.

At the same time there is epidemiological evidence of an increase in poliomyelitis in many tropical and sub-tropical countries. The inadequacy of public health services in many developing countries and the rather ineffective

live polio vaccine occasionally reported from some tropical areas complicate even further the poliomyelitis problem.

As was mentioned previously, methodology of surveillance will differ depending on the results gained from the successful use of vaccination.

It should be realized that in many developing countries with hot climates the immunity status of child age groups could change in a relatively short period of time, especially in fast-growing cities. This explains some rather unexpected outbreaks in recent years in cities in Africa and South America.

Notification of disease, (by age), clinical and laboratory surveillance of clinical cases, and especially repeated serological surveys of the immunity status of the population, are essential for recognition of the problem and the sound planning, implementation and evaluation of immunization programmes.

WHO has already taken steps towards the organization of closer and more effective international surveillance of poliomyelitis. This is mainly based on the network of WHO Reference Centres, (isolation, typing of viruses, studies of genetic stability of strains), and WHO Serum Reference Banks, (collection and investigation of sera for immunological surveys). WHO also organizes the programme of production, testing and distribution of reference reagents needed in poliomyelitis surveillance.

The Organization helps in the planning and evaluation of long-term vaccination programmes in a group of European countries, with the evaluation of live polio vaccine in tropical conditions and periodically disseminates epidemiological information on the global situation in the Weekly Epidemiological Record.

The last Committee on International Quarantine carefully reviewed a number of other communicable diseases of international importance which are extensively or only in a limited way under surveillance, but recommended that the programme in relation to the International Sanitary Regulations should be limited at the beginning to malaria, influenza and poliomyelitis only.

However, there is no doubt that several other infections, especially those transmitted between vertebrate animals and man (zoonoses) are often spread

internationally by live animals and animal products. It is important to note that apart from regional or bilateral agreements between exporting and importing countries, there are no world-wide regulations to ensure zoo-sanitary control. The recent tragic episode of vervet monkey disease among laboratory workers in Germany and Yugoslavia underlined the existing danger.

As a logical development of the implementation of surveillance activities the readiness of WHO Headquarters and Regional Offices to provide Member States (on their request) with immediate technical advice and assistance (providing experts and emergency material aid) in epidemics, has been further elaborated and strengthened. Highly experienced WHO staff or experts, and material for diagnosis should be available in one or two days after notification.

The introduction of the concept of surveillance into the International Sanitary Regulations would therefore provide a better knowledge of the factual epidemiological situation as a basis for public health decisions and actions.

Surveillance activities are also a basis for the evaluation of control measures. Surveillance activities in communicable diseases also involve the follow-up of all other factors which might influence the spread of infection (e.g. environmental health conditions). Therefore, the need to co-operate with hygienic or environmental health services is obvious.

Finally, surveillance activities greatly facilitate epidemiological forecasts which are most important for short and long-term planning of health activities.

The concept of surveillance in epidemiological services and surveillance activities is a long-term one and must be based on the modern, microbiological laboratory. In the last few years the WHO Serum Reference Banks and other WHO Reference Centres and co-operating laboratories have greatly helped several developing countries in starting and further developing surveillance activities of communicable diseases. I believe that the results obtained are the best example to individual countries for a better understanding of the need for strengthening epidemiological and public health laboratory services for every country in the control and prevention of communicable diseases.

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