SURVEILLANCE OF YELLOW FEVER

by

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Yellow fever was one of the great killers during the 18th, 19th and beginning of the 20th centuries. It caused large and severe epidemics in America, Africa and in some cities in Europe.

Yellow fever is an acute, febrile, self-limited disease caused by a virus and transmitted by mosquitoes. The disease ranges in severity from forms so mild that may pass unrecognised to severe and fatal forms. The fatality among indigenous populations in endemic regions in Africa has been reported as less than five per cent. For non-immune persons it may be 30 per cent, or higher.

There are two main methods for the control of yellow fever; the control or eradication of Aedes aegypti the urban vector of the disease and vaccination of populations exposed to jungle yellow fever or living in places were no control measures have been taken against Aedes aegypti.

In America the measures taken for the control and eradication of Aedes aegypti have eliminated the thread of the urban form of the disease. Vaccination is applied to the populations in immediate contact with the forest and especially to labourers entering the forest. When a suspected case is found laboratory investigations are carried out for its diagnosis and if possible, vaccination is applied to the population of the area. Liver samples are taken of all cases dying of a febrile disease of less than ten days duration in the areas where yellow fever can be present. This system has permitted to maintain a quite effective surveillance of yellow fever in the tropical and forest areas of South America.

In Africa the disease remains endemic and outbreaks or isolated cases have continued to occur in one or other areas.

Slide 1

This slide shows the location of outbreaks of one or more cases in Africa for 1940 to 1967. Mass vaccination was applied to large areas from 1940 to 1960 and this measure brought a reduction of the number of cases and outbreaks without eliminating completely the disease.

The reappearance of yellow fever in Senegal in 1965 after 12 years during which no cases had been reported called attention to the importance and potential danger of the disease in West Africa and a permanent surveillance system was organized by the Virus Unit.

Technical facilities available in the area have been co-ordinated so that a firm laboratory diagnosis of yellow fever can be made in suspected cases before an epidemic has developed.

This system is organized on three levels. The first level is formed by "sentinel hospitals". One to four of these hospitals has been selected in each country according to its size. They are located in areas where according to available ecological or historical data, outbreaks are more likely to occur.
In this second slide the location of the selected "sentinel hospitals" and the available laboratories is shown.

The physician in each "sentinel hospital" who normally deals with febrile cases is made responsible for the early detection of definite or suspected cases. The national laboratory or the WHO Regional Reference Centre supplies the physicians with information about methods of laboratory diagnosis and encourages them to send the appropriate materials to the laboratory. They have been provided with a kit containing tubes, syringes, needles, a viscerotome, etc., to take samples. These samples are sent without delay from the "sentinel hospital" to the national laboratory or directly to the WHO Regional Reference Centre when no national laboratory able to carry out yellow fever diagnostic tests is available.

The national laboratory, the second level of the system, prepares the specimens received for histopathological, biological or serological testing. If the national laboratory does not have the facilities to do some or all of the necessary tests, it refers the materials to the WHO Regional Reference Centre which constitutes the third level of this pyramidal system.

The Regional Reference Centre is of course in a position to do all necessary testing and is ready to assist on request the national laboratory with equipment, personnel and advice. The Regional Reference Centre is responsible for confirming histopathological and virological diagnosis and for the identification of virus strains isolated at the national level. It makes available to national laboratories recent information regarding laboratory techniques for the diagnosis of yellow fever.

Final notification of cases or epidemics remains a matter of the national health authorities. The role played by the units at the different levels of the surveillance system is strictly technical.

The functions of the different levels of the yellow fever surveillance system are summarized in the Slide No.3.
The application of this system showed its effectiveness in July 1967. Two deaths suspected to be caused by yellow fever were reported in the North of Liberia. Histopathological samples of the liver from the two cases were immediately sent to the Regional Reference Centre in Dakar and the diagnosis was confirmed in 24 hours. An epidemiological investigation was immediately carried out in the area where the cases had occurred and the population of this area vaccinated. No further cases occurred.

*Aedes aegypti* is the main vector of urban yellow fever, the epidemiological form of the disease in which the virus is transmitted and maintained by a man-mosquito-man cycle.

It is consequently important to acquire a good knowledge of the presence, distribution and density of this mosquito in the areas considered at risk.

A survey of this mosquito is being carried out in large areas of West Africa by the staff of the Centre Muraz at Bobo-dioulasso with the support of WHO.

It is interesting to note that the presence, absence, or levels of density of *Aedes aegypti* in this region is more closely related to the cultural habits of the inhabitants of an area or village than to climatic conditions. Methods of keeping water are of special importance. Certain ethnic groups store water in small containers, of 10-15 litres which are emptied and washed frequently. In these circumstances it is practically impossible for *Aedes aegypti* to breed and the mosquito is absent or present in very small numbers in the villages inhabited by these groups.

On the other hand, other ethnic groups use large containers of 40-60 litres or even larger, which are kept buried in the ground and to which water is constantly added before they are emptied. They are never washed out. *Aedes aegypti* breeds freely and abundantly in them.

These are of course not the only factors which influence the presence or absence of this mosquito. There are many others which have great importance also, such as the length and intensity of rainy seasons, the abundance of abandoned pots and discarded containers around the village, etc. I have mentioned them only to show you that the *Aedes aegypti* survey is not a simple operation and that attention should be paid to many and complex factors.

The current survey is not yet finished although six countries have been visited. We expect to gain from it information of great value for the prevention of large outbreaks in the future.

As a preventive measure in areas at risk where *Aedes aegypti* is present, it is important to vaccinate the population. Vaccination had not been properly carried out in most of the countries in the region in recent years. Due to the encephalitogenic properties for children of the vaccine prepared with the French neurotropic strain of yellow fever, efforts are being made to increase production of 17D strain vaccine in West Africa. The Institut Pasteur of Dakar is at present producing this vaccine in large amounts and provides WHO with 250 000 doses of it annually free of cost for use in emergencies. It also offers WHO certain additional quantities at cost price to deal with potential epidemic situations.