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A SYSTEM OF SURVEILLANCE FOR MONKEYPOX AND HAEMORRHAGIC FEVER

INTRODUCTION

Monkeypox and haemorrhagic fevers are diseases which are usually seen in remote areas of the world. More specifically in Africa they tend to occur in areas which are isolated and often without a medical infrastructure such as dispensaries, clinics and hospitals. Any successful surveillance system must take into account this fact and must work around it.

Although many of the diseases in question are clinically, and probably epidemologically different, a well-designed, focused, and supervised surveillance system will be able to detect these several different disease patterns even if they occur simultaneously in a given area.

Specific diseases to be included in this surveillance system are:

(1) Monkeypox
(2) Ebola disease
(3) Marburg disease
(4) Lassa fever
(5) Congo haemorrhagic fever
(6) Yellow fever

I. <u>The purposes of establishing surveillance for cases of monkeypox and haemorrhagic fevers are</u>:

A. To study the epidemiology of the disease in known endemic areas:

(1) Specifically to study the transmission of disease in a given village and family surrounding a case.

(2) To obtain clues regarding the natural source of the disease.

B. To study the clinical spectrum of disease, particularly with an effort to detect and study mild or inapparent disease.

C. To search for disease where it has not been shown to occur.

II. <u>The objectives of the surveillance system are</u>:

A. To measure the frequency of occurrence, the person to person transmission and risks of acquiring the diseases both naturally and secondarily from a human case.

B. To quantitate the clinical spectrum of endemic disease in terms of severe, mild and asymptomatic infection.

C. To prove through serological tests and virus isolation the occurrence or lack of the diseases in specified surveillance areas.

III. Methods

The specific methodology or strategy used for surveillance will depend largely on two factors: (1) the specific information being sought, such as prevalence or incidence; and (2) the medical infrastructure available in the given area, i.e. hospitals, clinics, dispensaries etc.

The strategies discussed here assume the following general organizational components:

1. A laboratory staffed and able to carry out large volume serologic tests and virologic tests for the diseases in question.

2. A general medical surveillance officer based in Africa whose responsibility would be to oversee all of the various surveillance programmes in different countries.

3. A surveillance officer in each country with a vehicle, fuel and adequate support to allow extensive travelling with prolonged periods spent in somewhat remote areas.

4. Auxiliary surveillance officers or public health officers available in some remote areas.

IV. Monkeypox

A. Surveillance in areas of known occurrence

The strategy for these areas will be to quantitate the frequency of occurrence the transmission pattern and the clinical spectrum of disease.

(1) Hospital based surveillance. This is the first component of the surveillance system which should be established.

The purpose of this component of surveillance in a general endemic area is (1) to find fresh cases for study of secondary spread and for possible epidemiologic clues regarding the natural source; and (2) to identify specific areas or villages where more detailed studies of prevalence and incidence can be carried out.

To establish the hospital or dispensary based system the hospital personnel must be contacted, become interested and be trained to observe cases and report the specific needed information and to collect the required specimens. A reward system will need to be established either based on each properly reported and investigated case of rash disease, or on a confirmed case of monkeypox.

Assuming then that a hospital or dispensary shows willingness to participate, one or more persons at the facility must be trained to carry out the following steps:

1. Observe patients, especially children under the age of 10 for rash illness with a papular or pustular eruption.

2. Take a history and fill out the information form provided (see form).

3. Procure a lesion specimen, either a crust or a swab specimen.

4. Obtain an acute serum specimen. This is to be collected, allowed to clot, the serum decanted and stored at 4°C or -20°C if either available.

5. Send the information and specimens to the surveillance officer or save for regular pick up.

6. Obtain a follow-up examination and serum specimen after three weeks.

7. Obtain a post-mortem liver biopsy in the event of death.

The length of time for the report to reach the surveillance officer should not take more than about three weeks. Highly suspect cases, particularly a severely ill case, should be investigated without awaiting laboratory confirmation of its etiology. A full-scale investigation of family members as well as a control family should ensue with serum specimens and more detailed epidemiologic information (see form).

Regular visits of the country surveillance officer with reasonably close supervision will be required in order to make this system function.

(2) Village surveillance. A second method of surveillance should be established in a village or villages known to have had cases of monkeypox. There are several possible variations of this method.

1. Non-continuous surveillance with periodic serosurveys of the village population, or at least a cohort.

The objectives here are to detect the rate of seroconversion and possibly a rough idea of illness to infection ratio. Carrying out this type of surveillance will require the cooperation of the village, especially of the headman or chief.

An entire village or a least a cohort of about 500 people should be bled and followed with periodic visits and then re-bled at six month intervals for one to two years. The repeated bleedings will allow calculation of a seroconversion rate. Periodic visits with identification of at least severe rash illness will give a rough approximation of the illness to infection ratio. Additional clustering of seroconversion within families can be observed if it occurs.

Some idea of expected rates of seroconversion can be had from the initial serosurvey in a given village by comparing prevalence of antibody by age, smallpox vaccination scars and pockmarks.

2. Continuous village surveillance. This technique requires someone stationed in a village to carry out daily surveillance for rash illness. Either the whole village or a cohort will be randomly chosen and a serum sample taken. Each household selected will be visited at least three times weekly to check for rash illness or other types of illness where the monkeypox and haemorrhagic fever surveillances are combined. When an illness is identified, the patient is followed and a blood specimen is taken two weeks after recovery. In the case of a rash illness a lesion specimen is obtained.

The entire cohort is re-bled approximately every six months. Serum specimens are preferable but filter paper bloods can be used if handled properly.

We have considerable experience with these techniques in Sierra Leone and know that they can work with the proper amount of support and supervision. We generally use a reward system for the bleeding surveys. We give vitamin and iron pills at the time of the mass serosurveys. We give aspirin and chloroquine to symptomatic persons (in the case of fever surveillance) and iron tablets at the time the convalescent specimen is taken. These systems always require the cooperation and support a strong headman or chief. We try to use a local or village person as one of the persons stationed in the village for continuous surveillance.

B. Surveillance in areas of unknown but suspected occurrence
Area surveillance

1. A technique which can be used in remote areas with no health infrastructure and where the occurrence of disease is uncertain, is village to village surveillance by a person on a bicycle or small motorcycle. The person would visit selected villages or compounds regularly, asking about rash illness (or other disease complexes) taking appropriate information and specimens where required. The purpose of this technique is to document the occurrence of sporadic cases thus showing that the disease is endemic in the area under surveillance.

2. Hospital based surveillance. To be set up as described in part A1. This is probably the most efficient way to set up surveillance for sporadic cases, but it must be pursued and supervised carefully.

3. Seroprevalence survey. A one time seroprevalence survey can be done quickly in an area highly suspect for sporadic disease. The level of antibody titres by age-group and vaccination status or pock marking can be very helpful in giving clues as to endemicity.

4. Long-term specific village surveillance may not be so effective in these areas because of the limited number of villages which can be covered.

V. Haemorrhagic fevers

Just as the geographic extent, the frequency, source and transmission pattern of monkeypox cases need to be known, so the same knowledge is needed for haemorrhagic fevers, including yellow fever. The apparent geographic overlap of these diseases and monkeypox make it not only possible but desirable to link their surveillance together. There are two important reasons for this:

1. Specimens obtained from ill persons in these areas could contain one of the haemorrhagic fever viruses and thus infect a laboratory worker who is carrying out investigations for monkeypox in a non-maximum containment laboratory. Also, animal specimens from ecologic studies may well contain one of the haemorrhagic fever viruses. All such specimens must be screened in a maximum containment laboratory regularly working with the haemorrhagic viruses prior to being used in a non-maximum containment laboratory.

2. The haemorrhagic fevers can no longer be regarded as just strange and exotic diseases with little real impact on the populations at risk. They have become important disease problems not only to the local population but to referral hospitals and other facilities in cities where such patients may be brought. Increased knowledge about the geography, ecology and transmission of these diseases is needed in order to deal with them rationally and effectively. The expense, the scarce resources available and the enormous difficulty in carrying out surveillance programmes in these areas justify if not compel us to combine forces in studying these diseases.

The techniques to be used are essentially those outlined under monkeypox surveillance namely:

A. Surveillance in areas of known occurrence

1. Hospital-based to identify cases for epidemiologic investigation and areas for more complete village surveillance and for possible ecologic study.

2. Non-continuous village surveillance for studying seroconversion and clustering within families and villages.

3. Continuous village surveillance for studying the actual incidence of disease, the illness to infection ratio, and seroprevalence in various populations by age.

B. Surveillance in areas of unknown but suspected occurrence

1. Area surveillance in remote areas without medical facilities where disease occurrence is uncertain. This is to document sporadic cases of haemorrhagic disease and better define the boundaries of endemic disease.

2. Hospital or dispensary surveillance - possibly a more efficient way to document sporadic cases if facilities are available. See monkeypox A1, for details.

3. Seroprevalence survey. See monkeypox B3 for details.

Specimens are collected in the same manner as discussed under monkeypox surveillance.

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