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IMPLICATIONS OF A GLOBAL SMALLPOX PROGRAMME  
FOR SMALLPOX-FREE COUNTRIES

The Government of Netherlands New Guinea has asked that the above item should be placed on the agenda of the Regional Committee.

The Government referred to the danger of the occurrence of smallpox not only to the population of the country concerned but those of neighbouring countries and pointed out that the chance of infection is strengthened further by increased air and sea transport. Co-operation between smallpox-afflicted and smallpox-free countries might make it possible to eradicate the disease. The technical advice of WHO was requested on the implications of a global smallpox programme for smallpox-free countries.

The addendum now presented contains suggestions on how smallpox-free countries can continue to protect themselves from importing smallpox and thus play a part in the global programme of smallpox eradication.

1 FACTORS CONTRIBUTING TO THE IMPORTATION OF SMALLPOX

The two weeks incubation period of smallpox, coupled with the rapid means of modern conveyance, facilitates the spread of the disease from one country to another.

Normally, the risk of disease introduction into a territory through the usual routes of travel by air, land and sea is adequately safeguarded by a national quarantine service adhering to international sanitary regulations. Failure to observe such regulations may occur in the country where the infected individual originated or in the country where the disease has been introduced. For example, a valid international smallpox vaccination certificate may be issued to an individual without fully taking the precautionary safeguards recommended, or clearance may be given in an infected area to a case or suspected infected individual who is about to embark on international travel. On the other hand, if for one reason or another the receiving country fails to carry out recommended procedures for the inspection of incoming passengers, infected individuals may pass unnoticed only to serve later as the focus of an outbreak.

In areas where smallpox has not been observed for a long time medical officers and practicing physicians may not be able to identify the clinical forms of the disease. Any delay in the recognition of the disease can only

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increase the opportunity for exposure of susceptible contacts and result in more secondary cases. Such a situation occurred in Mindoro, Philippines, in 1947 following entry into that island of an unrecognized case of smallpox.

Again, in countries and territories where smallpox has not been reported for decades, there is a natural tendency for the health authorities to relax the strictness of the measures against smallpox and to employ personnel, time and funds for purposes other than smallpox control. The time may come however when the immunity of the population begins to wane and a level is reached where a high percentage becomes susceptible to the disease. If at this stage smallpox is accidentally introduced an epidemic outbreak is likely to ensue.

## 2 SUGGESTED ANTI-SMALLPOX MEASURES

### 2.1 Quarantine regulations

Strict observance of quarantine regulations by smallpox-free countries and territories is an essential requirement to prevent entry of the disease.

Under the convention providing for the international sanitary regulations, health administrations are obliged to undertake appropriate action which will ensure that ports and airports in their territories have at their disposal the organization and equipment sufficient to apply the measures required.

Two alternative measures are recommended to health administrations to prevent the importation of smallpox, viz.,

- (1) the possession by all arriving international travellers of a valid smallpox vaccination certificate, or
- (2) the possession of a valid certificate of vaccination by all international travellers coming from either:
  - (a) any country where smallpox exists, or from
  - (b) any smallpox infected area.

The World Health Organization collects and receives reports on smallpox cases from countries and has the duty of transmitting this information to other countries. A disease intelligence function such as this can be effective only if all the countries concerned send accurate reports to the Organization as soon as possible. When reporting is delayed or inaccurate, international preventive measures against the introduction of smallpox in disease-free countries will be weakened. Countries where the disease is present are, therefore, responsible for: (a) prompt and accurate reporting to the state health authority concerned of cases occurring within the country, (b) prompt reporting of the information collected by the state health authority to designated stations of the World Health Organization, and (c) strict observance of procedures for the issuance of valid smallpox vaccination certificates and the departure of suspected cases.

### 2.2 Special arrangements

Although quarantine measures, when faithfully observed, are satisfactory preventive safeguards, special precautions are required for situations where unprotected individuals, or groups of the population, cross the boundaries of land frontiers or engage in inter-island travel without benefit of

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quarantine supervision. In such cases, the international sanitary regulations recommend that the governments concerned should (a) conclude arrangements which would provide for a direct and rapid exchange of epidemiological information, (b) adopt sanitary measures to be applied in contiguous territories at their common frontier or with neighbouring islands, (c) combine two or more territories into one territory for the purposes of any of the sanitary measures to be applied, and (d) arrange for carrying infected persons by means of transport specially adapted for the purpose. Sanitary measures adopted in this sort of agreement are assumed to be consistent with the provisions of the international sanitary regulations. States are expected to inform the Organization of any such arrangement which they may conclude and the Organization will, in turn, send immediately to all health administrations information concerning such an arrangement.

### 2.3 National vaccination campaigns

Until global smallpox eradication is reached the health programmes of smallpox-free countries must include provision for action in the event that smallpox is accidentally introduced into their territories.

As budgetary considerations and general programme commitments of national health administrations would generally dictate against special vaccination teams to raise the level of immunity in the population, integration of vaccination with the regular activities of health service personnel would offer a satisfactory compromise. If such a policy is adopted primary vaccination can be practiced in infancy and re-vaccination carried out on entering and leaving school. Although the convention on international travel requires presentation of a valid smallpox vaccination certificate administered within three years it is, nevertheless, conceded that for national immunization programmes vaccination of the population once every five years is satisfactory. It may however be a judicious policy to require vaccination at three-year intervals for government health workers, such as quarantine and hospital staff, who may be exposed to greater risks than the population at large. Since it is difficult to conduct vaccination campaigns for the adult population, particularly in the less highly developed countries, use may be made of seasonal events such as festivals, official public gatherings, etc. which would permit ready access to large segments of the population for vaccination purposes. It is recommended however that the work performed during the routine field visits of health staff should normally include smallpox vaccination. By way of priority, it would seem that vaccination should first be conducted among the inhabitants of cities and towns serving as ports of entry (either by air, land or sea), among people living in the land frontiers and coastal areas, and those living along land or water routes usually traversed by travellers.

Smallpox vaccination is a relatively simple technique which can be done rapidly but in all campaigns, the proper training of vaccination personnel and the use of a potent vaccine are essential requirements. The planning for the vaccination of the greatest number of susceptibles at regular intervals is a problem that needs careful study and development by the public health administrator. The danger of a smallpox epidemic in a country should a case of smallpox be accidentally introduced would depend upon the level of immunity in the population. When this is 80% or over, there is no danger; on the other hand, when only a small segment is artificially protected by vaccination the danger of spread is correspondingly high.

In general, the danger of an outbreak if a case is accidentally introduced would be reduced if diagnosis were made promptly and accurately. As stated above health and medical personnel in countries long free from the disease may

not recognize the case, and there is therefore justification for sending quarantine officers to endemic countries to study and observe the various clinical forms of smallpox. When available, supplementary facilities such as diagnostic laboratories afford a quick means for confirming the clinical diagnosis.

When a case of smallpox is introduced control measures should consist of isolation of the patient and the immediate vaccination of contacts. Persons become infected with the virus soon after exposure and the susceptibles in the immediate household develop symptoms about thirteen days following the onset of the original case. Contacts of secondary cases will contract smallpox on an average thirteen days after the onset of the secondary cases and so on. As the outbreak progresses uncontrolled infection will extend beyond families and irregularity of notification will result because the period of infectivity of smallpox is not limited to one day. Hence, an examination of notifications received, particularly if the day of onset (or stage of the disease) is known, will indicate whether the cases are the early generation in an outbreak or the late notification of cases in an outbreak which has been going on for weeks.

Deaths from smallpox may occur within three-four days of the onset of illness in the fulminating cases which are often undiagnosed, at eleven-fourteen days after onset of illness (not rash) in malignant smallpox, and at more variable periods, but commonly fourteen-twenty-one days, when deaths may follow complications or sepsis.

When sudden notifications of deaths and cases are received simultaneously the interpretation would be that the outbreak has already reached the third, fourth or even later generations.

Application of control by means of the so-called "ring" vaccination method starts at the focus where the contacts, such as family and household members, close contacts, neighbours, etc., are at greatest risk. An allowance of three-four days vaccination work is given for this phase and arrangements made to permit visits at different times of the day so that all contacts can be vaccinated. A return to the original focus is scheduled after a period of four days for the purpose of detecting secondary cases and inspecting vaccination results. If no reaction to the vaccination is observed another re-vaccination is recommended. A third visit is made again three-four days afterwards to look for secondary cases and to inspect the results of re-vaccination. If no reaction is noted a second attempt at re-vaccination can be made as it has been observed that in some instances a reaction is obtained only after a second or third attempt. As soon as the group at greatest risk has been protected by successful vaccination, the subsequent work of the health staff would consist of case-finding where similar protective measures are followed as in the primary case.

If the contacts are considered immune because of a prior attack, or a successful re-vaccination within the previous three-five years, it is recommended that surveillance should be maintained until the height of the reaction to the recent vaccination has passed. If the contact is not considered immune, surveillance is recommended for a period corresponding to the incubation period of the disease. A rise in temperature in the contact during the period of surveillance indicates a need for prompt isolation until smallpox is excluded.

The organization of control measures by means of 'ring' vaccination requires the existence of a well-developed and highly efficient health service. Reporting must be rapid, diagnostic facilities should be at hand, and personnel able to carry out the necessary epidemiological investigations and trace the contact should be available. In countries in which medical services and communications are not sufficiently organized the maintenance of a full vaccination state

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is recommended. In a community where the level of immunity in the population is low and where the health services are not yet sufficiently organized to carry out the "ring" method effectively it may be justifiable to follow a modified vaccination technique which begins with vaccination on the immediate contacts but which is rapidly widened to cover the entire community where the case was discovered.

### 3 CONCLUSIONS

The objectives of the smallpox measures to be taken in countries free from the disease should be protection of the population against the introduction of the disease and prevention of a serious outbreak or epidemic if it is introduced. The smallpox control activities in such countries should therefore be based on:

- (1) strict observance of quarantine regulations;
- (2) the avoidance of serious outbreaks following the introduction of an imported case by:
  - (a) using the so-called "ring" vaccination method which consists of the early diagnosis of all imported cases followed by vaccination, isolation and/or surveillance of contacts and possible contacts. The successful application of this method requires the existence of a well-developed and highly efficient public health service, or
  - (b) maintenance of a high immunity level in the population.