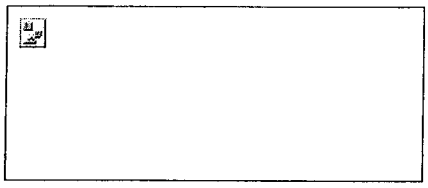
Manual on the preparation of national animal disease emergency preparedness plans



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Preface

The control and eradication of livestock diseases are primarily the responsibility of national governments whose executive for this purpose is the national veterinary service. Since its inception FAO has been actively involved in the control of livestock diseases and its Animal Health Service (AGAH) is dedicated to this purpose. Over the years AGAH, with the help of expert panels and technical assistance schemes, has played a key normative role in developing standards and policies for dealing with major diseases. The result has been progressive reorientation of veterinary services, education and research so as to ensure an integrated approach to major diseases, to the

improvement of animal health and productivity and in the preparation of animal products. In this regard AGAH collaborates with other international and regional organizations, particularly the International Office of Epizootics (OIE), the World Health Organization (WHO), the International Atomic Energy Agency with which FAO has a Joint Division (FAO/IAEA), regional organizations such as the Pan-American Health Organization (PAHO) and the Inter-African Bureau for Animal Resources of the Organization of African Unity (OAU/IBAR), as well as with bilateral and multilateral donor agencies.

A characteristic of transboundary animal diseases (TADs) is that they themselves can be the cause of national emergencies and, as this manual demonstrates, their significance often transcends national boundaries. They are of particular importance to food security and sustained economic development and trade for many countries. It is imperative therefore, wherever possible, to limit the socio-economic disruptions resulting from outbreaks of TADs.

The role of FAO in the fight against epidemic diseases of livestock has recently been strengthened with the establishment of the special programme, Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES). Furthermore, the World Food Summit, through Objective 3.1 of Commitment Three of the Rome Declaration on World Food Security and the Plan of Action, November 1996, commits governments, in partnership with all actors of civil society, and with the support of international institutions to "seek to secure effective prevention and progressive control of plant and animal pests and diseases, including especially those which are of transboundary nature, such as rinderpest, cattle tick, foot and mouth disease and desert locust, where outbreaks can cause major food shortages, destabilize markets and trigger trade measures; and promote concurrently, regional collaboration in plant pests and animal disease control and the widespread development and use of integrated pest management practices".

It should also be noted that the need for effective preparedness for and response to emergencies, including those caused by pests and diseases, is enshrined in Commitment Five of the World Food Summit Plan of Action, where Objective 5.2 states inter alia that international organizations will "maintain, promote and establish, as quickly as possible, in collaboration with non-governmental organizations and other organizations, as appropriate, the preparedness strategies and mechanisms agreed upon at the ICN, including development and application of climate forecast information for surveillance and early warning, drought, flood, other natural disasters, pest and disease alertness".

The Manual on the preparation of national animal disease emergency preparedness plans is thus both a book of reference for national veterinary services and a contribution of the EMPRES programme towards the fulfilment of a component of the World Food Summit Commitments.

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Acronyms and abbreviations

APHCA	Regional Animal Production and Health Commission for Asia and the Pacific (FAO)
ASEAN	Association of Southeast Asian Nations
ASF	African swine fever
BSE	Bovine spongiform encephalopathy
CBPP	Contagious bovine pleuropneumonia
CVO	Chief Veterinary Officer (or the Director of Veterinary Services or other equivalent position)
ELISA	Enzyme linked immunosorbent assay
EMPRES	Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases
EUFMD	European Commission for the Control of Foot-and-Mouth Disease

FAO	Food and Agriculture Organization of the United Nations
FMD	Foot-and-mouth disease
GIS	Geographic Information System
GREP	Global Rinderpest Eradication Programme
IAEA	International Atomic Energy Agency
IATA	International Air Transport Authority
NGO	Non-governmental Organization
OAU/IBAR	Organization of African Unity/Inter-African Bureau for Animal Resources
OIE	International Office of Epizootics/Office international des épizooties
PAHO	Pan-American Health Organization
PANAFTOSA	Pan-American Foot-and-Mouth Disease Center
PARC	Pan-African Rinderpest Campaign
PPR	Peste des petits ruminants
RADISCON	Regional Animal Disease and Surveillance Control Network
RVF	Rift Valley fever
SADC	Southern African Development Community
SPC	South Pacific Community
SWF	Screwworm fly
TAD	Transboundary animal disease
TADINFO	Transboundary Animal Disease Information System
VAI	Virulent avian influenza
WHO	World Health Organization
WRL	World Reference Laboratory
www	World Wide Web

Introduction

Animal disease emergencies: their nature and potential consequences

Animal disease emergencies may occur when there are unexpected outbreaks of epidemic diseases or other animal health related events which have the potential to cause serious socio-economic consequences for a country.
These emergencies are frequently caused by outbreaks of transboundary animal diseases (TADs), which are of significant economic, trade and/or food security importance for many countries. Such diseases can spread easily and reach epidemic proportions; control/management, including exclusion, requires cooperation among several countries.
The occurrence of one of these diseases may have disastrous consequences for a country when they:
· compromise food security through serious loss of animal protein and/or loss of draught animal power for cropping;
· cause major production losses for livestock products such as meat, milk and other dairy products, wool and other fibres, and skins and hides;
· cause losses of valuable livestock of high genetic potential. They may also restrict opportunities for upgrading the production potential of local livestock industries by making it difficult to import exotic high-producing breeds that are extremely susceptible to TADs;
· add significantly to the cost of livestock production since costly disease control measures need to be applied;

· seriously disrupt or inhibit trade in livestock, germplasm, and livestock products, either within a country or internationally. Their occurrence may thus cause major losses in national export income in significant livestock-producing countries;
· inhibit sustained investment in livestock production, thus trapping livestock producers in uneconomic, peasant-type agriculture;
· cause public health consequences where diseases can be transmitted to humans (i.e. zoonoses);
· cause environmental consequences when wildlife populations die out; and
· cause unnecessary pain and suffering to many animals.

The International Office of Epizootics (OIE) recognizes 15 List A diseases, most of which could also be regarded as being TADs. These are foot-and-mouth disease (FMD), rinderpest, peste des petits ruminants (PPR), contagious bovine pleuropneumonia (CBPP), Rift Valley fever (RVF), lumpy skin disease, vesicular stomatitis, swine vesicular disease, bluetongue, sheep and goat pox, African horsesickness, African swine fever, hog cholera (classical swine fever), fowl plague and Newcastle disease. Examples of the serious consequences that these and other diseases have had internationally are shown in the Box. However, this list is not exclusive. Other viral, bacterial, rickettsial and mycoplasmal diseases may also be regarded as having the potential to cause animal disease emergencies under some circumstances. Indeed they may not necessarily be infectious diseases. For example, animal pests such as the New World and Old World screwworm flies may fit into this category.

Most people tend to equate emergency animal diseases with exotic or foreign animal diseases, although this is not necessarily so. Unusual outbreaks of endemic diseases may also cause an emergency when there is, for instance, the appearance of a new antigenic type such as a significantly different FMD virus subtype in an endemic country or when there is a significant change in the epidemiological pattern of the disease such as an unusually severe outbreak of anthrax. The emergence of previously unknown diseases may also cause an emergency, as in the case of bovine spongiform encephalopathy (BSE) in the United Kingdom in 1986, equine paramyxovirus disease (Hendra virus) in Australia in 1994 and Nipah virus disease of pigs and humans in peninsular Malaysia in 1999. There are other animal health emergencies that may be caused by non-disease events, for example a major chemical residue problem in livestock or a food safety problem such as haemorrhagic uraemic syndrome in humans caused by verotoxic strains of E. coli contaminating animal products.

While this manual will focus on the major transboundary animal diseases, the preparedness planning principles discussed can and should be applied equally to all types of disease and non-disease animal health emergencies described.

Examples of the potential consequences of transboundary animal diseases

Rinderpest is perhaps the most serious cattle plague. When this virus disease was first introduced to Africa in the late nineteenth century, it spread over almost the whole continent within ten years, killing an estimated 10 million cattle and untold numbers of wildlife - irrevocably changing livestock husbandry and wildlife ecology. In 1994, rinderpest spread to remote mountainous areas of northern Pakistan that had previously been free of the disease, killing an estimated 40 000 cattle and yaks.

Foot-and-mouth disease is a highly contagious virus disease of cloven-hoofed animals. A major epidemic of type O FMD in Taiwan, Province of China in 1997 caused the death of some 184 000 pigs and a further 3.85 million pigs were slaughtered as part of the eradication campaign. The price of pigs dropped to a quarter of the price in force immediately before the outbreak.

Rift Valley fever is a mosquito-borne viral zoonotic disease. The first recorded outbreak of RVF in Egypt in 1977 caused an estimated 200 000 human cases of the disease with some 600 deaths as well as large numbers of deaths and abortions in sheep and cattle and other livestock species. An outbreak of the disease in East Africa in 1997-98 not only caused livestock losses and human deaths but also seriously disrupted the valuable livestock export trade to the Near East.

Bovine spongiform encephalopathy, a prion disease of cattle, was first recognized in the United Kingdom in 1986. Since then, over 170 000 cattle have either died or been slaughtered. The discovery of a probable link between BSE and new variant Creutzfeld-Jakob disease of humans in 1996 led to major disruptions of world beef markets.

Contagious bovine pleuropneumonia is a serious mycoplasmal disease of cattle. There has been a catastrophic spread of CBPP over the last few years in Africa where it now affects some 27 countries and causes estimated losses of up to US$2 billion annually. In 1995 the disease was reintroduced to Botswana for the first time in 46 years. As part of the eradication campaign, all cattle (approximately 320 000) in an area of northern Botswana had to be slaughtered at a direct cost of $100 million; indirect losses were over $400 million.

Hog cholera (or classical swine fever) is a generalized virus disease affecting only pigs. A serious outbreak of the disease in the Netherlands in 1997-98 led to the death or slaughter of some 12 million pigs as part of the eradication campaign. The cost of this outbreak was estimated to be US$2.5-3 billion, half of which was public money and the other half was more or less equally shared between farmers and other participants in the livestock production chain. The effects of the epidemic were so severe that the Government of the Netherlands approved a national pig restructuring plan that foresaw a reduction in the national pig herd of about 25 percent within two years.

African swine fever is another generalized virus disease affecting pigs. In 1996 it occurred for the first time in Côte d'Ivoire, where it killed 25 percent of the pig population and, according to various estimates, cost the country between US$13 and 32 million in direct and indirect losses and eradication costs. There has since been serious spread of ASF to Togo, Benin and Nigeria.

Virulent avian influenza is a lethal virus disease of poultry with some zoonotic potential. An economic analysis of outbreaks of VAI in Pennsylvania, United States in 1983-84 showed that the direct costs of eradication were US$64 million, and the indirect costs to consumers were $500 million through increased prices of products. On the other hand, it was estimated that VAI would have cost the United States poultry industry $2 billion annually had it become endemic. The influenza virus causing an outbreak of VAI in Hong Kong in 1997 was found to be capable of transfer to humans and, as a consequence, a decision was taken to depopulate chickens there completely.

The benefits of animal disease emergency preparedness planning

As can be seen from the foregoing, an animal disease emergency such as an outbreak of a transboundary animal disease can have serious socio-economic consequences which, in extreme cases, may affect the whole national economy. If a new disease can be recognized quickly while it is still localized and prompt action taken to contain and then progressively eliminate it, the chances of eradication of the disease are markedly enhanced. Conversely, eradication may be extremely difficult, costly, and even impossible if the disease is not recognized and appropriate control action taken before it becomes widespread or established in wildlife.

The target should always be to eliminate progressively and finally eradicate a transboundary animal disease (and prove that national or zonal freedom has been regained) if epidemiological and other circumstances are favourable. The alternative approach of simply "living with the disease" through the institution of routine vaccination campaigns and/or other disease control measures will in the end prove far more costly and will be a permanent constraint to efficient livestock production systems. Furthermore, the continuing presence of a TAD in a country, even if losses are minimized by effective disease control programmes, will inhibit the opening of export trade opportunities for

livestock and livestock products. Eradication of the disease and provision of scientific proof of freedom from the disease to a level of international acceptability will remove this constraint to international trade.
Contingency planning and other preparedness programmes for animal disease emergencies should be regarded as providing the key to mounting early effective action in the face of an emergency. In fact these should be recognized as some of the more important core functions of national animal health services.

The principles of animal disease emergency preparedness planning

The two fundamental components of animal disease emergency preparedness planning are the development of capabilities for:
· early warning, and
· early reaction to disease epidemics and other animal health emergencies.
These require advance preparation of both generic and disease-specific written contingency plans and operating procedures, the testing of such plans and training of staff; the development of capabilities at national, provincial and local veterinary headquarters, including field and laboratory services; development of mechanisms to involve other necessary government and private sector services and farming communities in the emergency response; development of the capacity to apply all the necessary resources to counter the disease or other animal health emergency in the most efficient way (including equipment, personnel and finances); and, finally, advance establishment of the appropriate legal and administrative structures to deal with an emergency.

Early warning of diseases

Early warning enables rapid detection of the introduction of, or sudden increase in, the incidence of any disease of livestock which has the potential of developing to epidemic proportions and/or causing serious socio-economic consequences or public health concerns. It embraces all initiatives, mainly based on disease surveillance, reporting and epidemiological analysis that would lead to improved awareness and knowledge of the distribution and behaviour of disease outbreaks (and of infection) and which allow forecasting of the source and evolution of the disease outbreaks and the monitoring of the effectiveness of disease control campaigns.
The success of a country's capability for rapid detection of the introduction or increased incidence of transboundary and potentially epidemic animal diseases depends on:
· good farmer and public awareness programmes for high-threat epidemic livestock diseases that involve improving the veterinary/farmer interface;
· training of field veterinary officers and veterinary auxiliary staff in the clinical and gross pathological recognition of serious epidemic livestock diseases; collection and transportation of diagnostic specimens; and the need for prompt action;
· sustained active disease surveillance to supplement passive monitoring, based on close coordination between field and laboratory/epidemiology veterinary services, and use of techniques such as participatory questionnaires, serological surveys and abattoir monitoring to supplement field searching for clinical disease;
· establishment of reliable livestock identification systems for enhancement of disease-tracing capabilities;
· dependable emergency disease-reporting mechanisms to regional and/or national/federal veterinary headquarters;
· implementation of an emergency disease information system;
· enhancement of laboratory diagnostic capabilities for priority diseases within provincial and national veterinary laboratories;
· development of strong linkages between national laboratories and regional and world reference laboratories, including the routine submission of specimens for specialized antigenic and genetic characterization of disease-causing agents;
· strengthening of national epidemiological capabilities to support emergency preparedness and disease management strategies;
· prompt and comprehensive international disease reporting to OIE and neighbouring countries, etc.;
· inclusion of early warning in contingency planning for livestock disease epidemics.

Early reaction to disease outbreaks

Early reaction means carrying out without delay the disease control activities needed to contain the outbreak and then to eliminate the disease and infection in the shortest possible time and in the most cost-effective way, or at least to return to the status quo and to provide objective, scientific evidence that one of these objectives has been achieved.
For this to be achieved, the following elements need to be in place:

· development of national emergency disease contingency plans, both generic and for specific identified high-risk diseases, which should be established, tested and refined through simulation exercises;
· establishment of a national animal disease emergency planning committee;
· establishment of a consultative committee on emergency animal diseases (or a national animal disease emergency task force) charged with the responsibility of implementing the national animal disease emergency plans;
· installation of diagnostic capabilities for all high-threat diseases. These should be fully developed and tested in national and, where appropriate, provincial diagnostic laboratories, and linkages established with world and regional reference laboratories;
· ensured arrangements for involvement of the private sector (e.g. livestock farmers' organizations, veterinary practitioners, livestock traders, commercial farming companies, animal product processors and exporters);
· arrangement for epidemic livestock diseases to be included in national disaster plans so that the police, army and other services can be involved as and when necessary;
· preparation of legislative and administrative frameworks to permit all necessary disease control actions to be implemented without delay;
· arrangements whereby funding for disease control campaigns can be quickly provided;
· ensuring that veterinary services are structured in such a way as to facilitate disease reporting and implementation of a nationally coordinated disease control/eradication campaign without delay during an emergency;
· provision of trained personnel and other necessary resources;
· compensation arrangements whereby farmers or others can be paid fair and quick compensation for any animals or other property destroyed as part of a disease control campaign;
· ensured access to quality-assured vaccines (containing the appropriate antigenic strain(s) for likely disease outbreaks) through a vaccine bank or from other sources;
· harmonization of disease control programmes and cooperation with neighbouring countries to ensure a regional approach;
· determination of the available international agencies involved in epidemic disease control/containment, including FAO/EMPRES, which could provide early reaction assistance if needed and establishment of regular communication channels with such organizations.

Chapter 1

A coordinated national approach to animal disease emergency preparedness planning

Responsibilty

Responsibility for animal disease emergencies

The Chief Veterinary Officer (CVO) or equivalent, such as the Director of Veterinary Services of the country, should have overall technical responsibility with regard to preparedness for and management of animal health emergencies. The appropriate government minister would of course be ultimately responsible.

Responsibility for animal disease emergencies with a public health component

Animal disease emergencies that have a significant public health component are a special case. These emergencies might occur, for example, in a major outbreak of a zoonotic disease such as Rift Valley fever, Japanese encephalitis, Venezuelan equine encephalitis or rabies. For these emergencies, negotiations should be carried out between the Ministry of Agriculture and the Ministry of Health (or their equivalents). Agreement should be reached in advance on a joint framework for preparing contingency plans and for other complementary preparedness programmes. Agreement should also be reached on the most efficient mechanisms for coordinating emergency responses, for implementing disease control and eradication programmes, and for sharing responsibilities. Appropriate opportunities for sharing resources between the two agencies should also be explored, so as to avoid unnecessary duplication. This might include a single diagnostic laboratory facility for the zoonosis/es in question, or at least the sharing of diagnostic reagents and of expertise between government veterinary and medical laboratories, common cold-chain facilities for vaccines, joint field missions and joint public awareness and public relations campaigns.

Of critical importance is the development of coordinated and efficient mechanisms for the rapid exchange of emergency disease reports and other key epidemiological information between the two agencies. These arrangements should apply at local and regional levels as well as at the national headquarters of both ministries. This is vital in order to enable a rapid response to new disease incidents and extensions of the outbreak, whether they are first manifested in humans or animals.

Getting started - obtaining support

In order to have emergency preparedness planning recognized as an important core function of national veterinary services, and to have adequate funding and other resources allocated to these activities, the CVO should enlist the support of all interested parties. These would include, inter alia, the CVO's own minister and senior ministry officials, other government departments and agencies including national economic development planning authorities, farming communities and organizations, livestock marketing authorities, livestock traders and exporters, and livestock product processors.

Of these, the most important target groups are the government and the farming community.

In presenting a strong case for support for emergency preparedness planning, the identified risks of the transboundary animal disease or other animal health emergency, and analysis of those risks, should be described together with the potential socio-economic consequences of an incursion or epidemic of the disease. This is discussed more fully in the risk assessment section in Chapter 3. Additionally, the benefits that will result from more rapid containment and eradication of the disease outbreak through forward contingency planning and preparedness should be forcefully presented. The case should preferably be supplemented by a formal socio-economic cost-benefit analysis.

National animal disease emergency planning committee

A National Animal Disease Emergency Planning Committee (NADEPC) should be appointed to facilitate and coordinate emergency planning. This committee should be directly accountable to the Minister of Agriculture and should be charged with the responsibility for developing and maintaining a high state of preparedness for animal disease emergencies. It should preferably be chaired by the CVO and should hold regular meetings to carry out the following functions:

· commissioning of risk assessments on high-priority disease threats and subsequent identification of those diseases whose occurrence would constitute a national emergency;

· appointment of drafting teams for the preparation, monitoring and approval of contingency plans and other documents;

· liaison with, and involvement of, relevant persons and organizations outside the government animal health services who also have a role in animal health emergency preparedness planning. This would include, inter alia, the national veterinary association, livestock industry groups, the national disaster management authority and departments of finance, health and wildlife;

· enhancement of the capabilities of emergency field and laboratory veterinary services, especially for specific high-priority livestock disease emergencies;

· development of active disease surveillance and epidemiological analysis capabilities and of emergency reporting systems;

· staff training and farmer awareness programmes;

· assessment of resource needs and planning for their provision during animal health emergencies;

· drafting of legislation and development of financial plans;

· implementation of simulation exercises to test and modify animal health emergency plans and preparedness;

· overall monitoring of the national state of preparedness for animal health emergencies.

NADEPC should comprise the CVO as chairman, the national animal disease planning officer (see below) as secretary, director of field veterinary services/director of disease control (or equivalent), director of the national veterinary laboratory, head of the epidemiological unit, director of animal quarantine and directors of state or provincial veterinary services.

In addition to these senior animal health officials, representatives of other ministries that may have a substantial role in responding to animal health emergencies, such as health, wildlife services, economic planning and finance, should either be full members of the committee or should be coopted as required. It is also highly desirable to have members drawn from the private sector, such as representatives of major livestock farming and processing organizations.

NATIONAL ANIMAL DISEASE EMERGENCY PLANNING OFFICER OR UNIT

A National Animal Disease Emergency Planning Officer should be appointed. This officer should be a senior veterinary officer with training in epidemiology and wide field experience in the management of disease control programmes. If circumstances warrant it a small unit of professionals should be appointed in addition.
The planning officer would be both the adviser to and the executive officer of the National Animal Disease Emergency Planning Committee, and would be actively involved in all NADEPC programmes itemized above.

Animal diseae emergencies as a component of the national disaster plan

Most countries have well developed national disaster plans. These allow essential government and non-government services and resources to be rapidly mobilized in response to a disaster. Such plans may also allow these essential services to be given special powers to act in the emergency. The national disaster plan is usually aimed at specific natural disasters of an emergency nature such as major fires, floods, hurricanes, earthquakes and volcanic eruptions. A strong case can be made for the official recognition of a disease emergency as a defined natural disaster situation which can be incorporated into the national disaster plan. An epidemic of a transboundary animal disease, for example, has the same characteristics as other natural disasters: it is often a sudden and unexpected event, has the potential to cause major socio-economic consequences of national dimensions and even threaten food security, may endanger human life and requires a rapid national response.
There are several essential government services, other than the Ministry of Agriculture, which will be invaluable in an emergency. These include, inter alia:
· defence forces (notably the army and air force) which can provide support for such activities as transportation of personnel and equipment to disease outbreak sites, particularly when these are inaccessible to normal vehicles; provision of food and shelter; protection of disease control staff in areas with security problems; and provision of communication facilities between national and local disease control headquarters and field operations;
· police, for assistance in the application of necessary disease control measures such as enforcement of quarantine and livestock movement, and protection of staff if necessary;
· public works department, for provision of earth-moving and disinfectant spraying equipment, and expertise in the disposal of slaughtered livestock in eradication campaigns;
· national or state emergency services for logistical support and communications.
Once approval has been given for the recognition of animal health emergencies within the national disaster plan, a set of standard operating procedures should be prepared and agreed with all cooperating agencies. The format of these documents will presumably be determined by pre-existing arrangements for the national disaster plan. They should set out in simple, unambiguous terms just how the national disaster plan is going to be activated in the case of an animal health emergency. They should also describe what duties and functions the support agencies may be expected to perform under different circumstances. Finally, they should establish the formal relationship between the various agencies and the chain of command. It should be emphasized that the Ministry of Agriculture (or equivalent ministry responsible for animal disease issues) is the lead combat authority during the emergency response.

Chapter 2

Organization of veterinary services during an animal disease emergency programme

The need for a command structure of veterinary services for emergency responses

Fighting a disease epidemic or combating other animal health emergencies are in many respects like fighting a war and require the same level of discipline. It requires the same ability to make rapid decisions based on analysis of the best information that can be made available from all sources, to convert those decisions into clear orders which can be conveyed down the chain to those who are charged with the responsibility of carrying them out, and to know that orders have been carried out and with what results. There must therefore be efficient mechanisms in place for the transmission of information and instructions from the national veterinary services headquarters to the front line of the disease eradication campaign in the field and laboratory and for feedback of information to headquarters.

It is clear that for these things to happen quickly and efficiently in an emergency, the veterinary services for a country must be placed in a command structure or line-management system at least for the duration of the emergency response.

National veterinary services are generally structured so as to optimize routine activities such as endemic disease control, veterinary public health, quarantine, etc. In recent years, government veterinary services in many countries have also been rationalized and restructured in many ways, including:

· Regionalization, where the authority and responsibility for delivery of animal health services have been devolved to provinces or regions that match new delegated political structures. This may result in the senior veterinary officer in the region being answerable to an administrative or political superior who may not fully appreciate the potential national socio-economic consequences of a major animal disease emergency rather than to the national CVO.

· Rationalization and downsizing of government services, which have led to major retrenchments of professional and technical staff in the public sector, to the point where the remaining staff resources are inadequate to cope with the major demands of an unexpected animal disease emergency.

· Privatization of veterinary services which has led to the transfer to the private sector of many animal health programmes and functions that have traditionally been the responsibility of governments, including field veterinary services, veterinary diagnostic laboratories and meat inspection.

· Separation of policy functions from operational functions, whereby those arms of government responsible for developing policy and for advising ministers on policy matters are administratively quite separate from those who are operationally responsible for managing major government programmes, including the CVO.

· Separation of veterinary laboratories from the field command. In many countries national veterinary laboratories have been transferred to research administrations, thus weakening links with the CVO and with field veterinary services.

These new structures are frequently not conducive to the mounting of an effective and timely response to an animal health emergency. Countries should review their situation with a view to devising the most appropriate structures and lines of responsibilities that can be rapidly and seamlessly put in place when an emergency arises. This may include organizing one or more of the following well in advance of any emergency:

· An agreement that animal health emergencies will be handled at national level and that the CVO will assume overall responsibility for responding to the emergency and be directly answerable to the minister in this role.

· An agreement with regional or provincial authorities that their own veterinary staff will come under the line management of the national CVO for an animal health emergency response programme. Arrangements also need to be put in place to ensure that regional field and laboratory veterinary services are fully involved in emergency preparedness planning and training activities and, in collaboration with national veterinary headquarters, in providing early warning of emergencies including emergency disease reporting to national headquarters.

· Similar arrangements for all essential government veterinary services including the central veterinary laboratory to come within the command structure of the CVO, if this not already the case, for the purposes of the emergency response.

· Pre-existing contractual agreements for private sector veterinary organizations, universities and other academic institutions, research institutes, etc. to provide essential services during an animal health emergency.

· Negotiation with the national veterinary association of terms and conditions for hiring practitioners and other private sector veterinarians as temporary government veterinary officers if needed.

Consultative committee on emergency animal diseases (CCEAD)

Countries may find it useful to establish a CCEAD that can be convened as soon as there is a disease or other animal health emergency and that can meet regularly during the course of the emergency response. This would principally be a technical committee whose role would be to review epidemiological and other disease control information, make recommendations on the activation of agreed contingency plans, maintain an oversight over the campaign and advise the CVO and the minister on future plans for the campaign and on implementation of those plans.

A suggested composition of the CCEAD might be:

· CVO (chairperson)
· director of field veterinary services/director of disease control;
· head of the epidemiological unit;
· directors of state, provincial or regional veterinary services;
· director of the national veterinary laboratory;
· director of any regional veterinary laboratories covering the outbreak areas;
· senior representatives of farmer groups or organizations affected by the outbreak;
· representatives of other key groups, e.g. national veterinary association, universities;

· other technical experts as required (with observer status).
If the command structure recommended at the beginning of Chapter 2 cannot be implemented for any reason, it becomes essential that a CCEAD be established so that there can be a consensus approach to the conduct of the emergency response campaign.

National animal disease control centre

Countries should establish a permanent national animal disease control centre. In the event of an outbreak of an emergency animal disease, the centre should be responsible to the CVO for coordinating all emergency disease control measures in the country. The centre should be close to the office of the CVO. The epidemiology unit should either be attached to the centre or should work in close collaboration with it. The CVO may delegate day to day responsibilities for implementing agreed policy to the head of the centre, who would normally be the director of field veterinary services.
The responsibilities of the national animal disease control centre in the emergency response would include:
· implementing the disease control policies decided by the CVO and CCEAD;
· directing and monitoring the operations of local animal disease control centres (see below);
· maintenance of up-to-date lists of available personnel and other resources, and details of where further resources may be obtained (see Chapter 7),
· deployment of staff and other resources to the local centres;
· ordering and dispersing vaccines and other essential supplies;
· monitoring the progress of the campaign and providing technical advice to the CVO;
· advising the CVO on the definition and proclamation of the various disease control zones;
· maintenance of up-to-date lists and contact details of risk enterprises, etc. (see Chapter 7);
· liaison with other groups involved in the emergency response, including those that may be activated as part of the national disaster plan;
· preparation of international disease reports and, at the appropriate times, cases for recognition of zonal or national freedom from the disease;
· management of farmer awareness and general publicity programmes, including press releases;
· general and financial administration, including the keeping of records.
The national animal disease control centre should be fully equipped with meeting rooms, a range of maps covering all parts of the country (preferably at 1:50 000), and all suitable communication equipment for liaison with local animal disease control centres, veterinary laboratories, etc., by telephone, radio, e-mail and facsimile as appropriate. The centre should also be linked with the emergency disease information system (see Chapter 4).

Local animal disease control centres

During an emergency, one or more local animal disease control centres should be set up within easy reach of the infected zones of the disease outbreak. Ideally they should be sited so that teams are able to travel to and from any site for surveillance or any other disease control activities on the same day. Where distances are not great, these local centres could be established on a permanent basis in a regional or district veterinary or agricultural office. Otherwise, possible locations for temporary local disease control centres (e.g. local government offices) should be identified and agreed in advance.
The local animal disease control centre should be fully equipped with offices, meeting rooms, maps, communication equipment to contact both field personnel and the National Animal Disease Control Centre, vehicles and fully stocked central stores. Central cold-storage facilities for vaccines should also be located at or within easy access of the centre. The centre should have simple equipment that will allow it to process and dispatch diagnostic specimens, including serum samples.
Each local animal disease control centre should be under the control of an experienced senior field veterinary officer. This officer should be given the responsibility for directing the emergency disease control and eradication programme within the area, under the general supervision of the national animal disease control centre and the CVO. All staff allocated to a centre for the period of the disease emergency should be under the command of this field veterinary officer for the duration of their attachment. The officer in charge of the centre should be given the authority to:
· designate a farm, herd or community as an infected premises, when necessary after consultation with, and the agreement of, the national animal disease centre;
· quarantine infected and dangerous contact premises;
· send surveillance teams to all places where there is susceptible livestock;

· deploy the necessary staff to infected premises to arrange valuation, slaughter and safe disposal of animals, cleaning and disinfection;
· advise on the delineation of infected, surveillance and control zones, and on the measures to be taken in them;
· impose livestock movement restrictions;
· suspend the operations of, or place zoosanitary restrictions on, livestock markets, abattoirs and other risk enterprises;
· organize and implement vaccination programmes;
· carry out insect vector control programmes if necessary;
· liaise with police and other authorities over the maintenance of disease control restrictions;
· liaise with local wildlife authorities;
· carry out publicity campaigns;

The local animal disease control centre should be allocated sufficient staff to carry out these functions properly. Each major area of field activity should be under the control of an experienced veterinary officer. The centre should also have a veterinary epidemiologist, who can provide specialized advice to the officer in charge and take care of disease reporting and the emergency disease information system. Depending on the type of disease control strategy chosen, there will be a need for disease surveillance teams, vaccination teams, quarantine and livestock movement control staff, valuers, infected premises teams (livestock slaughter, disposal, cleaning and disinfection), administrative staff (stores and general administration) and a public relations/education officer.

Difficult or marginalized areas

Countries may be faced with the situation where they have to deal with an outbreak of an epidemic livestock disease in areas that are difficult for geographical reasons or because they are relatively inaccessible due to civil unrest or because they practise nomadism or transhumance. Such areas frequently have little contact with outside government officials. The conventional approaches recommended above will need to be considerably modified in these circumstances. Only staff experienced in the local conditions and who can gain the confidence of local communities should be used.

Sometimes the main outside contacts of such communities will be through agricultural and other specialists employed by non-governmental organizations (NGOs). NGOs and their staff should be regarded as a valuable resource for assistance in implementing animal health programmes in difficult areas, including epidemic livestock disease control campaigns. Negotiations should therefore be carried out with appropriate NGOs to obtain their collaboration in this area. The necessary training and resources should then be supplied to their staff.

Community animal health workers are another valuable resource. Their help should be enlisted, and they should be suitably trained and equipped.

Strategies for dealing with disease outbreaks in difficult areas are discussed in Chapter 5.

Chapter 3

Risk analysis as a component of animal disease emergency preparedness planning

Risk analysis is something that we all do intuitively in our everyday life as well as in our professional work. Only recently has it developed into a more formal discipline and is increasingly used in many fields of endeavour. In animal health it has perhaps been most widely applied in quarantine. Quarantine risk analyses are used in reaching decisions as to the most appropriate health conditions for imported animals and animal products and strategies for quarantine operations.

Risk analysis is a tool that can also be used to good advantage for animal disease emergency preparedness planning. In this context, it is most readily applied to preparedness planning for exotic diseases (or exotic strains of endemic disease agents) and it will be described here for this purpose. There is no reason, however, why it cannot be applied in other animal health emergency planning.

Principles of risk analysis

Risk analysis comprises three components: risk assessment, risk management and risk communication.

Risk assessment

In this component the risks of an event occurring or of taking a particular course of action are first identified and described. The likelihood of these risks occurring is then estimated, their potential consequences evaluated and the assessment of the risk modified accordingly. For example, an exotic disease with a high risk of entry to a country but only a low risk of establishment or minimal potential socio-economic consequences would only obtain a low overall score on a risk assessment.
Risks can be assessed in a quantified, semi-quantified or qualitative way. It is inherently extremely difficult to quantify or actually put probability numbers to risks in many biological systems because of the lack of historical precedents and serious gaps in available biological data. It is recommended that qualitative risk assessments be used for exotic diseases. The risks can be described as "extreme", "high", "medium" or "low", or by a simple scoring system, for example, 1-5 for the level of risk and 1-5 for the level of potential consequences.

Risk management

This is the process of identifying, documenting and implementing measures to reduce risks and their consequences. Risks can never be completely eliminated. The aim is to adopt procedures to reduce the level of risk to an acceptable level.
In essence, this manual provides the risk management framework for emergency animal diseases.

Risk communication

This is the process of exchange of information and opinions on risk between risk analysts and stakeholders. Stakeholders in this context include all those who could be affected by the consequences of risks, that is, everyone from farmers to politicians. It is important that risk assessment and risk management strategies be fully discussed with stakeholders, so that they feel comfortable that no unnecessary risks are being taken and that risk management costs are a worthwhile insurance.
To ensure ownership of decisions, risk analysts and decision-makers should consult with stakeholders throughout the whole process of risk analysis so that the risk management strategies address their concerns, and decisions are well understood and broadly supported.

Who should carry out the risk analysis

The risk assessment component is best carried out by the central epidemiological unit in the national veterinary headquarters as part of the national early warning system for transboundary animal diseases (TADs) and other emergency diseases. Risk management and risk communication are tasks for everyone, but these should be coordinated by the CVO.
It should be remembered that risks do not stay static. They will change with such factors as evolution and spread of epidemic livestock diseases internationally, emergence of new diseases and changing international trading patterns for the country. Risk analysis should therefore not be seen as a one-off activity. It should be repeated and updated regularly.

Risk assessment for emergency animal diseases

As described above, risk assessment consists of identifying the risks, assessing the likelihood of their occurrence and modifying them by an evaluation of their potential consequences.
Risk exotic diseases (or disease agent strains) should be identified by keeping a close watch on the international livestock disease situation. This should be a routine function of the central epidemiological unit. Apart from the scientific literature, the most valuable source of information is the International Office of Epizootics, through such publications as its weekly disease reports and the annual World Animal Health, and through consultation of its Handistatus database. Disease intelligence is also available from FAO, for example in the EMPRES Transboundary Animal Diseases Bulletin, which is published quarterly and is also available on the Internet at:
http://www.fao.org/waicent/faoinfo/agricult/aga/agah/empres/news5.htm
PROMED, an Internet server and mailing service, provides an extremely useful forum for rapid dissemination of official and unofficial information on animal, plant and human disease occurrences around the world and Animal Health Net is also a useful source of information.
Having identified and listed the exotic disease threats, the next step is to assess the seriousness of the threat of entry of each disease to the country and identify the routes and mechanisms by which it may enter. Questions to be raised include:
· What is the current geographical distribution and incidence of the disease around the world?

· Is the distribution fairly static or has there been a recent history of spread to new countries, regions or continents?
· How close is the disease? Is it present in neighbouring countries? If so, where are the nearest outbreaks to shared borders?
· Is there a past history of introduction of the disease to the country? Is it possible that it is still present in undetected endemic pockets of infection or in wildlife?
· How is the disease spread? What are the relative roles of live animals, genetic material, meat, dairy and other animal products, insect vectors, migrating birds and animals in transmitting the aetiological agent?
· Are there significant imports of potential risk animal species or materials for the various exotic diseases? Do they come from endemic regions? How secure are import quarantine procedures?
· Are there smuggling, unofficial livestock movements, transhumance or nomadic practices which would constitute a risk for entry of exotic diseases?

The next step is to evaluate how serious the socio-economic consequences might be if there is an incursion of the disease. Questions to be raised include:

· Is the disease likely to become established in the country? Are there susceptible animal host populations and insect vector species (for arboviruses)? Are there any epidemiological factors that will either inhibit or facilitate the spread of the disease?
· Will it be difficult to recognize the disease quickly in different parts of the country?
· How large are the populations of susceptible livestock in the country? How important are such livestock industries to the national economy? What is their importance in satisfying nutritional and community needs?
· How serious will production losses be from the disease? Will food security be threatened?
· What effect would the presence of the disease in the country have on the export trade of animals and animal products? What effect will it have on internal trade?
· Will the disease cause human illness or deaths?
· Will the disease cause environmental consequences such as decimation of wildlife? Are there likely to be wildlife reservoirs of infection established?
· How difficult and costly will the disease be to control and eradicate? Can it be eradicated?

By addressing these questions and issues it will be possible to build up a risk profile of the various exotic or strategic diseases. Furthermore, an idea of the magnitude of the risk presented by each disease may be judged in qualitative if not quantitative terms. Most important, it will be possible to prioritize diseases for risk. It will also be possible to ascertain where the pressure points may be for entry of the diseases and how veterinary services and animal disease preparedness planning may need to be strengthened.

The value of risk assessment for animal disease emergency preparedness planning

The type of risk assessment that has been described will be of value for:

· determining those emergency diseases for which there is the greatest need and urgency to prepare specific contingency plans. It is recommended that contingency plans be prepared for at least the three diseases considered to be of the highest national priority;
· determining where and how quarantine procedures and border controls need to be strengthened;
· determining how laboratory diagnostic capabilities need to be strengthened;
· planning training courses for veterinary staff and farmer awareness and publicity campaigns;
· determining needs for vaccine banks or preparedness;
· determining how and where active disease surveillance needs to be strengthened.

Chapter 4

Early warning contingency planning

Early warning is the rapid detection of the introduction of, or sudden increase in, any disease of livestock which has the potential of developing to epidemic proportions and/or causing serious socio-economic consequences or public health concerns. It embraces all initiatives and is mainly based on disease surveillance, reporting and epidemiological analysis. These lead to improved awareness and knowledge of the distribution and behaviour of disease outbreaks and infection, allow forecasting of the source and evolution of the disease outbreaks and the monitoring of the effectiveness of disease control campaigns.

Disease surveillance

Disease surveillance should be an integral and key component of all government veterinary services. This is important for early warning of diseases, planning and monitoring of disease control programmes, provision of sound animal health advice to farmers, certification of export livestock and livestock products and international reporting and proof of freedom from diseases. It is particularly important for animal disease emergency preparedness.
It is beyond the scope of this manual to deal comprehensively with the requirements of disease surveillance. Reference should be made to the FAO Animal disease surveillance handbook, which is in preparation. However, the approaches to be adopted for a comprehensive system of disease surveillance are summarized below.

Passive disease surveillance

Passive disease surveillance is the routine gathering of information on disease incidents from sources such as requests for assistance from farmers, reports from field veterinary officers and livestock officers, submission of diagnostic specimens to laboratories and the results of laboratory investigations. Routine disease reports may also come from other sources such as abattoirs and livestock markets.
It is important that passive surveillance systems be strengthened and that the disease information they yield be effectively captured and analysed. However, it should be recognized that complete reliance on passive surveillance usually leads to significant under-reporting of diseases. It is essential that passive surveillance be supplemented by a strong system of active disease surveillance, particularly for emergency animal diseases.

Active disease surveillance

Active disease surveillance requires purposeful and comprehensive searching for evidence of disease in animal populations or for verification that such populations are free of specific diseases. Active disease surveillance programmes may be of a catch-all nature to detect any significant disease occurrences, targeted against specific high-threat diseases or designed to monitor the progress of individual disease control or eradication campaigns.
The components of successful active disease surveillance programmes are:
· close integration between the activities of field and laboratory veterinary services;
· regular visits to farming communities for farmer interviews about diseases, provision of animal health advice, clinical examination of livestock and, when appropriate, post-mortem examinations and collection of diagnostic specimens including serum samples. Emphasis should be given to critical areas identified by disease risk analyses and other epidemiological assessments;
· participatory rural appraisal programmes for epidemiological evaluation of specific diseases;
· utilization of disease information from all potential sources in the public and private sector, including veterinary inspections at abattoirs, private veterinary practitioners and veterinarians in commercial livestock industry positions;
· gathering of ancillary information to support prioritization and decision-making on animal health programmes, e.g. livestock production and socio-economic data;
· periodic targeted serological surveys in animal populations. These may be used either to detect the spread of infection or to prove freedom from infection. They are also occasionally used to monitor the effectiveness of vaccination campaigns. Serological surveys should be carefully designed to yield statistically valid information on the disease status of animal populations. There is often an inherent difficulty in interpreting the results of serological surveys where both vaccination and natural infection are occurring, but this may be overcome to some extent by selecting appropriate serological tests.
Epidemic livestock diseases are frequently spread by the movement of infected animals. In active disease surveillance of such diseases, emphasis must be given to situations where animals and people are on the move. This includes livestock markets, livestock trading routes, border areas and situations such as nomadism, transhumance and refugee movements from wars and civil strife.
Wildlife disease surveillance must not be overlooked. Wildlife may provide a reservoir of infection for some diseases, but may also act as a sensitive indicator of diseases that are not clinically apparent in adjacent livestock populations. The latter has occurred recently with African Lineage 2 rinderpest virus in East Africa. Close cooperation is required between veterinary and wildlife authorities. As direct examination of wildlife by capture techniques or slaughter is expensive and often difficult to organize, where possible sera and other diagnostic specimens should be collected when such wildlife surveys are carried out.

Emergency disease reporting and information systems

Emergency disease reporting

Most if not all countries have evolved disease reporting mechanisms that are primarily designed for routine endemic disease occurrences. These mechanisms often suffer from one or more serious deficiencies, including overlong reporting chains from local to district to provincial and finally to national offices, with the consequent risk of inordinate delays and distortion of information at each level; and collection and transmission of information that is based on poor epidemiological surveillance or diagnostic methods or is inadequate for good disease control decision-making.

For these reasons, special emergency disease reporting mechanisms for potentially serious disease outbreaks or incidents must be put in place as an essential component of preparedness plans. These should allow critical epidemiological information to be transmitted to national veterinary headquarters rapidly and efficiently, preferably on the same day. This may be done by telephone, facsimile, e-mail, radio, or courier - whichever is the most appropriate for the circumstances and the location. Local and regional veterinary offices should in any case be provided with the necessary communications equipment and field and laboratory staff should have a list of contacts and alternatives so that emergency disease reports may be received and acted upon quickly at their destinations.

In the case of an emergency report on a disease outbreak or incident, the basic information that needs to be conveyed is:

- the disease or diseases suspected;
- the exact geographical location of the disease outbreak(s);
- the names and addresses of affected farms or villages;
- livestock species affected;
- approximate numbers of sick and dead animals;
- brief description of clinical signs and lesions observed;
- date(s) when the disease was first noticed at the initial outbreak site and any subsequent sites;
- details of any recent movements of susceptible animals to or from the outbreak farm or village;
- any other key epidemiological information, such as disease in wild or feral animals and abnormal insect activity;
- initial disease control actions taken.

All transboundary and other emergency animal diseases should be made compulsorily notifiable within the country.

Emergency disease information system

All countries should have a fully operational disease information system so that there can be a two-way flow of information between national veterinary headquarters, government veterinary diagnostic laboratories and regional veterinary offices (or local disease control headquarters) that will allow the efficient monitoring of the progress of disease eradication or control programmes. This is even more important for responses to emergency diseases. The development of a disease information system is an essential part of national animal disease emergency preparedness planning. It is desirable but by no means essential that this be computerized.

The information that is captured in this system should be limited to the essentials for the planning, implementation and monitoring of disease control campaigns and for international reporting. The information system should not be cluttered with data that are not required for decision-making. It should be emphasized that the emergency disease information system needs to be a two-way process, with adequate feedback from national veterinary headquarters to the field and laboratory veterinary staff who originally collected and processed the information.

The following provides an indication of the type of information that may be included in the emergency disease information system:

- results of field clinical and serological surveillance and of other activities such as abattoir and market surveillance;
- exact geographical locations of infected farms or villages, with essential epidemiological data such as dates of detection and probable start of infection, livestock species affected with numbers of sick and dead animals and numbers at risk, diagnostic specimens collected, tracebacks and traceforwards and disease control actions taken;
- results of laboratory investigations, collated with the above;
- locations of quarantined areas and infected or surveillance zones, including data on susceptible livestock populations and locations;
- priority lists of farms and localities for future surveillance and for vaccination programmes, etc. based on epidemiological analyses;

· data related to the implementation and progress of vaccination campaigns and of any disease eradication procedures such as slaughter of infected or potentially infected animals, safe disposal of carcasses by burial or burning and disinfection of premises;
· disposition and availability of essential human and physical resources such as vaccines, diagnostic kits, vehicles, disinfectants, etc.

Geographic locations feature prominently in the above disease information requirements. The emergency disease information system should therefore incorporate a facility for mapping. At a later stage in its development, consideration could be given to the incorporation of a geographic information system (GIS).

Assistance can be provided to countries in their development of emergency diseases information systems by the FAO/EMPRES programme. A transboundary animal diseases information system (TADINFO) is being developed by EMPRES which can be made available to countries that do not already have a suitable system in place.

Training of veterinians and other animal health staff in early recognition of emergency diseases and collection and dispatch of diagnostic specimens

In many countries, particularly the developing ones, it is unlikely that many veterinarians or other animal health workers in either the public or private sector will have had first-hand experience with transboundary or other emergency animal diseases, as these diseases may never have occurred in the country or may have been exotic for a considerable period. This deficiency needs to be rectified by a systematic training programme for all those who, in their professional capacity, may be the first to come into contact with an incursion or outbreak of such a disease. Because a disease may strike in any part of the country and because of staff turnovers, training programmes should be both comprehensive and regular. This training must extend to staff in the remotest parts of the country.

Obviously, it will be neither practicable nor necessary to train personnel to a high level of expertise in these diseases. In most cases it is sufficient for trainees to be familiar with the basic clinical, pathological and epidemiological features of risk diseases and what to do if they suspect one of these diseases. Perhaps most important is to inculcate in people an awareness that if they are confronted by an unusual disease outbreak, either in the field or in the diagnostic laboratory, they should include exotic diseases in the range of their differential diagnostic possibilities and act accordingly. They should be trained in the steps they need to take to secure a confirmatory diagnosis, including collection and transport of diagnostic specimens, and in the immediate disease control actions that need to be instituted at a disease outbreak site. More specialized training will be needed for personnel who are nominated as members of specialist diagnostic teams (see p. 00). Training should also be intensified for diseases judged to be of very high and immediate threat.

A number of training possibilities may be selected as appropriate, including sending key field or laboratory staff to another country to gain first-hand experience when there is a major disease outbreak. While this is the best type of training, it is unpredictable and expensive. Nevertheless, this possibility should be explored when there is a disease emergency in a neighbouring country. Staff would be able to observe the disease and disease control procedures in a similar environment and they would also provide additional human resources for the recipient country responding to the emergency.

Other intemational training opportunities may occur from time to time. Several countries with access to microbiologically high-security laboratory and animal facilities, such as Australia, the United States, the United Kingdom and South Africa, run training courses in which exotic diseases can be demonstrated by experimental infection of susceptible livestock species. There may be the opportunity for external students to attend. There is also the possibility of training for laboratory staff at world or regional reference laboratories or through programmes organized by the Joint FAO/IAEA Division. Training programmes may also be arranged occasionally by other international organizations .

National emergency disease training workshops should be organized as the mainstay of training and should be targeted at government field and laboratory veterinary officers, veterinary practitioners, industry veterinarians and public health and quarantine veterinarians including those stationed at abattoirs, markets, border posts and air- and seaports. Formal presentations and discussion sessions on the major emergency diseases should be supplemented as much as possible by audio-visual teaching aids, including colour slides and videos on the diseases. A list of available training aids is shown in Appendix 2. The presentations should also include discussion of the basic principles and strategies for preventing and eradicating the diseases. Practical demonstrations may also be carried out on the correct methods for collection and dispatch of diagnostic specimens.

At the same time, instruction should be provided on disease reporting responsibilities and procedures, disease surveillance and other field epidemiology methods and immediate disease control actions at the outbreak site(s). Similar but simpler training workshops should be organized for auxiliary veterinary staff.

Field diagnostic manuals are most useful if they are prepared in a simple, practical and graphic format whereby they can always be carried in a vehicle and can be available for quick reference at the site of a disease outbreak. The manual should cover essential information on the aetiological agent, host species, epidemiology, clinical signs, gross pathology, differential diagnosis and collection of diagnostic specimens for each of the emergency diseases.
Training in emergency disease recognition and management should also be an integral part of the curriculum of undergraduate veterinary students in universities.

Farmer awareness/education programmes and other publicity campaigns

This is one of the most critical but sometimes neglected aspects of preparedness planning for emergency diseases. It is also important for fostering a sense of participation in and support for emergency disease control/eradication campaigns among livestock farmers and other key stakeholders. It also engenders a "bottom-up" approach to planning and implementation of disease control programmes to complement the more traditional "top-down" approach adopted by governments.
The communication strategies should aim to make stakeholders aware of the nature and potential consequences of important livestock diseases and of the benefits to be derived from their prevention and eradication. Furthermore, they should always have an element of rallying the community to the common cause of fighting a disease epidemic.
When possible, professional communicators and extension experts should be enlisted to help design and carry out awareness and publicity campaigns. Ideally, personal visits and discussions with farming communities and livestock traders, etc. are preferable, but newspapers, radio and television can reach a large target audience quickly. Radio programmes have proved to be a very effective method for spreading the message. These should be broadcast at times of the day when most farmers could be expected to be listening to the radio, which may be early in the morning or at night.

Livestock farmers

Early warning of outbreaks of potentially serious livestock diseases is only likely to occur if farmers are prompt to seek help from their local government veterinary officer, private veterinary practitioner, livestock officer or animal health assistant when they experience an unusual disease in their animals. This is the vital first link in bringing an occurrence of such a disease to official attention. It is therefore worth while devoting considerable attention to farmer and other public awareness programmes in emergency disease preparedness planning.
An essential prerequisite for encouraging farmers to make rapid contact with their district veterinary office or equivalent for help when faced with a disease outbreak is that a high level of trust and confidence has been established between the farming community and local animal health officials. This is not something that happens overnight. Farmers are more likely to report unusual disease occurrences at an early stage if they perceive that there will be tangible benefits in doing so. The required level of trust and confidence needs to be built up over time by regular visits to farming communities, well-planned extension programmes and an established pattern of assistance and advice on more routine animal health matters. Local animal officials should be both accessible and easy to contact. Reports of unusual disease incidents should always be taken seriously and investigated promptly and thoroughly, even if on the surface they may appear to be false alarms.
Awareness campaigns on the more important emergency livestock diseases should become a routine element of extension programmes for farmers. They may be targeted particularly at diseases that have been identified as being of highest threat in risk analyses (see Chapter 3) and at high-risk areas for entry and/or occurrence of these diseases.
Farmer awareness campaigns should encompass:
· simple descriptions of the nature of the diseases, how they are spread, their potential consequences for the individual farmer and local communities and the importance of their prevention and early detection;
· basic zoosanitary procedures that farmers should routinely adopt. These may include purchase, as far as is practicable, of animals with a known animal health status from areas known to be free of diseases, segregation of newly purchased animals (particularly those acquired from livestock markets) from other animals on the farm or in the village for the first two weeks or so, segregation of any sick animals and elementary hygiene practices;
· key clinical signs which may alert a farmer to the possible occurrence of particular diseases. These should be explained in straightforward, non-technical terms. The "3 Ds" used in rinderpest awareness campaigns are an excellent example. These are discharges, diarrhoea and death; farmers in risk areas are advised that if they see any two of these in their cattle they should assume that there is rinderpest and act accordingly;
· information on whom to contact and how to contact them if there is an unusual disease occurrence.
A series of audio-visual aids may be prepared or obtained from external sources to support extension programmes. These should be designed for specific audiences bearing in mind the level of sophistication appropriate for each

group. They may include posters, leaflets and videos. A selection of training aids which may be suitable for this purpose are listed in Appendix 2.

Livestock traders

Livestock traders are another important target group for public awareness campaigns, but they are often overlooked. The movement of animals through livestock traders is often the key epidemiological factor in the spread of epidemic livestock diseases. The need to build up a climate of trust and confidence between animal health officials and livestock traders is just as important as that discussed for farmers. The general themes for emergency disease awareness should also be similar, although emphasis should be placed on the importance of sourcing animals from disease-free areas where possible, not buying any sick stock and following any rules about quarantine and vaccination, testing or identification of animals. The potential consequences of the occurrence of a disease for internal and international trade should be emphasized.

Public awareness campaigns

Campaigns targeted at specific groups should be supplemented by more general public awareness programmes. These can be channelled through media outlets including newspapers, radio and television. Radio broadcasts can be an extremely powerful (and perhaps the only) means of reaching farming communities and nomadic groups in remote areas or areas that have been rendered relatively inaccessible for reasons such as civil strife.

Specialist diagnostic teams

It is recommended that specialist diagnostic teams be ready to be mobilized when there is a report from the field of a suspected emergency animal disease. These arrangements should be made well in advance of any emergency and the members should be available and equipped to travel to a disease outbreak site at short notice. In this case they must have at their disposal all the equipment needed for the preliminary investigation of a disease and for collection and transport of diagnostic specimens.

The composition of the diagnostic team will vary according to circumstances but may include:

- a veterinary pathologist from the central or regional veterinary diagnostic laboratory;
- a specialist epidemiologist, preferably with first-hand experience or training in the major transboundary animal diseases;
- a veterinarian with extensive experience of endemic diseases in the target livestock species;
- any specialist (e.g. entomologist) required for special examinations.

The specialist diagnostic team should be given a high level of training in at least the identified high-priority emergency diseases and in participatory techniques.

The team would travel to a disease outbreak site with local veterinary staff, as directed by the CVO. They would be expected to make clinical examinations, collect histories and make preliminary epidemiological investigations, particularly in respect to tracebacks (have any new animals joined the infected herds or flocks in recent weeks and where did they come from?) and traceforwards (have any animals left the infected herds or flocks in recent weeks and where did they go to?). They would also autopsy sick or very recently dead animals and collect a range of diagnostic specimens appropriate to the endemic and exotic diseases included in the differential diagnosis and transport these back to the laboratory.

The team should also be able to take any immediate disease control actions at the outbreak site and should have the necessary authority to do this.

The specialist diagnostic team would be expected to report their assessment of the disease outbreak immediately to the state/provincial/regional veterinary officer and the CVO, specifying steps taken to secure a confirmatory diagnosis and advice given on further disease control strategies, including declaration of infected and surveillance zones.

Laboratory diagnostic capabilities

The rapid and accurate diagnosis of diseases can only be assured in fully equipped laboratories that have a range of standardized diagnostic reagents, experienced staff and a sufficient throughput of diagnostic specimens to maintain expertise. It should be noted that development of diagnostic expertise for exotic disease using tests that require handling the live agent should only be attempted in microbiologically high-security laboratories.

It would be impractical and excessively costly for most countries to maintain a national veterinary diagnostic laboratory that has full capabilities for confirmatory diagnosis of all transboundary and other emergency diseases, many of which will be exotic. However, countries that have significant livestock populations should have a

veterinary diagnostic laboratory that is equipped and competent to undertake a broad range of standard techniques in pathology, virology, bacteriology and serology to the standard where the isolation and preliminary characterization of aetiological agents for emergency livestock diseases could be attempted. For very high-threat transboundary animal diseases, consideration should be given to developing capabilities for some key diagnostic tests, such as ELISA antigen and antibody detection tests and fluorescent antibody tests.
The OIE Manual of standards for diagnostic tests and vaccines provides authoritative information on diagnostic procedures for OIE List A and B diseases.
Specimen transport containers should be kept at both central and state or provincial veterinary laboratories and should be made readily available for field veterinary officers and specialist diagnostic teams. They should ideally consist of leakproof primary containers such as glass universal bottles with a metal screw-cap and rubber washer. These should then be packed into a leak-proof secondary container, such as a steel paint tin, with absorbent material and an ice-pack if chilling is required. This container should be placed in a robust outer container which must be clearly labelled. Specimen advice notes should also be provided.

International reference laboratories and collaboratng centres

There is a network of FAO and OIE reference laboratories and collaborating centres around the world which are available to provide advice and assistance to countries. They are designated for specific diseases or for broader subjects such as emergency preparedness for transboundary animal diseases, vaccine quality assurance and biological standardization and veterinary epidemiology and economics. Full use should be made of these reference laboratories and collaborating centres; their names, full contact details, subjects and geographical areas of responsibility are shown in Appendix 1.
FAO reference laboratories provide consultations, assist in making diagnoses, develop diagnostic capability, maintain a reference collection of disease agents and produce and standardize reagents. They also assist in characterization of causative agents and in training activities.
FAO collaborating centres provide technical advice, expertise and consultations on designated subjects pertinent to FAO headquarters, field projects and member countries. FAO also assists in the organization and implementation of training activities.
As part of their emergency disease preparedness planning, countries should establish and maintain contact with appropriate reference laboratories and collaborating centres. In the case of reference laboratories, they should determine the nature and range of diagnostic specimens or isolated agents that should be sent for confirmatory diagnosis or further characterization, specify any means of transport to be added, the method of packaging and refrigeration and the labelling of packages, including correct address and any necessary customs or IATA declarations. This information should be carefully documented.
It is important that potential or confirmed aetiological agents from emergency disease outbreaks be sent to the appropriate international reference laboratory for further characterization. It is recommended that several isolates taken from different geographical locations and at different phases of the outbreak be forwarded to the laboratory. Characterization studies at the reference laboratory will help to select the most appropriate disease control and eradication programmes, including the right vaccine for the situation. Furthermore, molecular epidemiology studies (based on nucleotide sequencing and preparation of phylogenetic maps or dendrograms) will allow detailed comparisons to be made with viruses or other agents from other geographical areas, thus throwing light on their origins and spread on a regional or global scale.
Full use should also be made of reference laboratories and collaborating centres for the help that they can provide for training opportunities, provision of specialized advice in planning and standardized diagnostic reagents, etc.

International disease reporting

International Office of Epizootics (OIE)

OIE has obligatory disease reporting requirements for member countries. This should be factored into emergency disease preparedness plans. A staff member in the national veterinary headquarters should be responsible for preparing draft international disease reports, for OIE and elsewhere, to be approved by the CVO. The head of the epidemiological unit would generally be the most appropriate person to carry out this function.
In brief, countries should notify OIE within 24 hours of any of the following events:
· for List A diseases: the first occurrence or recurrence of a disease, if the country or region of a country was previously considered to be free of that particular disease;
· for List A diseases: important new findings which are of epidemiological significance for other countries;

· for List A diseases: a provisional diagnosis of a disease if this represents important new information of epidemiological significance for other countries;
· for diseases not on List A, if there are new findings of exceptional significance for other countries.
Thereafter, weekly reports should be sent to OIE to provide further information on the evolution of the disease incident until the disease has been eradicated or the situation stabilized.
Monthly reports should be sent regarding the absence or presence and evolution of diseases in List A, and findings of epidemiological importance for other countries with respect to those diseases not on List A. Annual reports should be sent on all diseases in Lists A and B and on any other diseases considered to be of socio-economic importance or of major veterinary interest.

Regional organizations

There are several regional organizations that have been established, inter alia, to coordinate livestock disease control programmes at a regional level, foster international cooperation on animal health issues and facilitate safe international trade in livestock and livestock products.
These organizations may require their member countries to report and share information on diseases. Examples of such organizations are :
· Regional Animal Production and Health Commission for Asia and the Pacific (APHCA)
· Organization of African Unity/Inter-African Bureau for Animal Resources (OAU/IBAR)
· Pan-American Foot-and-Mouth Disease Center (PANAFTOSA)
· Regional Animal Disease and Surveillance Control Network (RADISCON)
· Southern African Development Community (SADC)
· Southeast Asia Coordinating Group for the Control of Foot-and-Mouth Disease
· South Pacific Community (SPC)
· Gulf Cooperation Council (GCC)

FAO EMPRES livestock programme

A global early warning system is being established for transboundary animal diseases within FAO's EMPRES programme. This will be part of TADINFO and is designed to complement the OIE system. Its purpose is to support national and international animal disease control efforts rather than trade (as in the OIE system).
Epidemiological data for global TADINFO will be sourced from regional reporting systems, OIE, reference laboratories, SID (the IAEA sero-surveillance database) and from various unstructured sources such as consultant reports and PROMED postings. This is planned for use not only as a historical disease database but also as a disease mapping and geographic information system (GIS) that will allow epidemiological analyses to be carried out on the mechanisms of the international spread of TADs.
National animal disease emergency planning committees should establish a regular working relationship with the EMPRES group at FAO headquarters in order to obtain the full benefits of the TADINFO system in obtaining early warning of disease threats and for assistance in developing prevention and contingency plans against these diseases.

Special arrangements with neighbouring countries and trading partners

Transboundary animal diseases by definition do not respect borders and can spread rapidly from country to country. Neighbouring countries should therefore cooperate closely in the control of these diseases. Unless this is done the disease control efforts of individual countries will be continually frustrated. Part of this cooperation should be the rapid sharing of information on the occurrence of new diseases and on the spread of existing epidemic diseases to new areas, particularly near shared borders. Arrangements should be made for this information to flow not only between the respective CVOs, but also at a local level between contiguous district or regional veterinary offices along the borders.
Similarly, arrangements should be made for the rapid flow of disease information between the CVOs of major trading partner countries for livestock and livestock products.

Chapter 5

Early reaction contingency planning - principles and strategies

Early reaction is to carry out without delay the disease control activities needed to contain the outbreak and then to eliminate the disease and infection in the shortest possible time frame and in the most cost-effective way, or at least

to return to the status quo that existed previously and to provide objective, scientific evidence that one of these objectives has been achieved.
It is far too late to leave the planning of an emergency disease eradication or control programme to the time when a disease outbreak has actually occurred. There will then be intense political pressure and pressure from livestock farmer groups for immediate action. In such a climate mistakes will be made, resources misused, deficiencies rapidly highlighted, and there will be unavoidable delays resulting in further disease spread and higher costs - unless there has been adequate forward planning and preparation.
This chapter first highlights the importance of effective quarantine services for the prevention of exotic animal diseases. It then describes the principles and strategies of epidemic livestock disease control and eradication that need to be taken into account in the preparation of early reaction contingency plans.

Preventing the entry of exotic animal diseases

The old maxim that "prevention is better than cure" is particularly relevant to exotic animal diseases. Quarantine should be regarded as one of the most important core functions of government veterinary services. Transboundary and other exotic animal diseases can be introduced to countries in many ways. These include entry of infected animals or germplasm (semen or ova), entry of contaminated animal products or biological products (e.g. vaccines), contaminated food waste from aircraft or ships, infected people (in the case of disease transmittable to animals), migrating animals and birds, or even by natural spread of insect vectors or by wind currents. While governments may be powerless to prevent some of the latter methods of disease introduction, the others can be considerably mitigated by efficient quarantine services.

Quarantine programmes should include the following:

· International border controls to prevent the smuggling or uncontrolled entry of animals, animal products and other potentially dangerous goods. At the same time, border programmes should provide a legal method for entry of the above through sound animal health certification and pre- and post quarantine. Licencing of traders may be considered. Sensitivity will be necessary when there are uncontrolled animal movements across borders because of nomadism, transhumance, influx of refugees, etc. as harsh quarantine restrictions may just encourage smuggling and be counterproductive.
· Import quarantine. Quarantine conditions should be negotiated with exporting countries for the safe importation of animals, germplasm and animal products. This will include pre-export testing and quarantine, animal health certification, and any necessary post arrival inspection, testing and quarantine. The OIE International Animal Health Code for Mammals, Birds and Bees provides guidelines for such programmes.
· Quarantine inspection of people and goods arriving at international airports and seaports.
· Safe disposal of international aircraft and ship food waste through incineration or deep burial.

General principles of epidemic livestock disease control and eradication

A number of basic approaches may be used to control and eliminate epidemic livestock diseases. They are usually used in combination. The weighting that is given to the different approaches will be determined by the nature of the disease in question, the epidemiological circumstances and their acceptability and cost.
The approaches to be used are summarized below.

Denial of access of the disease agent to susceptible host animals

This may be achieved by:
· Applying good hygiene and sanitary practices when handling livestock. This includes disinfection of all personnel and equipment. In this context, veterinary services should note that there have been several well-documented cases of highly contagious diseases such as FMD being spread from farm to farm by veterinarians on their rounds.
· Removing potentially contaminated materials from the environment, by disinfection, destruction and /or safe disposal. This includes cleaning and disinfection of premises that have housed infected animals, destruction of contaminated feedstuffs and other materials and burial or burning of the carcasses of infected animals.
· Preventing the feeding of contaminated materials to livestock. Many diseases can be transmitted in this way. The classical example in recent years has been bovine spongiform encephalopathy (BSE). However, entry into the food chain is an important method of perpetuation and spread of other important animal pathogens, particularly by swill feeding. These include FMD, African swine fever, hog cholera (classical swine fever) and swine vesicular disease. These diseases have spread not only from farm to farm but from continent to continent. Controls on swill feeding by either enforcing strict bans on swill feeding of animal tissues to animals or allowing only the feeding of heat-treated

swill to animals should be an integral part of the prevention and eradication of a number of epidemic livestock diseases including those mentioned above.
While the other approaches to be described could be considered as subsets of denying access of the disease agent to susceptible hosts, they are conveniently considered separately.

Avoiding contact between infected and susceptible animals

This is one of the most important approaches and may be achieved by:
· Quarantining of infected or potentially infected farms or areas. A ban or appropriate animal health restrictions are placed on the movement of susceptible species animals into or out of the quarantined area until infection is considered to have been removed. Restrictions may also be placed on the movement of people, potentially contaminated animal products and other materials.
· Imposing livestock movement controls. These are usually imposed over a wider area around the immediate quarantined or infected area, as part of a zoning policy (for example, within surveillance or control zones). With such controls the movement of susceptible species is only permitted under strict, designated conditions when it is deemed safe. This may include the transport of livestock direct to abattoirs for immediate slaughter for those diseases that are not transmitted by meat or other animal products. There may also be bans or restrictions placed upon congregations of susceptible animals such as at livestock markets or race meetings.
· In some cases, through erecting large-scale fencing or other physical barriers. However, potential adverse effects, such as disruption of wildlife habitats and of traditional movements of people and their animals, should first be evaluated.

Removing infected and potentially infected animals

This is often referred to as an eradication policy. Susceptible species on infected farms or in designated infected areas are immediately slaughtered on site and their carcasses disposed of safely, usually by burial or burning. It is often combined with cleaning and disinfection procedures for the infected premises. Because of the rapid spread of epidemic diseases, all susceptible animals are slaughtered, whether obviously infected or not. For some infectious disease control programmes, such as for brucellosis and tuberculosis, it is possible only to slaughter animals that have been tested positive, but this is not appropriate for rapidly contagious epidemic diseases.
A component of an eradication policy may also be selective reduction of susceptible wild and/or feral animal populations in infected areas, but before embarking on such a programme a careful evaluation should be made.

Reducing the number of susceptible animals

This is an important approach used in many countries. In emergency disease control it is usually achieved by vaccination of susceptible animals. Vaccination may be done selectively (for example as "ring vaccination" around infected areas) or as "blanket" vaccination programmes in susceptible animal populations. Depending on the nature of the disease and of available vaccines, it may be possible to eliminate infection completely. More usually vaccination is used to reduce the level of infection in animal populations to an acceptably low level where other disease elimination policies are more feasible. In fact, in some cases routine vaccination may mask underlying infection in animal populations.

Reducing access of vectors to susceptible animals

This may be appropriate for insect-borne diseases and, in some cases, may be achieved by reducing vector numbers in an area by treatment and/or elimination of potential breeding sites. Large-scale insecticide spraying is generally too costly, ineffective in the long term, and/or environmentally unacceptable. Other approaches might be to treat susceptible animals with long-acting insecticides during critical periods or remove animals from high-activity insect vector areas either continuously or during times of the day or year when insect vectors are most active.

Biological control

To date, there has been only one emergency disease situation for which biological control has been proven. This has been for the New World screwworm fly (Cochliomyia hominovorax) in the Americas and North Africa using the sterile insect release method (SIRM). SIRM techniques are also currently under evaluation for the Old World screwworm fly (Chrysomia bezziana).

Strategies for epidemic livestock disease control and eradication

Containment first

Containment of an outbreak of an epidemic disease is the first priority. Stabilizing the situation is the prelude to eradication.

In order to contain the outbreak, one must be able to determine where the disease is - which farms or areas are infected and which are free. This means that all the active disease surveillance procedures discussed in Chapter 4 should be put immediately into effect. There needs to be an intensive search for new foci of infection for the disease, with priority given to:

· following up any reports or rumours of the disease;

· regular (preferably daily) disease surveillance visits to farms or farming communities close to known foci of infection - in designated surveillance zones (see below);

· following up epidemiological tracebacks. These are new animals that have been brought on to the infected farm in the period immediately before the disease was first noticed and that may have been the source of infection. Their origin must be identified, together with any other locations that they may have infected during transit, and investigated for the disease;

· following up epidemiological traceforwards. These are animals that have left known infected farms during the critical period when they may have been in contact with infected animals. These animals may be spreading the disease to new areas so that the farms to which they have gone must be identified and investigated,

· surveillance of any animals that have congregated with known infected animals over critical periods for transfer of infection, e.g. at common watering-points or pastures and markets;

· any high risk areas for spread or occurrence of the disease that have been identified by epidemiological analysis. An example may be Rift Valley fever - those areas that have similar climatic features and build-up of mosquito vector populations to places where an outbreak of RVF is occurring.

As can be appreciated, the task of following up tracebacks and traceforwards and other epidemiological leads becomes very complicated if, for example, suspect animals have been through livestock markets. This points to the need for countries to have in place livestock identification mechanisms or at least effective "paper trails" (e.g. movement permits) for animals that have been sold or moved.

As new foci of infection are identified, starting from where the disease was first detected, appropriate disease control actions must be put into place immediately and strictly enforced to prevent further spread of the disease from these foci. In most cases this will involve quarantining the infected farm or area and placing bans or restrictions on the movement of susceptible species animals and dangerous animal products or other materials in surrounding zones. The disease control/eradication strategies selected for the particular disease (e.g. eradication or ring vaccination) are then carried out.

Zoning

The proclamation of geographic areas in which specific disease control strategies are to be carried out is known as "zoning". Zoning almost always takes place in the form of concentric "circles" around known or suspected foci of infection, with the most intensive disease control activities in the inner zones. The actual size and shape of the zones may be determined by administrative boundaries or geographic barriers or be driven by epidemiological or resource imperatives. The nature of the disease control zones and the activities carried out in each zone are dependent on the particular disease control/eradication strategy selected. These are described in the next sections.

Finally, disease-free zones or regions of the country may be declared. In these, the emphasis of surveillance shifts from detecting infection to proving freedom from infection. More emphasis thus should be given to such techniques as sero-surveillance. In the early stages of a disease eradication campaign, while the extent of the disease is still being assessed, it could be expected that the disease control zones are comparatively large and the disease-free zones comparatively small. As the disease control campaign progresses, it is to be hoped that the situation would reverse with the ultimate aim of the whole country being declared disease free.

Zoning is now recognized as an important principle in the definition of the animal health status of countries by OIE.

Stamping out by slaughter of affected herds or flocks

This is usually the most efficient method for the rapid elimination of an introduced exotic or other emergency disease. It is also often the most cost-effective. Not only is the disease eradication campaign shorter and achieved for a lower overall cost, but there is a much shorter waiting period before the country can be recognized as being free of the disease and the export of livestock and animal products resumed.

Several social, economic and other factors need to be carefully evaluated before eradication is selected as the desired strategy for any specific disease contingency plan. These factors include:

· whether or not slaughter of infected animals is likely to gain general community acceptance on religious, ethnic, animal welfare and other social and economic grounds;

· any comparative advantages and disadvantages and likely success of implementation of other strategies. In this context, vaccination should not be available for some epidemic livestock diseases so that eradication is the only viable option. African swine fever is a typical example. At the other end of the spectrum, eradication is unlikely to have much beneficial effect. This particularly applies to insect-borne diseases such as Rift Valley fever and bluetongue;

· whether or not the human resources, equipment and other physical resources are available to carry out all the activities needed for the implementation of a disease eradication campaign properly (see below). While eradication is likely to be less costly and more efficient overall, it may be quite resource-intensive in the short term;

· whether adequate provisions and mechanisms are available for the fair and quick compensation of owners for any livestock or property destroyed in the campaign. This is discussed more fully in Chapter 6.

In an eradication campaign, activities carried out in designated disease control zones are described below.

Infected premises

It is here that the disease has actually been detected and includes all areas where there are susceptible animals that could have become infected through contact with the diseased animals. The premises may be a single farm, household, or herd/flock, but could also be an entire village, settlement, common grazing land or even livestock saleyards. Activities to be undertaken are itemized below.

1. The infected premises are immediately quarantined with a complete ban on the movement in or out of susceptible species animals, animal products and potentially contaminated materials.

Where necessary, this may be supported by disinfection/decontamination of persons, vehicles, equipment and other materials leaving the premises.

2. All susceptible species animals are immediately slaughtered, whether they are obviously infected or not. The animals should be slaughtered by methods that take account of animal welfare concerns and the safety of operatives. Rifles, captive-bolt guns or lethal injections (e.g. barbiturates) are most commonly used. For poultry, gaseous mixtures are often the preferred method. A mixture of at least 70 percent carbon dioxide in air in a sealed container is the most efficient, although carbon monoxide from vehicle exhaust pipes may also be used (provided adequate safety precautions are taken). Neck dislocation, either by hand or by mechanical devices may also be used for birds.

3. Carcasses of all animals that have either been slaughtered or have died naturally of the disease are disposed of safely so that they no longer constitute a risk for further spread of the pathogen to other susceptible animals either by direct or indirect means, e.g. by carrion eaters or scavengers or by contamination of food or water. This is most usually achieved by deep burial (depending on such factors as the nature of the terrain, closeness of water-tables to the surface, and availability of earth-moving equipment) or by burning (depending on such factors as availability of suitable fuels and the danger of starting grass or bush fires). If in situ disposal is not practical it may be possible to transport carcasses to a common disposal point in sealed vehicles. This should be done within the infected area (see below). Rendering of carcasses may also be satisfactory provided destruction of the pathogen can be guaranteed. Incineration is generally too expensive, except in special circumstances, e.g. for BSE. It may also be necessary to dispose safely of potentially contaminated animal products held on infected premises, e.g. meat, hides, wool, dairy products or eggs, depending on whether such products constitute a risk for transmission of infection. In some circumstances it may be safe to retain these for home consumption.

4. Premises must be decontaminated. The environs of the infected premises, particularly where animals have congregated, must be thoroughly cleaned and disinfected. This includes animal houses, sheds, pens, yards, water troughs, etc. Potentially contaminated materials such as manure, bedding, straw and feedstuffs should be removed and disposed of as for carcasses. Appropriate disinfectants must be selected for each disease. These may consist of soaps and detergents, oxidizing agents, alkalis, acids, and/or aldehydes. Insecticides should also be used to prevent the transfer of contamination by flies.

5. After slaughter, disposal and decontamination procedures are completed, the infected premises are left destocked for a period that is determined by the estimated survival time of the pathogen in the particular environment. As a general rule, this is shorter in hot climates than in cold or temperate climates. However, a minimum for any disease is 21 days.

6. Partial or complete restocking of susceptible animals in the infected premises is then allowed. However, these animals are kept under close surveillance and, provided there is no evidence of infection for a period equivalent to say two incubation periods for the disease, the premises may be released completely from quarantine.

Dangerous contact premises

These are premises where overt disease has not yet appeared, but for which epidemiological investigations indicate that there is a high likelihood that infection has been introduced. This circumstance might occur with an immediate neighbour to infected premises that have introduced animals from infected premises during the critical period for transfer of infection. A worst case scenario of a highly contagious disease being detected in a livestock market may lead to many dangerous contact premises.

These premises are put under the same tight quarantine as infected premises and are subject to intense surveillance (at least daily). Provided there is no evidence of infection, they may be released from quarantine after a period equivalent to at least two quarantine periods for the disease.

In certain circumstances a decision may be taken to slaughter animals from dangerous contact premises.

Infected zone

This is the area immediately surrounding infected premises. While its size and shape are influenced by topographical features, physical barriers, administrative borders and epidemiological considerations, OIE recommends that it be at least a 10-km radius around a disease centre in areas with intense livestock raising and 50 km in areas where extensive livestock raising is practised. Activities to be undertaken are itemized below.

1. Strict controls should be maintained on the movement of susceptible species animals and potentially contaminated animal products into or out of the infected zone. These should preferably be banned or only allowed in circumstances where there is no risk of further transmission of infection. An example might be the direct transport of apparently healthy animals to an abattoir for immediate slaughter, in the case of disease agents that are not transmitted by meat (e.g. CBPP and rinderpest). Local salvage could be considered for such diseases if warranted by circumstances.
2. Intensive surveillance is undertaken, ideally involving daily clinical inspection of susceptible species animals on all farms or other livestock premises in the zone. Inspection teams should wear protective clothing and practise good personal disinfection when leaving the premises. If wildlife or feral animals are likely to be involved, arrangements should be made with wildlife authorities for disease surveillance to be undertaken. In the case of avian diseases, arrangements may be made for a daily dead bird pick-up service (in sealed plastic garbage bags or the equivalent) from poultry farms, with these being taken back to the laboratory for autopsy and diagnostic tests. Surveillance should also be extended to include commercial and hobby aviaries.
3. Closure of livestock markets and other congregations of susceptible species (e.g. race meetings and livestock). A decision on whether or not to close risk enterprises, such as abattoirs and dairy factories located in the infected zone, should be made after careful consideration of epidemiological and other factors, i.e. whether they constitute a significant threat for further spread of the disease. However, in some cases, there could be advantages in keeping the enterprise open as this tends to keep animals within the zone and retain the economic viability of the affected community. Strict zoosanitary codes of practice should be enforced in this case.
4. Publicity campaigns should be carried out to inform people of the nature of the disease and of the restrictions in place.

The infected zone should be left in place for as long as it is reasonably expected, on the basis of epidemiological evaluations, that infection may still be present. However, there is a risk in maintaining restrictions for too long as resentment may build up in the community, with a resulting reluctance to maintain the livestock movement bans and other restrictions.

Surveillance (or control zone)

This zone is much larger and surrounds one or more infected zones. It may cover a whole province or administrative region (or clan or tribal area). Activities undertaken are described below.

1. There is enhanced active disease surveillance in the control zone. Herds and flocks should be inspected at about weekly intervals and this inspection should be supplemented by serological surveys.
2. Livestock movements into or out of the control zone are allowed, but livestock movements out of the control zone should be subject to permits after clinical examination of the animals.
3. Risk enterprises are allowed to operate but are subject to strictly enforced zoosanitary codes of practice.
4. Livestock markets and other congregations of animals should be suspended if they are considered to constitute a considerable threat for the further spread of the disease. If they are allowed to continue they should be subject to surveillance and rigidly enforced codes of practice.
5. Publicity campaigns should be carried out.

Vaccination supplemented by other disease control measures

Well-planned, comprehensive vaccination programmes, supplemented by other disease control measures, can go a long way towards eliminating many epidemic livestock diseases. This may be the strategy of choice in areas where large-scale eradication is unacceptable for one reason or another.
There are a number of important issues to be evaluated before selecting a vaccination strategy. These issues are described below.

Vaccine type

Different types of vaccine may be available and their comparative advantages and disadvantages should be evaluated. Live attenuated vaccines generally provide a more durable immunity and require fewer doses. However, assurances need to be obtained that the vaccine has been thoroughly tested on the types of animals for which it is to be used and it has been found to be safe and free of potential problems with teratogenicity if administered to pregnant animals, reversion to virulence or re-assortment/recombination with field strains. Some live vaccines (e.g. oral Newcastle disease vaccine) can be administered in ways that involve little or no handling of animals.
Inactivated (killed) vaccines should be safe in all circumstances. However, they often require two doses in a primary immunization course, together with periodic booster doses. Several new-generation genetically engineered vaccines show great promise, but few have yet come to commercial reality.
For epidemic livestock diseases such as FMD for which the causal agent exhibits antigenic variation, it is important to select the correct antigenic type and subtype vaccine in order to achieve good levels of immunity. Field isolates of the agent should therefore be regularly collected from different parts of the country and submitted to a world or regional reference laboratory for antigenic characterization. The most appropriate vaccine strain(s) can then be chosen.

Vaccine quality

There have been several well-documented disasters where vaccines have actually caused the diseases that they have meant to prevent, often in previously free areas. This has happened because killed vaccines have been improperly inactivated and because both live and killed vaccines have been contaminated with virulent virus, perhaps through cross-contamination with challenge virus cultured in the same laboratory. Just as serious has been the use of ineffective vaccines, which have either lost their potency or perhaps were never potent even when they left the manufacturer. Not only does this cause waste of money and scarce resources, but also leads to a false sense of security.
Vaccines should always be sourced from highly reputable manufacturers who follow internationally accepted quality assurance procedures and codes of good manufacturing practice. The manufacturers should be subject to approval and quality control verification by independent national or international biological control authorities.

Vaccination cover

The aim in vaccinating a population of animals is not only to protect the animals that are actually immunized, but also to cut down the rate of transmission of the pathogen in the target population to a level where infection is no longer sustained in that population. The latter is often referred to as herd immunity and a 70 percent vaccine coverage quoted as the figure to achieve this, but in many cases the justification is somewhat vague. In fact, in some cases, including FMD, it has been shown that a higher vaccination cover is required to achieve really good herd immunity.

Vaccine protection

The ideal vaccine not only protects animals from the clinical disease if they are subjected to challenge by the disease agent in the field, but also prevents infection and virus growth. Not all vaccines match this ideal and a proportion of animals can develop a silent infection, especially in the respiratory tract after nasal aerosol challenge. Fortunately, virus multiplication is generally at a lower level than in unimmunized animals and the excreted virus is usually insufficient to establish transmission. However, in partially and suboptimally immunized populations the virus can continue to circulate within the non-vaccinated sector of the population. Thus, the impact of the disease can be reduced to a point where mortality is unremarkable against the normal background level of disease from diverse causes, particularly under extensive range management. Once vaccination ceases and the level of herd immunity falls, the disease becomes more visible. For this reason it is necessary to maintain enhanced active disease surveillance to detect any possible breakdowns until well after vaccination campaigns are stopped and freedom is confirmed.

Vaccine storage and application

Vaccines must be stored at the correct refrigeration temperature at all times and used before expiry dates. This means that cold chains must be maintained for vaccines up to the time of their injection. Inactivated vaccines may require more storage space, as the dose volume is generally larger than for live attenuated vaccines. Heat-stable, live vaccines, if available, reduce cold storage problems.

Too often, injection of vaccines in the field becomes a hit or miss affair because animals are inadequately restrained. Vaccination teams must be trained in proper techniques and equipped to restrain animals properly.

It may be possible to give more than one vaccine at the same time, either at different sites or in the same injection, thus saving resources and possibly improving the acceptability of the vaccination programme to farmers. However, manufacturers should be consulted to determine whether this practice is safe and efficacious.

Vaccination and disease surveillance

Vaccination campaigns may complicate disease surveillance activities in two ways. First, if vaccination campaigns are not carried out in a comprehensive way and there is a mixture of immunized and unimmunized animals in the population, clinical surveillance may be more difficult. This is because the disease, if present, may be very unevenly distributed. Second, there are few serological tests available that can discriminate between antibodies that have been derived from vaccination or from natural infection. Therefore interpretation of the results of serological surveys may be difficult. This problem can be alleviated somewhat by having a permanent identification system for vaccinated animals, so that it is at least known whether or not an animal has been vaccinated if it gives a positive or doubtful result to a serological test.

Vaccination programmes may be used as a tool for the elimination of epidemic livestock diseases in different ways, as described below.

Ring vaccination

Ring vaccination is the rapid creation of an immune belt around an infected area and may be carried out to contain a rapidly spreading epidemic disease outbreak or in situations where the effectiveness of other methods to prevent the spread of the disease in and around infected zones, e.g. quarantine and livestock movement controls, cannot be guaranteed, or where these areas may be relatively inaccessible. A decision to implement ring vaccination needs to be made quickly or else the size and number of infected areas may make this unmanageable. The width of the immune belt should be determined by epidemiological factors and resource availability considerations but, as a general guide, should be of the order of 20-50 km. Speed is of the essence and vaccination in the target ring should ideally be completed within a week or so. It is preferable to select a narrower ring for which human resources, vaccines and other resources are available for comprehensive vaccination within this time frame rather than to select a larger ring where gaps may be left in the immune belt for longer periods. The vaccination ring would then be extended later as necessary. Having selected the target area for the ring, vaccination should commence at the outer circumference and move centripetally towards the infected herds or flocks. Separate vaccination teams should be used for herds/flocks in which there is a high suspicion of infection.

Ring vaccination should be supplemented by other disease control measures including disease surveillance, livestock movement controls and, where possible, quarantine of infected premises. The movement of susceptible species animals into or out of the combined infected/ring vaccination zones should not be permitted. Livestock markets and other congregations should also be suspended in this area. Intensive disease surveillance should be carried out within and around the infected/ring vaccination, with the greatest concentration of effort being in the area immediately surrounding the vaccine ring.

A decision could be taken to extend the vaccination ring inwards or, if necessary, to have a second outer vaccination ring.

Blanket vaccination

This involves the comprehensive vaccination of all susceptible species animals over a larger area. It may be the preferred option when the disease outbreak has become well established and there are multiple foci of infection, or when other disease control methods are impractical for one reason or another. The vaccination area should cover known and suspected infected areas together with those areas considered to be at high risk for spread of the disease. The latter may include known livestock movement routes. It may be necessary to carry out several rounds of vaccination over a few years in the target area, until the clinical disease apparently disappears, or the incidence is at least reduced to a level where other disease control measures can be followed.

The vaccination campaign should be supplemented by heightened disease surveillance activities both inside and outside the vaccination area(s), together with publicity programmes. The movement of animals from vaccinated areas to disease-free areas should be regulated in such a way as to minimize the possibility of spread of infection.
Whichever vaccination programme is selected, the following guidelines should be followed:
1. The purposes of the vaccination programme should be carefully defined and the programme targeted to meet the desired objectives. If the national goal is eradication on a regional or country-wide basis, vaccination should not be allowed to become merely a routine activity of government veterinary services.
2. Having selected the target animal population and area, the vaccination should be carried out as comprehensively as possible, with the target as close to 100 percent vaccination cover as practicable.
3. Different vaccination teams should be used for herds/flocks that are known or thought to be infected and those that are thought to be free. This is to minimize the possibility of spread of the disease.
4. For the same reason, groups of animals from different herds should not be congregated together for vaccination.
5. Vaccinated animals should be permanently identified as such, even if this involves something as simple as ear-notching.

Mixed strategies

Although the previous two strategies have been presented as alternatives, they are not mutually exclusive. It is quite sound to combine elements of both to suit different epidemiological or resource availability circumstances or to suit different phases of an eradication campaign.
For example, it may be decided to slaughter infected herds or flocks and then to use ring vaccination in a control zone around these, or targeted vaccination in other strategically important areas. One disadvantage is that it will complicate the interpretation of disease surveillance, particularly that of serological surveys. However, a combination of eradication and vaccination may well be selected in a number of countries or areas where there may be some doubt about the ability to maintain strict quarantine or animal movement controls or where there are inadequate resources for comprehensive disease surveillance. Vaccination may also be used to dampen down the rate of spread of an epidemic disease to the point where "stamping out" can be applied.

Strategies for dealing with special circumstances

Nomadism and transhumance

The presence of an epidemic disease in highly mobile cattle herds and sheep and goat flocks in the semi-arid lands complicates the eradication process greatly.
Nomadic and transhumant pastoralists are among the most knowledgeable of livestock farmers and they are amenable to cooperation with veterinary authorities if their confidence has been gained and they are given the opportunity to participate actively in decision-making. Many are amenable to quarantine procedures as a part of their traditional disease management practices, providing these are carried out sympathetically with full consultation. This is important because changes in climate and weather, which have profound implications for the seasonal availability of feed and water, may affect their willingness to conform to quarantine regulations. Virtually all pastoralists are now familiar with the value of vaccines in controlling major epidemic diseases.
Confidence building achieved largely through communication and improvements in the veterinary-farmer interface must start well in advance of any disease emergency. It is a most important and fundamental activity of animal health services. A specialist unit of veterinarians and livestock production specialists is desirable to develop and implement strategies for animal health service delivery to such communities. Livestock graziers' organizations (or similar cooperative organizations representing the interests of pastoralists) and participatory animal health programmes involving community animal health workers have an important role in building confidence and cooperation as well as in undertaking many of the actions of disease control.
Mapping of migration routes and an understanding of the factors that drive migrations are the keys to anticipating future livestock movements and managing the risk of disease introduction.
Should a disease emergency involve migratory communities, it is essential to involve community elders in decision-making and implementation of control activities from the outset.

Insecure or otherwise inaccessible areas

Relative inaccessibility of areas as a result of natural causes (climate or topography) or insecurity resulting from civil unrest present a major challenge to the successful control and elimination of epidemic diseases.
These areas often share a number of characteristics:

· they are remote, often inaccessible by road and distant from centralized services and may be inhabited by transhumant agropastoralist people who see other agricultural work as a supplement to their livestock-raising activities and/or they may be inhabited by nomadic pastoral people;
· they may be inhabited by people with a well-established traditional way of life who are disinclined to change and whose decision-making processes are complex as they take into account climate, economic considerations (both monetary and non-monetary), social concerns, political factors, legal constraints or incentives and other ecosystem variables;
· they are experiencing civil conflict, resulting in insecurity, displacement of people, loss of assets, greater need to remain mobile and to varying degrees breakdown or stress to traditional social structures;
· they have been marginalized in that the inhabitants have relatively little development contact in terms of education, outside trade and government services, including veterinary services.

These characteristics have precluded the successful implementation of conventional vaccination programmes which have a "top-down" approach with predetermined targets for vaccine coverage and sero-surveillance results, a tight time schedule for predefined activities and contact with communities is primarily only through local officials. Such a model fails to accommodate the dynamics of special action areas and lacks the inherent flexibility required to work in such areas. It is now realized that approaches that use local community-based participation are more likely to succeed. The participatory-based approach to the elimination of disease and the provision of animal health services promotes decentralized, community-based and privatized delivery of vaccination and other animal health services. These should be under the general supervision of official veterinary services. To carry out a successful disease eradication programme in a special action area, a thorough understanding of the complexities of the area and positive interaction and dialogue with a substantial cross-section of the local community are required. The use of thermostable vaccines, which are less reliant on refrigeration, is preferred, if these are available.

Wildlife or feral animal involvement in epidemic livestock disease outbreaks

This situation complicates emergency disease responses. The actual role of wild or feral animals in the epidemiology of the disease should first be considered. In some diseases they may act as a reservoir for the disease and be a genuine threat for transmission of infection to domestic animals, but in others they may simply be acting as an indicator of infection that is already occurring in livestock in the area.

Reduction programmes for susceptible wild or feral animals may be possible in infected areas, but may be precluded on ecological or environmental grounds. If attempted, care must be taken to ensure that such programmes do not simply act to disperse potentially infected wildlife to new areas. Wildlife vaccination has been extremely successful in eliminating fox rabies from some regions, but as yet has very limited application in other diseases.

It may be possible to limit contact between susceptible wild and domestic animals and thereby reduce the chances of transfer of infection from one to the other. This could be done by fencing, livestock-free buffer zones or removing livestock from epidemiologically important wildlife. In the case of epidemic poultry diseases such as highly pathogenic avian influenza (HPAI) and virulent Newcastle disease, poultry sheds can be wire-netted or otherwise sealed to prevent direct access of wild birds. Steps should also be taken to prevent faecal contamination of poultry feedstuffs. In the case of HPAI, faecal contamination of water supplies by wild water-birds is an important source of infection for chickens and other domestic poultry. This may be prevented by using water from town-water or underground water supplies. Alternatively, water drawn for poultry farms from dams, lakes or rivers where water-birds congregate, may be treated by chlorination to remove any HPAI virus contamination.

If none of these measures are likely to be practicable and/or successful, it will probably be necessary to mount ring or blanket vaccination programmes for livestock in those areas where infection in wildlife constitutes a continuing threat.

As already stated, surveillance activities should be extended to wild and feral animal populations, in collaboration with wildlife authorities.

The end game - verified freedom from infection

This is often the most critical phase of the eradication campaign and occurs when the clinical disease has apparently disappeared. If the wrong actions are taken at this stage and undetected pockets of infection are left, many of the benefits that have accrued from the eradication campaign may eventually be lost.

Governments may make one of two potentially bad decisions at this stage unless they are properly advised. The first is that they may decide that since the clinical disease has waned or disappeared, the socio-economic losses are over and the scarce financial and other resources expended might be better diverted elsewhere. If disease control activities are prematurely wound down leaving undetected infection, the disease is likely to flare up into further serious outbreaks as immunity levels in animal populations decline. The second, at the other end of the spectrum, is that routine disease control programmes such as annual vaccinations may be maintained indefinitely because of the

fear of the political consequences if vaccination is stopped and there is another outbreak. In this case there will be a lasting economic burden from the control costs.

In both cases the export trade opportunities that may flow from having an internationally recognized disease-free status will not be available.

When the clinical disease appears to have disappeared from either a region of a country or the whole country it is time to take stock of the situation and to carry out a thorough epidemiological and economic assessment of future options.

It may well prove desirable to maintain strategic vaccination if there is still a high risk of a new incursion of the disease from a neighbouring country, for example. On the other hand it is often advantageous to change direction completely by stopping vaccination programmes altogether and moving to a disease search-and-destroy policy. This does not necessarily mean that fewer resources will be devoted to combating the disease in the short term. Rather they will be directed away from routine vaccination to increased activities directed to early warning and early response. There must be a willingness to enhance active disease surveillance activities and to maintain preparedness against the disease at a high level. In this way any disease breakdowns can be detected and eliminated quickly before they have done much harm by either a short, sharp targeted vaccination campaign or by eradication procedures. If the latter strategy is followed, it should be possible to declare provisional freedom from the disease after a suitable period following the cessation of vaccination. After further periods, declarations of freedom from the disease and finally from infection may be made to OIE. This is subject to demonstrated evidence of a high level of clinical surveillance and the carrying out of well-planned serological surveys giving negative results. At the stage where searches are being made for the last possible pockets of infection, consideration could be given to offering monetary or other forms of reward to persons reporting a clinical episode of what might be the disease in question or for actually finding the disease. However, the advantages and disadvantages should be carefully evaluated before embarking on this course.

Recommended standards for epidemiological surveillance in order to make declarations of freedom have been laid down by OIE for both rinderpest and CBPP (commonly known as the OIE "pathways"). These pathways are shown in Appendix 3.

It is of course possible to foreshorten considerably the periods for declarations of freedom to be made if a "stamping out" policy has been followed.

PRIORITIZATION IN NATIONAL EMERGENCY DISEASE ERADICATION PROGRAMMES

Much of the discussion in this chapter has been based on the presumption that an emergency disease outbreak has been detected relatively early and is still only present in one or a few separate pockets. Many countries are not in this fortunate position and have to contend with an epidemic livestock disease that has become well established in the country, and may well have been present for a number of years. In these circumstances, commencing a national disease eradication campaign that covers the whole country at once may be neither practical or wise. The spreading of resources too thinly over too large an area may result in overall setbacks and frustrations.

It may well be more effective in the long term to tackle the eradication in a step-by-step progression moving from one region to the next. In this case regions should be defined and selected on the basis that once eradication has been achieved in one region, and the campaign moves on to the next, there can be confidence that the disease will not re-enter the first region. Geographic barriers should be utilized wherever possible. In this respect, archipelago countries are fortunate in that the eradication can take place as an island-hopping campaign. Otherwise utilization should be made of any epidemiological or livestock production and marketing patterns that tend to make an area a discrete unit in terms of disease spread.

Next is the question of prioritization - which region(s) to tackle first. There is merit in selecting the major livestock breeding areas in the country since they are often important source areas for the disease, and livestock movements (and possibly infection) tend to spread centrifugally from there. The other advantage of tackling these areas first is that, when free, they will act as a valuable source of disease-free animals for restocking other areas.

Further prioritization should also be based on an understanding of epidemiological factors and livestock production and marketing systems which influence how the disease spreads and to where. A policy could be to follow the spread of the disease, starting regional campaigns at its source and ending where it finishes. In tropical and semitropical countries, livestock movements and direct contact among animals are often overwhelmingly the most important method of spread of infection. Therefore a thorough understanding of livestock movement patterns and routes is often vital for effective prioritization within epidemic disease eradication campaigns.

Chapter 6

Contingency plans

Countries need to have in place well-documented contingency action plans for specific, high-priority emergency diseases, together with a series of generic plans for activities or programmes common to the various specific disease contingency plans (e.g. setting up national and local animal disease control centres). They also need to have resource and financial plans and proper legislative backing for all actions. These contingency plans need to be considered and agreed upon in advance by all major stakeholders, including the political and bureaucratic arms of government and the private sector, particularly livestock farmer organizations. The contingency plans should be refined through simulation exercises and personnel should be trained in their individual roles and responsibilities.

Technical contingency plans

Technical contingency plans should consist of four sets of complementary documents:
1. Specific disease contingency plans that document the strategies to be followed in order to detect, contain and eliminate the disease.
2. Standard operating procedures for activities and programmes that may be common to several or all emergency disease campaigns.
3. Enterprise manuals that set out zoosanitary guidelines for enterprises that may involved in an emergency animal disease outbreak.
4. Simple job description cards for individual officers.
These plans should be written in straightforward language that can be understood and followed by all those who have to implement them. There is no need to replicate the last three sets of documents in the specific disease contingency plans. There should however be cross-referencing.
AUSVETPLAN (the Australian contingency plan) provides an example of how to write these contingency plans. AUSVETPLAN can be found at http://www.brs.gov.au./aphb/aha/ausvet.htm

Specific disease contingency plans

These should be prepared for each of the diseases that have been identified as being of high risk (see Chapter 3). They should not be very long, but should be clear, authoritative documents that provide sufficient information to allow authorities to make informed decisions on what policies and procedures should be used to control and eradicate an outbreak of that disease, and which are enforceable in law.
The format and contents of the disease contingency plans should be tailored to meet the requirements and circumstances of individual countries. However, the following model format, which is based on AUSVETPLAN with some modifications, may serve as a guide.

Nature of the disease

· aetiology
· susceptible domestic and wildlife animal species
· world distribution and previous occurrences in the country
· epidemiology (including likely pathways for spread within the country)
· clinical signs and pathology
Risk assessment (including potential consequences)
· risk profile of the disease for the country
· likely methods of introduction and geographical areas at high risk
· potential consequences for food security and poverty alleviation, production losses, trade losses and public health

Diagnosis and surveillance

· early warning mechanisms for disease introductions/outbreaks
· disease reporting procedures
· field and laboratory diagnostic strategies
· linkages with international reference laboratories
· surveillance strategies during different phases of eradication

Principles of control and eradication

· methods to prevent spread of infection and to eliminate the pathogen
· factors that may affect control and eradication: agricultural production systems, epidemiological, social and economic
· feasibility of control and eradication in the country

Policy and rationale

· overall policy
· zoning policy
· disease control and eradication strategies and procedures in each zone
· alternate disease control and eradication strategies and the general circumstances in which these other options would be used
· strategies for dealing with special circumstances: disease in wildlife or feral animals, areas with nomadism or transhumance and difficult or relatively inaccessible areas
· criteria for proof of freedom

Appendices

· criteria for defining infected areas and disease control zones
· summary of disease control actions in infected areas and other zones
- quarantine
- livestock movement controls
- stamping out, vaccination or other disease control procedures
· OIE International Animal Health Code for the disease

Standard operating procedures

These are detailed sets of instructions for key programmes and activities that tend to be generic rather than disease specific. They should be cross-referenced to the specific disease contingency plans.
Standard operating procedures may be prepared for:
· organization and operation of the national disease control centre
· organization and operation of local disease control centres
· emergency disease reporting and information systems;
· laboratory diagnosis and surveillance;
· field diagnosis and surveillance;
· zoning;
· quarantine and livestock movement controls;
· livestock destruction and disposal of carcases;
· cleaning and disinfection;
· planning and performance of vaccination programmes;
· valuation and compensation;
· extension and public awareness campaigns.

Enterprise manuals

These are codes of zoosanitary practice and instructions for action in what could be deemed as risk enterprises in a disease emergency. They should cover acceptable and unacceptable zoosanitary practices when these enterprises find themselves located in infected areas, disease control zones, or disease-free areas.
They may be prepared for:
· livestock markets
· livestock shows, race meetings and other congregations of animals
· abattoirs and knackeries
· smallgoods (meat) processing plants
· dairy factories
· feedlots
· egg hatcheries
· artificial breeding centres
· animal quarantine stations

· livestock traders and transporters
· zoos, wildlife parks and commercial aviaries
· veterinary practices

Job description cards

This is the final level of technical contingency plans. Job description cards are simple, itemized lists of roles, duties and responsibilities which are distributed to all personnel who are likely to be involved in the response to an animal disease emergency, and should be distributed well in advance of a disease emergency.

Support plans

Support plans are for the provision of the vital backing that will make the implementation of the disease contingency action plans possible. They may be specific for each disease contingency plan but tend to be more generic in nature.

Financial plans

Experience has shown that delay in obtaining finances is one of the major constraints to the rapid response to emergency disease outbreaks. The application of even modest funds immediately will certainly save major expenditure later. Forward financial planning is therefore an essential component of preparedness.
Financial plans need to be developed which provide for the immediate provision of contingency funds to respond to disease emergencies. These are for the necessary funds required over and above normal operating costs for government veterinary services. The plans should be approved by all arms of government, including economic planning authorities and the department of finance.
The funds may cover the cost of the whole eradication campaign but more usually will cover the initial phases of the campaign, pending a review of the outbreak and the control programme and of the funds required to finalize eradication.
The conditions under which funds may be released should be specified in advance. Normally they would be provided to the CVO when this officer advises that:
· the emergency disease has been diagnosed or there are reasonable grounds to suspect that the disease is present;
· the outbreak is capable of effective control and/or eradication;
· there are approved plans in place to do so.
The funds may be held as special funds which are sequestered for the purpose or there may be drawing rights provided up to a predetermined realistic amount against a specific government account.
In some countries it may be desirable for funds to be provided from both the government and private sector for emergency programmes against some diseases. This would be agreed upon after a review of the nature and proportion of public and private benefits that will be derived from the elimination of the disease. If appropriate, a funding formula may be agreed upon which covers payment of a fixed percentage of the cost of the total campaign by each sector or whereby each sector pays for specific components in the campaign. If the private sector is to contribute, it needs to be determined who in the private sector benefits (and therefore should share the cost). This may include processing industries and traders as well as farmer organizations. It also needs to be predetermined how the private sector funds will be raised. This could be done by livestock industry levies (say on livestock transactions or slaughterings) which are held in quarantined funds or by industry-wide insurance. Voluntary individual insurance policies are satisfactory for insuring against the consequential losses from a disease or disease control actions but are unsatisfactory for raising funds for the campaign itself.
In many cases the funding of the whole emergency disease eradication campaign may be beyond the resources of the country. If this is the case, forward planning should be carried out to identify potential international donor sources for such a campaign. This could include emergency support from FAO or appropriate international agencies. The procedures for applying for funding and requirements for preparing and submitting an application should be predetermined.
The financial plan should also include the provisions for compensation to owners for any livestock or property destroyed as part of the disease eradication campaign. The payment of inadequate compensation is not only inherently unfair, but is also counterproductive to the campaign. Inadequate compensation fosters resentment and lack of cooperation and encourages farmers to hide the presence of the disease. Compensation should be based on the fair market "farm-gate" value of the animals at the time of slaughter (assuming a value that the animal would have had as a healthy one). The same principle should be applied to products and property. The valuation should be carried out by an independent, professional valuer. If individual valuations are not practical, then generic valuations

for different classes of livestock may be acceptable. Compensation for consequential, rather than direct, losses are usually difficult to administer and are inappropriate.

Resource plans

The first step in preparing a resource plan is to make a resource inventory, listing all the resources that will be needed to respond to a moderate-sized outbreak of each of the high-priority emergency diseases. This includes personnel, equipment and other physical resources. The following resource lists required for different operations should be regarded as indicative rather than exhaustive:

· national animal disease control centre: senior disease control veterinarians and epidemiologists, financial and administrative officers and extra staff for recording and processing epidemiological and other information; maps (1:50 000 and 1:10 000), computers and communication equipment to local headquarters (e.g. facsimile, e-mail);

· local animal disease control centres: senior disease control veterinarians and epidemiologists, technical support and suitable administrative offices, office equipment, maps, computers, communication equipment with headquarters (facsimile, e-mail) and field staff (radio) and proformas for various disease control operations;

· diagnostic laboratories: trained laboratory staff, standard laboratory equipment plus any specialized equipment for key emergency diseases and diagnostic reagents for antigen and antibody detection;

· diagnostic/surveillance: veterinarians and support veterinary auxiliary staff, transport, maps, communications equipment, leaflets or posters on the disease(s), diagnostic collection kits and transporters, blood collection equipment and animal restraint equipment;

· vaccination: vaccination teams, vaccines, central and local refrigeration storage, transport, maps, cold storage transporters, vaccination equipment and animal restraint equipment;

· slaughter, burial and disinfection: supervising veterinarian, personnel, transport, humane killers, ammunition and other approved means of killing (e.g. carbon monoxide gassing of poultry), protective clothing, animal restraint equipment, front-end loaders and earth-moving equipment, approved disinfectants, soaps and detergents, shovels, scrapers and high-pressure spraying equipment;

· quarantine and livestock movement controls: enforcement teams, transport, road-blocks (if necessary), signs and posters.

Next, a list of existing resources is prepared, including their specifications, quantities and locations. A register should be maintained of specialized staff, together with their qualifications and expertise/experience with key emergency diseases. These resource lists and staff registers should be maintained at the national disease control centre and, where appropriate, at regional offices.

Comparison of the inventory lists of needed and available resources will inevitably highlight many deficiencies. The resource plan should identify how these deficiencies will be rectified in an emergency.

There are several options for accessing the necessary extra resources:

· a list of where essential equipment and stores may be purchased, hired or borrowed;

· in some cases of hard-to-obtain items it may be desirable to maintain a central store (e.g. disinfectants). Likewise, items which take some time to prepare (e.g. proformas) may also be stored;

· arrangements should be made for supply of personnel and equipment through the national disaster plan (see Chapter 1);

· arrangements should be made through veterinary associations for the temporary employment or secondment of veterinary practitioners in an emergency.

Supply of vaccines and diagnostic reagents presents special problems, as international sources are limited for a number of diseases. Sources of high-quality products are even more limited. These sources, and methods of ordering, should be identified in advance. Even then, manufacturers and suppliers may not carry adequate stock reserves to be able to fill an emergency order. Consideration could thus be given to coming to some contractual arrangement with manufacturers for guaranteed supplies in an emergency. For vaccines there may also be the opportunity to join a suitable international vaccine bank.

The resource plan and associated inventory lists need to be regularly updated.

Legislation

Acts of parliament or government regulations that provide the legislative framework and powers to carry out all necessary disease control actions need to be put in place in advance as part of preparedness planning. This may include legislation to :

· make proclaimed animal diseases compulsorily notifiable;

· allow the entry of officials (or other designated persons) on to a farm or other livestock enterprise for disease surveillance purposes and for the collection of diagnostic specimens;

· authorize the proclamation of infected areas and disease control zones;
· authorize the quarantining of farms or other livestock enterprises;
· authorize any bans on the movement of livestock, livestock products or other potentially contaminated materials or the issue of permits to move these only under specified animal health conditions;
· authorize the compulsory destruction and safe disposal of infected or potentially infected animals and contaminated or potentially contaminated products and materials, subject to fair compensation;
· authorize any other necessary disease control actions, including compulsory vaccination;
· provide for compensation to be paid to owners of livestock and property destroyed as part of disease control programmes and define standards for such compensation;
· allow codes of practice to be mandated for risk enterprises and activities (e.g. livestock markets, abattoirs, knackeries and dairy factories) and authorize any necessary disease control actions for these;
· authorize the compulsory identification of animals, where appropriate.

For countries that operate under a federal system of government, there should be a harmonization and consistency of legislation for animal disease emergencies throughout the country. The same should apply between countries within regions for which there is unrestricted exchange of livestock and animal products under free-trade pacts, e.g. the European Union, and the Mercosur countries in South America.

Simulation exercises

Simulation exercises are extremely useful for testing and refining contingency plans in advance of any disease emergency. They are also a valuable means of building teams for emergency disease responses and for training individual staff.

Disease outbreak scenarios that are as realistic as possible should be devised for the exercises, using real data where possible (e.g. for livestock locations, populations and trading routes). The scenario may cover one or more time phases during the outbreak with a possible range of outcomes. However, neither the scenario nor the exercise should be overly complicated or long. It is best to test just one system at a time (e.g. operation of a local disease control centre). Simulation exercises may be carried out purely as a paper exercise or through mock activities - or a combination of both approaches. At the completion of each simulation exercise there should be a post-mortem of the results. This review should identify areas where plans need to be modified and further training is needed.

A full-scale disease outbreak simulation exercise should only be attempted after the individual components of the disease control response have been tested and proved. Earlier exercises of this nature may be counterproductive.

Training

All staff should be thoroughly trained in their roles, duties and responsibilities in a disease emergency. Obviously more intensive training will need to be given to those who will be in key positions. It should also be borne in mind that any staff member, from the CVO downwards, may be absent or may need to be relieved during a disease emergency for one reason or another. Back-up staff should therefore be trained for each position.

The need for regular updating of contingency plans

Contingency plans, once prepared, should not be treated as static documents. They should be regarded as living documents that need to be regularly reviewed and updated as warranted by changing circumstances, This should be the responsibility of the national animal disease emergency planning committee. In reviewing and updating contingency plans, the following factors should be taken into account:
· changing epidemiological situations, both within the country and externally;
· new disease threats;
· changes in livestock production systems and internal or export trade requirements;
· changes in national legislation or in the structure or capabilities of government veterinary services (or other government instruments);
· experiences (both within the country and in neighbouring countries), results from training or simulation exercises and feedback from major stakeholders including farmers.

Chapter 7

International collaboration

Collaboration between countries

Considerable mutual benefits can be derived when countries cooperate in their emergency animal disease preparedness planning, particularly neighbouring countries or those within the same geographic region. Such countries often have similar socio-economic, environmental, epidemiological and agricultural production profiles and thus similar livestock disease risks, needs for and approaches to preparedness planning.
These countries may consider pooling resources in their emergency animal disease preparedness planning, either through informal networking or formally through existing regional organizations such as PANAFTOSA in Latin America, OAU/IBAR in Africa, APHCA and ASEAN in Asia, the Veterinary Committee of the EU and the EUFMD in Europe. This will ease the burden for all and, more important, result in harmonized plans for preventing and responding to animal disease emergencies. This is particularly significant in the case of transboundary animal diseases which, by definition, spread rapidly across national borders.

Potential avenues for collaboration include:

· joint risk assessments leading to harmonization of import quarantine policies and other disease prevention strategies;
· joint development by neighbouring countries of strategies and programmes to reduce the risk of epidemic diseases being spread by the movement across common borders of potentially infected animals, achieved through coordination of disease surveillance, quarantine, vaccination and other methods;
· coordinated animal health programmes for ethnic groups who practise nomadism and transhumance across borders;
· development of compatible disease reporting and information systems;
· exchanging information on disease occurrences at a national level and at a local level near shared borders (see Chapter 4);
· dividing responsibilities for preparing contingency plans for shared high-threat diseases or at least exchanging ideas and draft plans;
· reciprocal arrangements for development of laboratory diagnostic capabilities;
· establishment of international vaccine banks;
· joint training exercises, workshops and other programmes.
There are compelling reasons why countries should cooperate in their control and eradication campaigns for shared epidemic livestock diseases. A regional approach with coordinated campaigns in all countries is more likely to succeed and will reduce the subsequent risk for all countries to a greater extent than if countries act alone. Future export opportunities for countries in the region will be enhanced if diseases are eradicated on a regional basis.

The role of FAO

The role of FAO in fostering collaboration between countries

FAO is the largest specialist agency of the United Nations, dealing with all aspects of agriculture and food, including crops, livestock, fisheries and forestry. It has become the global centre for international normative policy and databases. FAO headquarters in Rome is the centre of a global network with increasingly decentralized operations and strategic policy support to member countries. The Organization has offices in 104 of its 175 member countries; there are also FAO regional offices for Africa, Asia and the Pacific, the Near East and Europe and liaison offices for North America, the United Nations, the European Union and Belgium and Japan. The majority of member countries have permanent representations based in Rome to work with the FAO Secretariat on global agricultural policy and coordination of international actions. The highest governing council of FAO is the Conference of Ministers of Agriculture of member countries, which meets biennially in Rome and during alternate years in each of the regions. The Conference determines the direction and programme of FAO's work, examines strategic issues facing world agriculture and the state of food supply and authorizes mechanisms for coordinating international actions. The pivotal role of FAO in global food and agriculture strategies and policy was reinforced in 1996 by the World Food Summit and the Rome Plan of Action.

With regard to international animal health, FAO collaborates with its sister organization WHO and has a special agreement with OIE, formally signed in 1947. The three organizations participate in the relevant working groups and commission expert consultations and panels at secretariat level. At the strategic level, the senior animal health officials of the three organizations and the FAO/IAEA Joint Division meet annually in Rome to review their animal health programmes.
FAO enhances its international coordinating role through special programmes such as EMPRES, expert and technical consultations, expert panels, the Committee on Agriculture and various commissions.
Some of the commissions are semi-autonomous, such as EUFMD which has its secretariat in the Animal Health Service in Rome, or APHCA which has its secretariat in the FAO regional office in Bangkok. The Near East and African regions do not currently have semi-autonomous commissions for coordinating policies and activities related to transboundary animal diseases.

FAO's response to agricultural emergencies

FAO's role in natural and human disasters is guided by the commitments set forth in the 1996 Rome Declaration on World Food Security and World Food Summit Plan of Action. FAO assists national and international efforts to prevent, prepare for and respond to natural disaster and human emergencies. It also manages agricultural relief programmes that help affected populations towards recovery, rehabilitation, development and a capacity to satisfy future needs.
To meet the threat of disasters caused by agricultural pest and disease outbreaks, FAO may be required to provide:
· support for research on transboundary agricultural pests and diseases affecting crops, forests and livestock;
· assistance in developing improved national and international structures and services for surveillance and control;
· monitoring of disease occurrence, its determinants and significant changes in disease epidemiology so as to recognize and predict livestock disease risks relating to emergencies;
· analysis of disease emergencies and formulation of technically sound interventions;
· assistance in implementing emergency measures to tackle transboundary outbreaks when they occur;
· control of local livestock disease outbreaks in disaster-affected areas, including prevention and control of flood-related and insect-borne animal diseases.
Within the wider context of agricultural emergencies, FAO has developed an elaborate and tested system for rapid response to requests from member countries for assistance in animal disease emergencies. For ministries of agriculture, the first point of contact in animal disease emergencies is often the local FAO representation in the capital city.

EMPRES

Through its global mandate related to animal health, FAO has traditionally played a major role in the fight against epidemic livestock diseases. The Organization has a notable record of successful intervention against transboundary livestock diseases through provision of technical expertise and logistic support to countries threatened by, or combating, a disease emergency.
In order to give even greater focus to this important activity, the 106th Session of the FAO Council authorized FAO's Director-General to establish a priority programme, the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES). This programme encompasses plant pests and diseases, notably plague locusts, as well as livestock pests and diseases.
The EMPRES livestock programme is located within the Animal Production and Health Division at FAO headquarters in Rome, Italy. It is also supported through animal health officers stationed in FAO regional offices. Contact may be made directly, or through FAO country representatives or regional offices (see Appendix 4).
EMPRES has a home page on the World Wide Web at
www.fao.org/waicent/faoinfo/agricult/aga/empres/empres.htm

EMPRES has four main categories:

1. Early warning: disease initiatives based predominantly on epidemiological surveillance, leading to improved awareness and knowledge of the distribution of disease or infection and to forecasts of the evolution of the disease.
2. Early reaction: actions to prevent a serious epidemic by rapid, effective containment and elimination of a disease outbreak. These include contingency planning and emergency preparedness.
3. Coordination: either coordination of the global eradication of an identified disease such as rinderpest (see below) or encouragement of regional initiatives for eradication of a given transboundary disease.
4. Enabling research: collaboration between FAO and scientific centres of excellence in directing research towards solving problems related to TADs.

At present EMPRES gives priority to transboundary animal diseases of strategic importance. These diseases may be subject to global or regional eradication programmes, such as rinderpest, foot-and-mouth disease and contagious bovine pleuropneumonia. EMPRES also gives priority to diseases of tactical importance that sporadically cause serious epidemics but are not at a stage to be considered for global or regional eradication campaigns; these diseases include Rift Valley fever, lumpy skin disease, peste des petits ruminants, African swine fever and Newcastle disease. Lastly, EMPRES prioritizes emerging diseases, such as BSE.
EMPRES has a regular publication: The EMPRES transboundary animal diseases bulletin. This may be obtained either by contacting FAO EMPRES or by accessing the EMPRES Web site.

FAO and the global rinderpest eradication programme (GREP)

Rinderpest is regarded as the original cattle plague. Over the centuries, it has caused the deaths of millions of cattle and buffaloes and untold numbers of wild animals in Asia, Europe, the Near East and Africa. It still threatens food security in a number of countries.
There is now strong international desire for global eradication of the disease. A target has been set for the year 2010 and a technical blueprint has been devised to make this possible The technical coordination of GREP is being undertaken by FAO within its EMPRES programme.
The GREP strategy is an excellent example of putting the principles in this manual into practice. It recommends that countries carry out comprehensive targeted vaccination programmes, supported by active disease surveillance. Heat-stable vaccines are available for areas where maintenance of cold chains may be a problem. When the clinical disease disappears, vaccination is progressively replaced by measures to prevent reintroduction of infection into apparently free areas, active clinical and serological surveillance programmes and actions to detect and respond quickly to disease breakdowns.
Central to this strategy are the OIE standards for epidemiological surveillance systems, the OIE pathways, which set out the steps to be followed in order to declare provisional freedom from rinderpest, provide evidence of freedom including random clinical and serological surveys and receive assessment by OIE as being free of infection. This process may be completed four to five years after the cessation of vaccination.

Joint FAO/IAEA Division

The animal production and health section of the Joint FAO/IAEA Division supports the introduction and utilization of nuclear and nuclear-related technologies by veterinary diagnostic laboratories in developing countries. Focusing principally on ELISA, the approach has been to assist FAO and IAEA member countries in using this technology to identify the major infectious diseases affecting their livestock, to determine prevalence as part of developing control and eradication strategies and then to use the same technology to monitor the effectiveness of interventions.
The support provided through the Joint FAO/IAEA Division to veterinary laboratories for control and eradication programmes is usually part of a greater effort involving the national veterinary service, with support from other international organizations and outside donors. Given the nature of transboundary diseases, this national effort is linked to similar efforts in surrounding countries and within a region. There is a need to work together with a common policy and strategy through international coordination in order to compare results of diagnosis and surveillance from country to country with confidence. This has given rise to the FAO/IAEA laboratory networks for rinderpest, CBPP, FMD and, most recently, Newcastle disease vaccination. Efforts are coordinated not just within the network but with national and regional disease control and eradication programmes. Such networks are focused on one disease and linked to a larger control/eradication effort.