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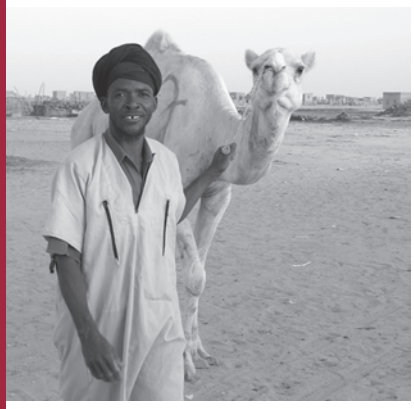

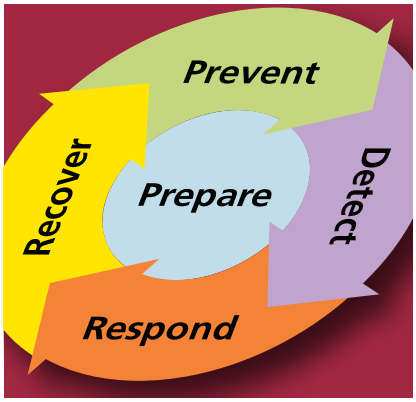

manual

GOOD EMERGENCY MANAGEMENT PRACTICE: THE ESSENTIALS

A guide to preparing for animal health emergencies

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GOOD EMERGENCY MANAGEMENT PRACTICE: THE ESSENTIALS

A guide to preparing for animal health emergencies

Nick Honhold, Ian Douglas, William Geering, Arnon Shimshoni, Juan Lubroth

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2011

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Contents

Foreword

An animal disease emergency, such as an outbreak of a transboundary animal disease (TAD), can have serious socio-economic consequences which, at their extreme, may affect the national economy. If a new disease can be recognized quickly while it is still localized, and if prompt action is taken to contain and then progressively eliminate it, the chances of eradication of the disease are markedly enhanced. Conversely, eradication may be extremely difficult and costly, or even impossible, if the disease is not recognized and appropriate control action is not taken until the disease is widespread or has become established in domestic animals or wildlife.

Planning for emergency disease eradication or control programmes cannot be left until a disease outbreak has occurred. At that point, there will be intense pressure from politicians and livestock farmer groups for immediate action. In such a climate, mistakes will be made, resources will be misused, deficiencies will be rapidly amplified and highlighted. Delays will result in further spread of the disease and higher costs. If there is inadequate advance planning, national animal health services will face a disease emergency with poor training and little or no previous experience. These severe problems can be avoided if there is adequate advance planning and preparation.

Preparedness programmes for animal disease emergencies provide the key to mounting early effective action in the face of an emergency. In fact, these programmes should be recognized as one of the important core functions of national animal health services. A strong linkage between animal and human health sectors may be critical to support surveillance and response.

Preparedness planning, including the development and approval of contingency plans for identified high-threat diseases, enables animal health services to be far better technically equipped to cope with a disease emergency. There are other benefits. Prior approval of plans will allow decisions to be made by politicians and senior civil servants more rapidly. This should enable government funds for the control campaign to be released more quickly and for necessary assistance to be made available more easily from other government agencies. Pre-established relationships with other agencies, especially public health agencies, will facilitate better responses through improved communication channels. Farming communities are also more likely to cooperate in an emergency disease-control programme if they see that quick, decisive action is being taken that ultimately will benefit them and that their contributions and inputs were considered during planning and review.

Contingency plans are often prepared against specific diseases that are considered to represent the greatest threat. However, contingency plans also enable animal health services to respond quickly to entirely unanticipated disease occurrences because the same general epidemiological and disease-control principles and systems that were developed for specific diseases can also be applied in any new situation.

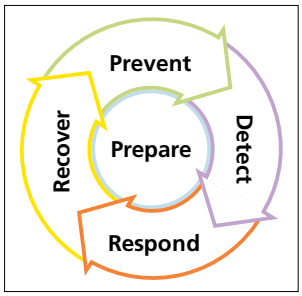
It is hoped that this document and other materials that will be provided as part of the GEMP package will assist and facilitate preparedness. A GEMP checklist is also provided. This may serve as a brief overview for managers.

Dr Juan Lubroth,
Chief Veterinary Officer
Animal Health Service
FAO May 2011

Acronyms and abbreviations

BSE	Bovine spongiform encephalopathy
CBPP	Contagious bovine pleuropneumonia
CCEAD	Consultative Committee on Emergency Animal Diseases
CVO	Chief veterinary officer
DIVA	Differentiation of infected from vaccinated animals
EDR	Estimated dissemination rate
EMPRES	Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases
EMPRES-i	EMPRES Global Animal Disease Information System
FAO	Food and Agriculture Organization of the United Nations
FMD	Foot–and–mouth disease
GPS	Global positioning system
HPAI	Highly pathogenic avian influenza
HRP	High-risk period
IATA	International Air Transport Association
ICS	Incident Command System
LDCC	Local (animal) disease control centre
LRP	Low-risk period
NADEPC	National animal disease emergency planning committee
NDCC	National (animal) disease control centre
NEC	National emergency committee
NGO	Non-governmental organization
OIE	World Organisation for Animal Health
PCR	Polymerase chain reaction
PPE	Personal protective equipment
PZ	Protection zones
RA/IA	Restricted/infected area
RRP	Raised-risk period
SOP	Standard operating procedure
SZ	Surveillance zone
TAD	Transboundary animal disease
TADinfo	Transboundary animal disease information system
TAHC	Terrestrial Animal Health Code
WAHID	World Animal Health Information Database
WHO	World Health Organization
WTO	World Trade Organization

Introduction and basic issues



PURPOSE OF THE MANUAL

A disease emergency is one of the most challenging situations that a veterinary service can confront (Annex A discusses many of the aspects of disease emergencies). Recent experience in various countries has shown that veterinary services must be well-prepared to deal with such an emergency in order to achieve rapid, cost-efficient control. To do this, the veterinary services must have a well-developed plan, the capacity to implement it, and it must practise implementing its plan.

The aim of this manual is to set out in a systematic way the elements required to achieve that level of preparedness for any emergency disease in animals. In particular, but not exclusively, this manual focuses on the control of transboundary animal diseases (TADs). Some of these principles may also be helpful in preparing for food safety, zoonotic and even non-infectious disease emergencies.

Emergency management preparedness programmes should provide the key to identifying and prioritizing disease incursion threats. The basic components of these programmes to be considered are preventing the entry of TADs and other disease threats, rapidly detecting disease and taking early effective action in the face of an emergency. Learning from outbreaks and reviewing the response sequence are critical to better performance in future emergencies.

Preparedness planning, including the development and approval of contingency plans for identified high-threat diseases, enables animal health services to be better equipped technically to cope with a disease emergency. There are other benefits. Prior negotiation and approval of plans will allow decisions to be made by politicians and senior civil servants more rapidly. This should allow the government to release required funds more quickly for the control campaign and facilitate the provision of any necessary assistance from other government agencies and the private sector. Farming communities are more likely to cooperate in an emergency disease-control programme if they see that quick, decisive action is being taken that will ultimately benefit them and if they are actively involved in preparing emergency plans. They will then share "ownership" of some of the plans.

This document includes a simple assessment tool that may assist managers in gauging their state of preparedness. This tool, however, is not intended to be a full evaluation. Conducting more rigorous evaluations of preparations also will be extremely valuable.

PREPARE/PREVENT/DETECT/RESPOND/RECOVER CYCLE

Figure 1 illustrates the cycle of good emergency management planning and disease control. It is meant to indicate that good emergency preparedness is an ongoing process. Prevention

FIGURE 1
Cycle of good emergency management planning and disease control

and detection ideally take place concurrently, and both take place during the absence of emergency diseases (sometimes referred to as "peacetime"). For an endemic disease, these phases will be carried out when disease is already present.

When a disease is detected, rapid response is essential to minimize the spread of the disease. Delays at this point are critical and can lead to a disease becoming widespread and endemic. After the disease has been controlled or eliminated, the response winds down

and a recovery period is required to return the affected livestock sector(s) to either the previous state, or more likely to a situation in which future risks have been reduced as a result of changes to legislation and/or practices.

Planning and practising takes place at all stages of the cycle. It is particularly important that response plans (also known as contingency plans) are regularly and thoroughly tested as part of the preparation phase. This will ensure that the plans are practical, feasible and well-understood and that the people who will be faced with the problem in the field are fully trained in implementing their role in the response.

FACTORS AFFECTING THE FREQUENCY, SIZE AND LENGTH OF DISEASE EMERGENCIES

Much of this section comes from thinking about disease incursions in terms of risk periods. This concept was originally developed to analyse disease outbreak response, but it has been expanded to cover the whole cycle of disease management. Annex B contains a more thorough description of this.

Preparedness planning and practice should be recognized as one of the important core functions of national animal health services. Preparation is required for all the subsequent steps in the disease management cycle to be effective. It is necessary to:

- establish a national disease emergency planning committee;
- determine the command structure and responsibilities;
- ensure that the required legal powers are in place;
- ensure that sources of financing have been identified;
- establish compensation policy;

- establish sourcing for any required vaccines and other critical supplies;
- undertake risk analysis to identify and prioritize potential disease risks;
- prepare, practise and refine contingency plans and operations manuals.

Disease management starts with prevention. Having a well thought out set of preventive measures will decrease the frequency and possibly the impact of disease incursions. It is necessary to:

- prevent entry of the disease agent in legal imports;
- prevent entry of the disease agent in illegal imports;
- maintain intelligence gathering for early warning of changes in distribution, virulence or epidemiology in affected countries and trading partners;
- establish, strengthen and maintain cross-border contacts with neighbouring administrations; and
- promote and strengthen routine biosecurity measures.

Early detection of any incursion is vital. The delay between incursion and detection is one of the most important factors in determining the severity of the outbreak. The components of an effective detection system include:

maintaining disease awareness among key staff and stakeholders;

- maintaining routine disease intelligence activities and targeted surveillance as required;
- reporting suspicions (by owners, veterinarians etc.);
- establishing and following a protocol for investigating suspect cases;
- establishing and following a protocol for initial mobilization of contingency plans;
- maintaining laboratory facilities to confirm a clinical suspicion.

Once a disease has been detected and confirmed, it is essential to:

- activate contingency plans;
- assess the initial outbreak (e.g. size, geographical spread, epidemiology) to judge what control measures may be required;
- implement the control measures as quickly and completely as possible;
- monitor progress and adjust policies accordingly;
- continue to exchange information and data with neighbouring administrations; and
- communicate with the public and all stakeholders, including the World Organization for Animal Health (OIE).

The other major determining factor in the overall severity of any outbreak is the amount of time taken between detection and full implementation of the required control measures over the whole area of the outbreak.

The presence of a disease in the country of a trading partner or neighbouring territory may increase the risk of introduction of a disease outbreak. Certain times of year may be accompanied by higher risks of the introduction or spread of disease, for example, where cultural or religious festivals may involve large-scale movements of animals. In these cases, it is prudent to take the following measures that will decrease the amount of time needed to implement control measures if an infection is detected:

Prevent

- Prevent entry of the disease agent through additional, targeted restrictions on imports in accordance with accepted international standards.

- Set import restrictions to allow low-risk trade to maximize effectiveness of the quarantine barrier.
- Prevent entry of the disease through tightened and targeted inspections for legal and illegal imports.
- Implement increased biosecurity measures, including quarantine facilities for live animals (e.g. livestock, wildlife and mascots), particularly at locations identified as high risk (e.g. border areas, markets, livestock trading businesses).
- Consider establishing pre-embarkation and post-entry testing for diseases of concern.

Detect

- Raise disease awareness among staff, stakeholders and the general public.
- Intensify surveillance to ensure early detection of any incursion.
- Cooperate closely with neighbouring administrations, exchanging information on any suspected or confirmed outbreaks, and fulfil international reporting obligations.

Respond

- Review contingency plans and make staff aware of their roles should the disease occur.
- Start to put initial structures in place for contingency plans.

Once a disease has been controlled or eliminated, the recovery process should begin. This includes:

- undertaking planned surveillance activities to demonstrate freedom;
- sentinel restocking;
- full restocking;
- fully implementing compensation policies, if appropriate;
- standing down the resources mobilized during the control/elimination phase;
- conducting post-outbreak analysis to assess the pre-outbreak practices and issues that led to the outbreak and any problems encountered in detecting and responding to it; and
- reviewing and revising legislation and plans to correct deficiencies, make risky practices safer and introduce new practices as required.

THE VALUE OF PLANNING FOR EMERGENCIES

Emergency responses present unique challenges for those who must respond. During an emergency it is often desirable to use normal systems with which people are already familiar, however emergencies usually cannot be addressed effectively in the same manner as daily work.

In particular, it is essential to have a clear understanding of who will be responsible for what activities and a single chain of command and line of communication so that all those involved understand what they have to do and from whom they will receive direction.

The best chain of command may not be the one which normally operates in a country. Therefore, plans need to be documented and agreed in advance so that everyone understands what will be happening and how the response will be implemented.

A well-prepared plan details the critical arrangements and approaches in advance. It provides a reference guide during the emergency to help avoid key actions being overlooked.

A key benefit of planning is that it prompts a wide range of people who are likely to become involved to think carefully about what may be the challenges. It will probably reveal issues that have otherwise not been considered. This enables some gaps or deficiencies to be addressed ahead of an outbreak.

The plan is a very useful document, but the planning process is also of tremendous benefit. Working through the planning process involves key players. They will be encouraged to think through the issues before a crisis situation exists, so that they might prepare and build skills. Planning may also be essential to sustaining human and animal health, food security and food safety, and may be essential to the country's ability to participate in the international trade of animals and animal products.

THE REQUIRED ELEMENTS OF PREPAREDNESS PLANNING

Preparedness planning and practice should be recognized as one of the important core functions of national animal health services. Four kinds of plans or documents are required in any comprehensive risk mitigation and response system. These are:

- an emergency preparedness plan (often shortened to "preparedness plan");
- a response or "contingency plan";
- an operations manual or manuals; and
- a recovery plan.

Comparing the required plans and documents

There is often confusion between the terms "emergency preparedness plan" and "contingency plan". The definitions of "preparedness" and "contingency" help to clarify the difference between these two types of plans:

Preparedness: A state of readiness, preparation for an event

Contingency: An unusual and unpredictable event; something liable, but not certain, to occur

From these definitions, it is possible to describe the different, but complimentary, purposes of the four kinds of plans:

- An emergency preparedness plan outlines what a government needs to do before an outbreak of a disease in order to be prepared (i.e. getting ready). This includes things that all of the stakeholders need to do.
- A contingency plan details what a government will do in the event of an incursion of a disease, beginning from the point when a suspect case is reported (i.e. responding). This includes things that all of the stakeholders need to do.
- An operations manual is a comprehensive set of instructions (also called standard operating procedures [SOPs]) produced by the government that instructs field staff and others how to undertake specific tasks required by the contingency plan (i.e. implementing the response).
- A recovery plan is the plan for the safe recovery or restoration of normal activities, although possibly with procedures and practices modified in light of the experience gained during the outbreak (i.e. recovery).

An emergency preparedness plan involves many activities, including preparing a contingency plan. This makes the contingency plan a "daughter" document of the emergency preparedness plan. The operations manual can be seen as a separate document under the emergency preparedness plan, but is more commonly and perhaps correctly seen as a "daughter" document of the contingency plan (or "granddaughter" of the emergency preparedness plan) because it determines what procedures are required. The exact relationships do not matter, as long as the purposes are understood.

Of course, there are many aspects of emergency preparedness plans, contingency plans and operations manuals that are common for different diseases. This has led to a system of creating a generic, overall emergency preparedness plan and contingency plan, with a chapter for each disease of interest. Operations manuals may be similar or identical for more than one disease.

Reviewing and updating the plans and documents

It is important to emphasize that these plans and instructions are living documents. Circumstances and policies change, knowledge increases and new techniques are introduced. It is essential that these plans and instructions be reviewed at regular, planned intervals and be updated to reflect changes since the last revision. This cannot be emphasized strongly enough. An out-of-date plan often hinders more than it helps.

These plans and instructions must be comprehensively reviewed and updated at least every five years, and it is important to mark and control the number of the version that is produced. Each page could include a footer with the version number and date. One visual option to ensure that the latest version is being used is to use different page colours for each version.

A NATIONAL DISASTER PLAN

Most countries have well-developed national disaster plans which allow essential government and non-government services and resources to be rapidly mobilized in response to a disaster. Such plans also may 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, radiation incidents 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 TAD, for example, has the same characteristics as other natural disasters. It is often a sudden and unexpected event, may cause major socio-economic consequences that impact across the nation (and may even threaten food security), may endanger human life and requires a rapid national response.

There are certain essential government services that are included in responding to national disasters. These services also have important roles in animal health emergencies and their participation can greatly assist the veterinary services in situations regarded as natural disasters. These services include, among others:

- defence forces (notably the army and air force), can provide support for transporting personnel and equipment to disease outbreak sites, particularly when these sites

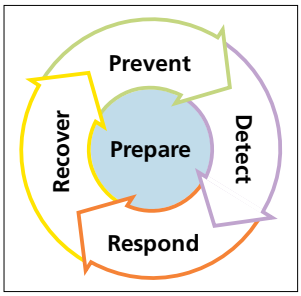
are inaccessible to normal vehicles; provide food and shelter; protect disease-control staff in areas with security problems; and provide communication facilities between national and local disease-control headquarters and field operations;

- police, can assist in applying necessary disease-control measures, such as enforcing quarantine and restricting livestock movement, and protecting staff if necessary;
- public works departments, can provide earth-moving and disinfectant-spraying equipment and expertise in the disposal of slaughtered livestock in eradication campaigns;
- national or provincial emergency services, can provide facilities, logistical support and communications.

It is strongly recommended that the Ministry of Agriculture take up the issue of including animal health emergencies in the national disaster plan. Achieving this should be a priority for the head of the animal health service.

Once approval has been given for recognizing animal health emergencies within the national disaster plan, a set of SOPs should be prepared and agreed with all cooperating agencies. The format of these documents will 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 event of a declared animal health emergency. They should also describe which 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 health issues) is the lead authority during a response to an animal disease emergency.

Prepare: Structures



INTRODUCTION

Preparation is the central activity of good emergency management practice. It is important to use the word "prepare" rather than simply "plan". Preparation includes both planning and practising the implementation of the plans to ensure that they are practical and well-understood. It also includes activities such as risk analysis.

RESPONSIBILITY FOR ANIMAL DISEASE EMERGENCIES

Ultimate responsibility for the control of animal disease emergencies lies with the office of the President, Prime Minister or equivalent. This responsibility may be devolved to the minister and ministry responsible for livestock or animal health. The Chief Veterinary Officer (CVO) or equivalent (e.g. Director of Veterinary Services) of the country should have the overall technical responsibility for preparing for and managing animal disease emergencies.

Animal disease emergencies that have a significant public health component are a special case. This might occur, for example, in a major outbreak of a zoonotic disease such as H5N1 avian influenza, Rift Valley fever, Japanese encephalitis, Venezuelan equine encephalitis or rabies. For these emergency diseases, negotiations should be carried out in advance of any outbreak between the Ministry of Agriculture and the Ministry of Health (or their equivalents) as to who would have initial responsibility during an outbreak. Agreement should be reached on a joint framework for preparing contingency plans and for other preparedness programmes which are consistent and complementary. It may even be appropriate to produce a single joint contingency plan.

The most efficient mechanisms for coordinating emergency responses and for implementing disease-control and eradication programmes, including a division of responsibilities should also be determined in advance. Opportunities for sharing resources between the two agencies, where appropriate, should also be explored to avoid unnecessary duplication. For example, this might include having a single diagnostic laboratory facility for the zoonosis(es) in question, or at least sharing diagnostic reagents and expertise among government-approved veterinary and medical laboratories; using common cold-chain facilities for vaccines; conducting joint field missions; and creating joint public awareness and public relations campaigns.

It is critically important to develop coordinated and efficient mechanisms to rapidly share emergency disease reports and other key epidemiological information between the two agencies. These arrangements should apply at the local and regional levels as well as at the national headquarters of both ministries. This is vital to ensure a rapid response to

new disease incidents and extensions to the outbreak, regardless of whether they are first manifested as human or animal cases.

GETTING STARTED – OBTAINING SUPPORT

The CVO should enlist the support of all stakeholders, in order to recognize emergency preparedness planning as an important core function of the national veterinary services and to have adequate funding and other resources allocated to these activities. These stakeholders would include, among others, 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.

To present a strong case for emergency preparedness planning, it is important to describe the identified emergency animal disease risks, an analysis of those risks, the potential socio-economic consequences of an incursion or epidemic of the disease, and the options for mitigating the risks. This is discussed more fully in the chapter on risk analysis. Also, the case should include the benefits that will be derived from more rapid containment and eradication of the disease outbreak through forward contingency planning and preparedness. Where possible, the case should be supplemented by a formal socio-economic cost-benefit analysis.

DETERMINING THE COMMAND STRUCTURE AND RESPONSIBILITIES

To ensure that the preparation phase is comprehensive, a clear structure of bodies with defined roles, responsibilities and duties is needed.

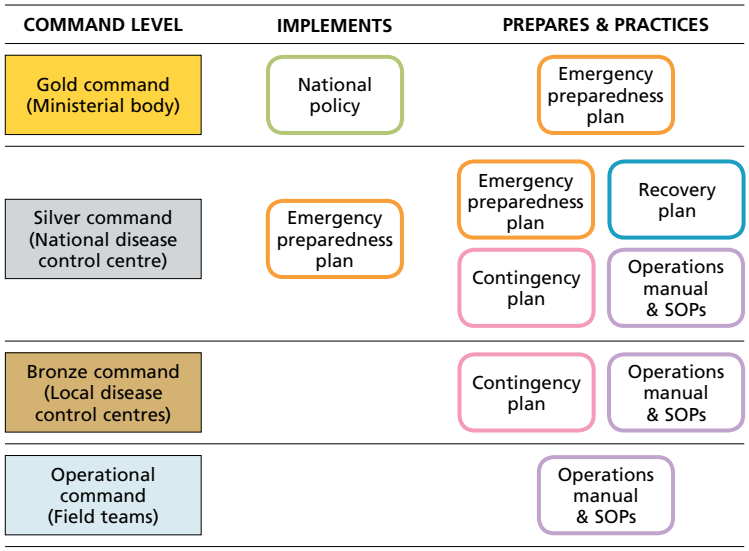
It has become common practice to have several levels of command, each with specific roles and duties. The chain of command often includes three levels, sometimes described as Gold, Silver and Bronze. These are briefly described in Table 1. The roles of each command during "peacetime" are shown in Figure 2.

Additionally, there is an operational command comprised of teams that undertake the field work, implementing the procedures contained in the contingency plan and operations manuals.

TABLE 1
Command levels for preparedness planning

Gold command	The national animal disease emergency planning committee is made up of the highest level of policy-makers and is often led by the head of government or his/her deputy. Other members are often ministers and state secretaries. The head of the animal health service (usually the Chief Veterinary Officer [CVO]) should be a member of this committee.
Silver command	The national disease control centre is usually headed by the CVO and is composed of senior government veterinarians and specialists (e.g. wildlife biologists, microbiologists, species and disease specialists, communications and legal specialists).
Bronze command	Local (animal) disease control centres are normally headed by the senior government veterinarian in the province or region.

FIGURE 2
"Peacetime" roles for the various command levels



Another reason for having these command levels during the preparation phase is that this structure is the same one used during the response phase; working in this way during preparation helps to practise and build familiarity with the command and control structure that will be required in the event of an emergency. This facilitates a rapid and smooth move from "peacetime" into response. This is another part of preparation: ensuring that the required structures for responses have not only been prepared but also practised.

Gold Command: National animal disease emergency planning committee

The overarching element of the command structure is the national animal disease emergency planning committee (NADEPC). This may be chaired by the President or Prime Minister, or his or her deputy or representative. The reason for this level of involvement is because any disease-control programme will require funding, and so the chairman of the committee must be able to engage the Ministry of Finance when necessary. Disease-control programmes often impact the environment and require resources that are normally available only to other state bodies such as national emergency agencies, the armed forces, home ministries or local governments. The animal health authority can only access these resources with the support of the most senior arm of government.

The NADEPC:

- establishes the overall policy for animal health emergencies;
- assures that the required legislation is in place;
- assures that funding has been identified (including for compensation);
- commissions and approves the preparedness, contingency and recovery plans; and
- reviews and approves the prioritization of diseases proposed by the National (animal) disease control centre (NDCC).

Silver Command: National (animal) disease control centre

A NDCC should be appointed to facilitate and coordinate emergency planning. This group or committee should be directly accountable to the Minister of Agriculture or equivalent and should be allocated the responsibility for developing and maintaining a high state of preparedness for animal disease emergencies. The NDCC should be chaired by the CVO and should hold regular meetings to carry out the following functions:

- commissioning risk assessments on high-priority disease threats and identifying the disease occurrences which would constitute a national emergency;
- proposing the priority diseases for which vigilance and preparation are required;
- appointing drafting teams to prepare, monitor and approve contingency plans and other documents;
- ensuring that the required legal powers are in place, drafting and getting legislation passed if required;
- designing and implementing preventive measures required to lower the risk of introducing and spreading the identified high-priority hazards, including the required import controls to OIE standards, post-import checks and biosecurity measures;
- enhancing the capabilities of emergency field and laboratory veterinary services, especially for specific high-priority livestock disease emergencies;
- developing active disease surveillance, epidemiological analysis capabilities and emergency reporting systems;
- devising and overseeing the implementation of the required preventive measures using the outputs of risk analysis;
- training staff and conducting farmer awareness programmes;
- assessing resource needs and planning for their provision during animal health emergencies;
- developing financial plans, including working with the Ministry of Finance and Planning;
- liaising with and involving relevant people and organizations outside of the government animal health services which also have a role in animal health emergency preparedness planning, including, among others, the national veterinary association, livestock industry groups, livestock breeder associations, the national disaster management authority and departments of finance, health and wildlife;
- implementing simulation exercises to test and modify animal health emergency plans and preparedness; and
- monitoring the national state of preparedness for animal health emergencies.

The NDCC should include the CVO as chairman, the national animal disease planning officer (see below) as secretary, director of the 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 co-opted 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.

Bronze command: Local (animal) disease control centres

During "peacetime", at least one veterinarian from each local veterinary office, preferably the local District Veterinary Officer, should be co-opted into the planning process to take part in preparing contingency plans and operations manuals within Local (animal) disease control centres (LDCCs). It would also be advantageous to include non-veterinary technical staff from this administrative level in preparing the operations manuals. In both cases, these staff with daily exposure to field conditions will bring essential knowledge and experience that will help to ensure that contingency plans and SOPs are practical and address the real issues and limitations so that they will be usable in the event of an outbreak.

ROLE OF CENTRAL GOVERNMENT, LOCAL AUTHORITIES AND THE PRIVATE SECTOR

Central government plays the lead role in planning and preparing for animal disease emergencies. At this level, legislation is passed and national preparedness and contingency plans are formulated and approved. Central government is also responsible for planning and running most training and simulation exercises which build the capacity and practical skills required during an outbreak.

Central government also has a clear role in the overall control of an animal disease emergency. It is only at this level that the policy decision-making and financial resources required to undertake the process are available. However, centralized government often does not have the manpower required to undertake the policies or, in many decentralized countries, the authority to implement them as this has often been devolved to regions or to provinces.

Local authorities (e.g. provincial, municipal) also play an important role in animal disease emergencies. While collaboration among ministries and other organizations is vital at the national level, collaboration at the local level is often equally or more important. As noted above, there are many countries in which much of the responsibility and authority for the implementation and enforcement of control measures lies at this level. These officers can play a key role in any LDCC.

The private sector also has an important role to play in planning and preparing. Frequently, private production units are affected during an emergency, and owners of these units should be involved at some stage of decision-making – preferably at all levels, where possible – in order to maintain cooperation with the national and local authorities. Excluding them leads to resentment and delays in implementing control measures – which will make the outcome worse, rather than better.

Other parts of the private sector are important in implementing control. Except for highly centralized systems, governments tend to have a limited supply of specialist staff that they can call on, and this supply of experts is rapidly used up in any emergency situation. The private sector usually has to be considered as a source of the necessary "surge capacity" of specialist staff.

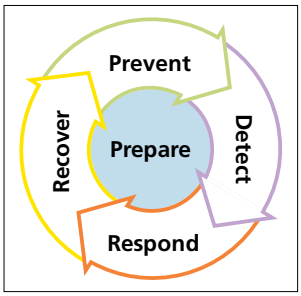
The armed forces may be able to supply large numbers of less specialized staff, but this

applies mostly where military service is compulsory. Where armed forces are limited in size, non-specialist staff may be required from the private sector as well. During an animal health emergency, there are often private sector specialists and non-specialists, such as private veterinary practitioners and veterinary students , who are available because their normal work has been suspended because of the emergency. Governments should be prepared to employ such staff on a temporary basis; they can supply manpower and bring specialist local knowledge which is invaluable at LDCC and operational levels.

The large supply of equipment that is required during an emergency should not be held in stock, but rather should be obtained from private sources when needed. Facilities, such as transport and rendering capacity, will need to be leased or reserved for use during an emergency. It is clear from this that the private sector has to be involved in the planning and preparation phase, as agreements to provide staff, equipment and facilities at agreed levels and prices during an emergency are developed. Staff also may need to be trained in order to be capable to take part in control measures quickly and when required. Participation in simulation exercises at the appropriate levels will be highly beneficial in building skills and relationships that will be vital during an emergency.

Some countries have negotiated international arrangements to provide needed "surge capacity" of critical resources (e.g. veterinarians and laboratory scientists) from neighbouring countries or countries with similar interests.

Prepare: Elements of an emergency preparedness plan



INTRODUCTION

The emergency preparedness plan is a high-level document that includes plans for all the activities required to prepare for the occurrence of one or more diseases. It consists of a number of elements.

HUMAN RESOURCE PREPARATION

Many different skills are needed during the response to an emergency disease. Some of these must be developed in advance of an emergency event, and it may be necessary to recruit skilled people during "peacetime". Some of these skills are scarce and critical to success, and these may need to be fostered well in advance.

In other cases, expertise and labour may have to be found during the response campaign. In either situation, the required skills need to be well-defined so that suitably capable people can be obtained quickly.

Some countries use private-sector expertise, while others have arrangements in place to obtain skills from neighbouring or even distant countries.

RISK ANALYSIS

Some process of risk analysis is needed to determine which disease(s) require preparedness planning and to what extent. Regular updates of the risk analysis process are required to detect changes in threats of incursion (e.g. new pathogens, changes in distribution and virulence of known risks and changes in possible routes of introduction).

A risk analysis process identifies the threats that represent the greatest risk and for which preparedness is most important and therefore helps to prioritize the range of disease threats.

See the chapter on risk analysis for more details about this important activity.

LEGAL FRAMEWORK

Emergency animal disease control demands that national authorities are able to take rapid actions. To do this, adequate and appropriate legal powers must be in place. This includes powers to cull animals on the basis of confirmed infection and on strong suspicion of exposure to infection, establish quarantine and movement controls, provide compensation, etc. Establishing legal powers takes time and so must be in place before any outbreak occurs in order to prevent delays. As it is not possible to devise a set of regulations for each disease,

there is a need for a general set of legal powers and regulations that are linked to a list of notifiable or prescribed diseases. Countries should review and revise their livestock disease legislation and regulations regularly, so that emergency disease-control actions can be undertaken within a proper legal framework. This will limit any legal challenges that may delay or inhibit control programmes.

Required legal coverage

To ensure adequate legal coverage, legislation needs to:

- introduce and update a list of notifiable diseases. Notifiable diseases must be reported to veterinary authorities when there is suspicion of their occurrence and are normally those diseases for which the veterinary authority has a statutory obligation to control;
- define officials and their powers;
- allow a "right of entry" for officials and other designated people to allow entry to a farm or other livestock enterprise for disease surveillance purposes, collection of diagnostic specimens, and to carry out any other approved disease-control actions. Owners must be able to be required to assist in any relevant manner;
- define what constitutes a "suspected premises", an "infected premises" and a veterinary assessed "dangerous contact premises";
- authorize the proclamation of infected zones 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 issue permits to move these only under specified animal health conditions;
- authorize the compulsory destruction or slaughter and safe disposal or processing of infected or potentially infected animals and contaminated or potentially contaminated products and materials, subject to fair compensation, and cleansing and disinfection of properties;
- authorize the destruction of wild or feral animals and uncontrolled/poorly controlled livestock;
- provide for compensation to be paid to owners of livestock and property destroyed as part of disease-control programmes and define standards and means of implementing such compensation;
- allow biosecurity codes of practice to be mandated for risk enterprises and activities (e.g. livestock markets, abattoirs and dairy factories) and authorize any necessary disease-control actions for these;
- authorize the compulsory vaccination or treatment of animals where required;
- authorize the compulsory identification of animals, where appropriate;
- authorize any other necessary disease-control actions.

Harmonization of laws

For countries which operate under a federal system of government, there should be harmonization and consistency of legislation for animal disease emergencies throughout the country, and between national and state/provincial levels. The same should apply between countries in regions for which there is unrestricted exchange of livestock and animal prod-

ucts under free-trade pacts, e.g. the European Union, the Mercosur countries in South America, and the Economic Community of West African States (ECOWAS) and the Southern Africa Development Community (SADC) in west and southern Africa respectively.

Law enforcement

Laws and regulations are obviously of little value unless they can be properly applied and enforced. Animal health and other officials must be given the necessary delegatory power and authorizations under animal health and quarantine acts to discharge their duties in a response to an animal health emergency. This includes other government agencies that are co-opted to provide assistance. It also may be necessary to enlist the assistance of the police and armed services in law enforcement under some circumstances, e.g. policing livestock movement restrictions and quarantining and protecting personnel involved in response activities.

FINANCING

Experience has shown that delay in obtaining finances is one of the major constraints to a rapid response to emergency disease outbreaks. The application of even modest funds immediately will very likely save major expenditures later. Forward financial planning is therefore an essential component of preparedness.

The finance plan should be drawn up in light of the required activities and should cover both ongoing costs (e.g. surveillance, risk analysis) and costs that are likely during an emergency (e.g. costs of control). The latter will be reflected in the associated contingency plan, as will some or all of the legislation.

Financial plans need to be developed which provide for the immediate provision of contingency funds to respond to disease emergencies; that is, the 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. More typically, they 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 s/he 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 being effectively controlled and/or eradicated, and
- there are approved plans in place to do so.

The funds may be held either as special funds sequestered for this particular purpose or there may be drawing rights provided up to a predetermined realistic amount against a specific government account. The NDCC should prepare an estimate of the level of financing required under a likely scenario for the first two weeks of a disease incursion, for each of the diseases identified as a priority. This estimate can be based on previous experience, experiences in similar countries, expert opinion or a combination of all three. These estimates should then be presented to the NADEPC.

A separate provision for the release of funds will be required for the response to an incursion that becomes more severe after the immediate phase, i.e. if the incursion becomes more widespread or lasts longer than the initial funds can cover. The amount required cannot be predicted, but the mechanism to identify the sources of funding and how they should be released must be developed during the preparation phase so that funds can be released quickly if required.

In some countries, it may be desirable for funds to be provided from both the government and the private sector for emergency programmes against some diseases (i.e. cost-sharing arrangements). This would be agreed upon after a review of the nature and proportion of public good and private good benefits that would be derived from the elimination of the disease.

If appropriate, a funding formula may be agreed upon in which each sector pays for a fixed percentage of the cost of the total campaign or specific components in the campaign. If the private sector is to contribute, it needs to be determined who in the private sector benefits from control and therefore should share the cost (e.g. processing industries, traders and farmers' organizations). It also needs to be determined how the private sector funds will be raised. The funds could be established through compulsory industry-wide insurance premiums or through industry levies on livestock transactions or slaughtering which are then held as special, reserved funds.

Voluntary individual insurance policies could be satisfactory for insuring against direct losses from a disease or disease-control actions, but they are unsatisfactory for raising funds for the campaign itself. However, there are currently few countries where insurance companies are prepared to sell such insurance, or if they do so, it can be very expensive.

Additionally, consequential losses, such as loss of income because of reduced milk production, are potentially variable because they depend on factors that cannot be predicted, such as the duration of an epidemic. Insurance companies will very rarely be prepared to cover these. It must always be remembered that insurance companies sell insurance to make a profit.

In some 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. The procedures for applying for funding and requirements for preparing and submitting an application should be predetermined. However, this sort of external funding can never be guaranteed and is unlikely to be available quickly. Most countries have a national disaster plan which includes funding, and it is desirable for animal health emergencies to be included in this for various reasons, one of which is to have access to finances.

COMPENSATION POLICY

A compensation policy is a cornerstone of any control policy that will require the killing of animals or the destruction of property. It must be stressed that compensation should be seen as mostly an incentive to encourage rapid reporting of disease, and not as compensation for all losses. Compensation arrangements that are either inadequate or too generous can encourage behaviours that are damaging to the control efforts. Poor compensation might encourage owners to hide or move their animals to avoid culling. Compensation

that is too generous might encourage risky behaviour in the hope that animals will become infected so that compensation will be paid.

Animals that are killed may represent to the owner both a direct capital loss and a loss of valuable future genetic capital. Most loss incurred by producers is the consequential loss of ongoing production during the outbreak rather than the value of the animals killed. However, these losses are not predictable, because they will depend on the overall duration and severity of the outbreak in the area of an affected farm. Therefore, other support mechanisms (e.g. financial and social, beyond compensation payments) should be considered as part of the plan to assist affected farmers to recover.

While compensation may be thought of as being expensive, the incentive it creates for rapid reporting has a strong effect on limiting the overall size and cost of an outbreak. Compensation is very likely to save money overall.

Compensation should be paid for any animals that are killed as part of a compulsory culling campaign, whether they are infected or killed as dangerous contacts or sometimes for welfare purposes. In effect, the government buys the animals and then kills them. Compensation should also be paid for products and property that are destroyed as part of a compulsory campaign. Since one of the major roles of compensation is to encourage the early reporting of disease, compensation should not be paid for animals that have already died or have been killed by the producer before the disease is reported and confirmed.

For compensation to be effective, it needs to be paid soon after the losses are incurred. Planning should consider how monies for compensation can be easily and quickly disbursed to those who are eligible for them.

Financing for compensation plans

The financial plan should 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 inherently unfair and also very counterproductive to the campaign. Inadequate compensation fosters resentment and lack of cooperation. It also encourages farmers to hide the presence of the disease or to move their animals to where they believe they will be safe.

Compensation should be based on the fair market 'farm-gate' value of the animals at the time of culling (assuming a value that the animal would have had as a healthy animal). Where possible, compensation should be paid at full market value. Compensation should be paid also for animals suspected as infected even if found later uninfected, and for contact animals destroyed within the efforts to contain or eradicate the disease. The same principle should be applied to products and property. The valuation should be done by an independent, professional valuer or team. If individual valuations are not practical, then generic valuations for different classes of livestock may be acceptable. Compensation for consequential, rather than direct, losses is usually difficult to administer and is inappropriate.

SURVEILLANCE SYSTEMS

Implementing active surveillance systems ensures rapid detection of an outbreak, which is key to controlling an infectious disease, and helps to demonstrate freedom from disease. The overall size and cost of any infectious disease outbreak is most strongly related to the

delay in its detection. Trading partners may require surveillance to demonstrate freedom from disease. Also, any positive surveillance result that is obtained later can be regarded as indicating an incursion.

It is equally important to publish negative results from investigations of suspect cases. Every year, there should be a number of suspect cases of most TADs which are investigated. Maintaining and publishing records of these is important in establishing international confidence that there is a functioning scanning surveillance system. An absence of suspect cases will certainly be taken internationally as evidence of a non-functional surveillance system and should also prompt action to improve surveillance nationally. The reports can be published in summary form, either in an annual report or in "real time" as an updated table on a Web site, or both.

Surveillance is dealt with in more detail in the chapter on prevention.

CONTINGENCY PLANS AND OPERATIONS MANUALS

Contingency plans and operations manuals are critical to enabling a swift response when an incursion is detected. Any delays in implementing control measures have a very significant negative impact on the speed with which an outbreak is controlled and therefore its size and, consequently, its cost. Contingency plans and operations manuals should be regularly reviewed to ensure that they stay fit for purpose. Such reviews are essential.

Contingency plans and operations manuals are addressed in more detail in section 8. Respond.

Laboratory capacity

Each contingency plan must contain detailed plans for ramping up laboratory testing capacity requirements during an emergency. This capacity is best provided locally in order to get rapid results, as long as testing can be performed accurately with existing resources. This might require contractual arrangements with laboratories inside or outside of the country. There must be an adequate level of equipment, training and supplies available on standby for immediate use at the start of an outbreak.

Ensuring that this is the case requires preparedness planning during "peacetime". Once an outbreak occurs, the need for testing will increase very rapidly. All testing should use accepted assays and methods as well as internal quality controls under appropriate biological safety requirements. To assure test quality, it is also advisable to work with an international reference laboratory during "peacetime". This will build the relationships needed for rapidly submitting samples to the international reference laboratory for testing.

Vaccine supplies

If during the contingency planning process, it emerges that vaccination is likely to be used for control, it is important that this vaccine be available in the required type and quantities at an early stage of an outbreak. The type and quantities should be decided and then a country must either establish a vaccine production capacity and antigen bank locally, or source the vaccine from outside the country, either through governmental links or from a private company. Particularly in the latter situation, it would be important to have a preproduction contract in place guaranteeing a given level of supply in the event of an outbreak.

In all cases, the vaccine to be used should be produced to the standards described in the OIE Manual of Diagnostic Tests and Vaccines.

The decision whether or not to use vaccines is, at times, a most difficult decision. The contingency plan should anticipate their use and ensure that procedures are in place (e.g. importation protocols for vaccines are predetermined) when a decision is taken.

Vaccine deployment (including cold chain, targeted species, vaccination teams or brigades, communication with local authorities and producers) needs to be planned. Consideration should be given to permanent identification of animals vaccinated and serological monitoring before and after vaccination to evaluate vaccine coverage and efficacy.

ESTABLISHING AND MAINTAINING RELATIONSHIPS

Stakeholder groups should include all those who will be required to contribute resources and all those who will be affected by control measures. This should include other ministries, local authorities, agencies, organizations (national and international) and projects which will be expected to provide manpower, equipment or funding.

Outside the governmental structures, other stakeholders should be included, such as farming communities and organizations, feed suppliers, local veterinary practitioners, milk collectors, livestock marketing authorities, livestock traders and exporters and livestock product processors. If tourism will be impacted, representatives of this industry should also be included.

It is important that these stakeholder groups are established and meet regularly in "peacetime". This will build up relationships and trust between the parties, something that is often lacking initially. Outbreak control would be hampered if building such relationships is attempted only after an outbreak occurs. The stakeholder groups should also have a role in reviewing and suggesting amendments to any contingency plan drawn up under the emergency preparedness plan. These might include agreed public messages concerning their industry or products.

RESPONSE TRAINING AND SIMULATION EXERCISES

The training required includes:

- training government veterinarians, private veterinarians and livestock-keepers in disease recognition and reporting procedures;
- training veterinarians and animal health technicians in response procedures, including emergency management;
- training epidemiology groups in outbreak investigations and analyses;
- undertaking regular desktop and field simulation exercises involving all stakeholders to practise implementation of contingency plans and operations manuals; public health officials should be included if a zoonosis is the cause.

This type of regular training and practise is key for maintaining a real ability to implement control measures and also for spotting gaps in the current system. Such training and exercises should be carried out according to a regular plan (e.g. training every two years, desktop exercises every three years and full field simulation exercises every five years) and consideration should be given to using trainers from international organizations. A desktop simulation practises some parts of the contingency plan, particularly the roles of the Gold

and Silver commands. A field simulation practises the role of the Silver and Bronze commands and the field staff (i.e. much of the contingency plan and the operations manual). International observers and trained experts should be invited to simulation exercises as evaluators who can provide feedback on the exercise.

Response training

All staff should be thoroughly trained in their roles, duties and responsibilities in a disease emergency. More intense 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. Experience has shown that emergency management teams perform better when they train and exercise as a team.

Simulation exercises

Simulation exercises are extremely useful for testing and refining the contingency plans, including the operations manual (e.g. SOPs), in advance of any disease emergency. They are also a very valuable means of building teams for emergency disease responses and for training individual staff.

The scenarios devised for the exercises should be as realistic as possible, 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 range of various 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 LDCC). Simulation exercises may be done purely as a 'paper exercise' or through mock activities – or as a combination of both approaches. At the completion of each simulation exercise, there should be a 'post-mortem' or review of the results. This review should identify further training needs as well as required modifications to the contingency plans, including the operations manual.

A full-scale disease outbreak simulation exercise should only be attempted after the individual components of the disease-control response have been tested and proven. Earlier exercises of this nature may be counterproductive. Care must be taken that simulation exercises are not confused with actual outbreaks in the minds of the media and the public. Notice on a planned simulation exercise should be sent to neighbouring countries and international organizations.

Regional or bilateral simulation exercises involving multiple countries can be conducted once national contingency plans have been thoroughly tested. International organizations can assist in coordinating regional exercises.

PUBLIC AWARENESS

Public awareness campaigns help to maintain vigilance against risks of incursion and knowledge of how to detect and report a disease.

Incursions of infectious disease may be due to either illegal activity, someone making a mistake or unwitting introductions of animals in the incubation period. They are then mostly detected and reported by either the livestock keeper or a private veterinarian called

to treat sick animals. Maintaining the awareness of livestock-keepers and traders of the risks and their obligations to report (and how to do so) is a vital part of the early detection system.

UPDATING DISEASE PLANS

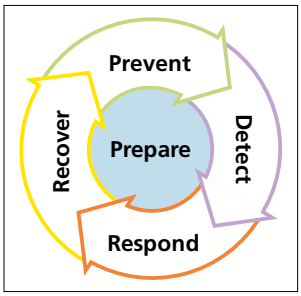
Preparedness plans, contingency plans, recovery plans and operations manuals should not be treated as static documents. They should be regarded as living documents that need to be regularly reviewed and updated as warranted by changing circumstances and technical knowledge. To assist in this approach, documents might be prepared in forms that are readily updated and a document identification process used to track the "current versions". In reviewing and updating plans, the following factors should be taken into account:

- changing epidemiological situations, both within the country and externally;
- new disease threats;
- any deficiencies highlighted in simulation exercises;
- the results of new risk analyses;
- new scientific findings or technological advances (e.g. better diagnostic methods or vaccines, new techniques related to culling of animals in outbreaks);
- experiences in previous equivalent outbreaks in the country and other countries;
- changes in the structure of livestock industries or methods of livestock husbandry, and internal or export trade requirements;
- new standards, guidelines and recommendations by international organizations such as the Food and Agriculture Organization of the United Nations (FAO) or OIE;
- changes in national legislation or in the structure or capabilities of government veterinary services (or other government instrumentalities); and
- feedback from major stakeholders, including farmers.

Risk analyses may also show that new emergency diseases have come to the fore, and highlight the need to prepare a new set of contingency plans for these new high-threat diseases.

It may be useful to consider the capabilities of the veterinary and other relevant services as preparations are made. The OIE Performance of Veterinary Services Pathway, which corresponds to a global programme for the sustainable development of a country's veterinary service's compliance with OIE standards on the quality of veterinary services, provides one good tool for achieving such a review.

Prepare: Risk analysis



INTRODUCTION

Risk analysis is a procedure which we all do intuitively in our everyday life as we also do in our professional work. Only in recent years has it developed into a more formal discipline which is being used increasingly in many fields of endeavour. In animal health it has been most widely used for helping to decide the most appropriate health conditions for imported animals and animal products and for strategies for quarantine operations. Guidelines for quarantine risk analyses have been included in the OIE Terrestrial Animal Health Code (TAHC). The four components of risk analysis described in the Code are shown in Figure 3.

Risk analysis is a tool that also can be used to very good advantage for animal disease emergency preparedness planning. In fact, it provides an excellent foundation for decision-making, and should be undertaken in an early stage of the development of contingency plans.

APPLICATIONS OF RISK ANALYSIS

Risk analysis can be applied at each stage of the emergency animal disease preparedness process. This includes:

- priority ranking of serious disease threats for the country, indicating what level of resources should be devoted to preparing for each of the high-priority diseases;
- determining import quarantine policy and how quarantine and other disease prevention procedures need to be strengthened;
- planning well-focussed training courses for veterinary staff and farmer awareness and publicity campaigns;
- determining how and where disease surveillance and other epidemiological systems need to be strengthened;
- determining how laboratory diagnostic capabilities need to be strengthened;
- planning disease response strategies, including comparative evaluation of different disease-control options.

FIGURE 3
The four components of risk analysis

WHO CONDUCTS THE RISK ANALYSES?

The risk analysis component would best be carried out by the epidemiological unit in the national veterinary headquarters as part of the national early warning system for TADs and other emergency diseases. Risk management and risk communication are tasks for everyone, but the CVO should coordinate these.

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, changing international trading patterns for the country, new scientific knowledge and technology. Risk analysis should therefore not be seen as a "one off" activity. The process should be repeated and updated regularly.

QUANTITATIVE VS. QUALITATIVE RISK ASSESSMENT

The assessment of risks can be done in a quantified, semi-quantified or qualitative way. The advantages and disadvantages of each approach are discussed in greater detail in Annex C. Quantitative analysis is widely used in physical fields, such as engineering, and sophisticated computer programmes are available to facilitate this. However, it is inherently very difficult to quantify (or actually ascribe probability numbers) to risks in many biological systems because of the lack of historical precedents and serious gaps in the available biological data. Risks should be quantified as far as is practicable. If this cannot be done, it is recommended that qualitative risk analyses be used for emergency diseases. The risks can be described as 'high', 'medium', 'low' or 'negligible', or preferably by a simple scoring system (e.g. 1-5 for the level of risk and 1-5 for the level of potential consequences). Not all risk factors are of equal gravity. Therefore, consideration should be given to modifying risk scores by a weighting system, although this can sometimes produce unexpected outcomes and should be well understood before being used. This ranking process will provide an agreed transparent mechanism for prioritizing the identified risks and a solid platform for contingency planning.

PRINCIPLES OF RISK ANALYSIS

Risk analysis comprises four components. These are:

- **hazard identification**, in which the main threats are identified and described;
- **risk assessment**, in which the risks of an event occurring and developing in particular ways are first identified and described. The likelihood of those risks occurring is then estimated. The potential consequences of the risks if they occur are also evaluated and are used to complete the assessment of the risk;
- **risk management**, which involves identifying, documenting and implementing measures to reduce identified risks and their consequences. The risks never can be completely eliminated. The aim is to adopt procedures that will reduce the level of risk to what is deemed to be an acceptable level;
- **risk communication**, which is the process of exchanging information and opinions on risk between risk analysts and stakeholders.

Qualitative risk assessment and the methodology for carrying it out are described in greater detail in Annex C and summarized below.

RISK ANALYSIS PROCESSES IN ANIMAL DISEASE EMERGENCY PLANNING

Hazard identification

This should be done by constantly monitoring the international status and evolution of outbreaks of transboundary and emerging animal diseases. The latest scientific literature should be monitored also. This should be a routine function of the epidemiological unit of the national veterinary services. Apart from the scientific literature, a most valuable source of information would be from OIE (through its regular international disease reports, publication on import risk analysis and World Animal Health Information System – including the World Animal Health Information Database [WAHID] from 2005 and Handistatus from 1996 to 2004) and from the various reports and publications of the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases[1] (EMPRES) programme of FAO. Information on zoonoses is available from the World Health Organization (WHO). ProMed, an Internet server and mailing service, currently provides a useful forum for very rapid dissemination of unofficial information on animal, plant and human disease occurrences around the world. The Global Public Health Intelligence Network is a secure, Internet-based "early warning" system that gathers preliminary reports of public health significance in seven languages on a real-time basis.

Risk assessment

Having identified and described the main disease threats, the next step is to assess how serious the threat of entry of each disease is and the routes and mechanisms by which it may enter. Questions which may be asked include:

- What is their current geographical distribution and incidence around the world?
- Is the distribution fairly static or has there been a recent history of spread to new countries, regions or continents?
- Have any new antigenic subtypes emerged which may threaten countries that routinely vaccinate against the disease?
- How close is the disease? What is the status of neighbouring countries, not only in respect to known presence of the disease, but also the level of confidence in their veterinary services to be able to detect and control outbreaks of the disease?
- If the disease is present in neighbouring countries, where are the outbreaks nearest to shared borders?
- Are there any feral or wild animal populations in the country which are susceptible to the disease and which may introduce the disease (e.g. through natural migrations) and/or act as a reservoir for the disease?
- Is there a past history of introduction or occurrence of the disease in the country? Is it possible that it is still present in undetected, endemic pockets of domestic, feral or wild animals or birds?
- How is the disease likely to be spread in the country? What would be the relative roles of live animals and their movements, fomites, meat or other animal products, insect vectors, wind-borne spread, etc. in transmitting the aetiological agent?

[1] http://www.fao.org/empres

- Are there significant imports of potential risk animal species, meat products or other materials? Do they come from endemic regions? Do quarantine import protocols conform to OIE standards? How secure are import quarantine procedures?
- How secure are barrier and border import controls/quarantine procedures to prevent unlawful entry of animals or risk materials? Is there smuggling, unofficial livestock movement, transhumance or other practices which would constitute a risk for entry of the disease? Is there political instability/civil unrest in neighbouring countries that might result in major movements of people and movement or abandonment of livestock?
- Where are infected animals likely to cross the border and where are the main livestock trading routes from these areas?
- Are there adequate biosecurity measures in-country to lessen the chance that exposure to susceptible animals will occur if a pathogen is introduced?

The next step is to evaluate how serious the socio-economic consequences might be if there is an incursion of the disease. Factors that may be taken into consideration include:

- Is the disease likely to become established in the country? Are there susceptible livestock host populations, and in the case of arthropod-borne diseases, are there competent insect or tick vector species?
- Is the disease likely to become established in feral animal or wildlife populations?
- Will it be difficult to recognize the disease quickly in different parts of the country?
- How large are the populations of susceptible livestock or poultry populations in the country? What are the livestock management and trading systems? How important are those livestock industries to the national economy? What is their importance in satisfying nutritional (food security) and other needs of communities?
- How are these livestock industries structured within the country? Are there large commercial and/or intensive production industries or do they consist of smallholder/village production or extensive pastoral systems? Is production concentrated in just a few areas of the country?
- How serious will the production losses be from the disease? Will food security be threatened? What will be the socio-economic consequences?
- Is there an actual or potential export trade in livestock or livestock products? If so, how important is this export trade for the national economy? What would be the likely reaction of importing countries if the disease was found in the country? What would the socio-economic consequences be, both at a local and national level, of the loss of export trade for an extended period?
- What are the likely consequences on internal trade in livestock and livestock products?
- Are there susceptible animal populations which are poorly controlled and allowed to roam freely, and which may constitute difficult-to-control reservoirs of infection?
- How difficult and costly will the disease be to control and eliminate? Is it capable of eradication? All resources and both direct and indirect costs should be considered.
- Are there likely to be adequate trained manpower and physical and financial resources available to mount an effective response against an incursion of the disease?

By addressing these questions and issues it will be possible to build a risk profile for each high-threat disease, uncover weaknesses and make judgements on the magnitude

of the risk presented by the disease, in qualitative, if not quantitative, terms. Most importantly, it will be possible to get an idea of how each disease ranks in relation to the risks of other high-priority diseases. In this context, a disease that had a high risk of entry to a country, but only had a low risk of establishment if it entered, or only had trivial potential socio-economic consequences for the country, would get only a low overall score in a risk assessment. Conversely, a disease assessed as having a low risk of introduction, but high consequences if introduced, would be rated more highly.

On the basis of this risk assessment and profiling, it should be possible to prioritize the risk associated with each of the diseases, and determine what level of resources should be devoted to preparedness planning for each disease.

It will also be possible to get some idea of the most likely sources and methods of entry of the disease agent and how the disease may spread in the country. The geographical pressure points for entry, establishment and spread of the disease also may be assessed. On the basis of this, it will become clear how and where preventive and disease surveillance strategies and programmes need to be strengthened.

Finally, it should indicate how veterinary services and contingency planning might need to be strengthened for the highest priority threat diseases.

Risk management

In a very real sense, this entire manual is devoted to risk minimization and management strategies for emergency animal diseases. Identification of critical control points through the risk assessment process will prioritize the steps included in this manual which are needed to manage the risks.

Risk communication

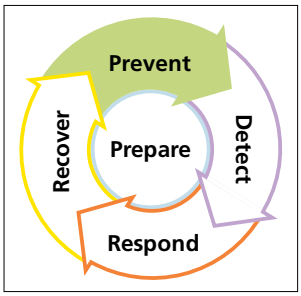
This is the process of exchanging information and opinions on risk between risk analysts and stakeholders. Stakeholders in this context would include all those who could be affected by the consequences of the risks (i.e. everyone from farmers to politicians). It is important that risk assessment and risk management strategies are fully discussed with stakeholders so that they feel comfortable that no unnecessary risks are being taken and that the risk management costs are a worthwhile 'insurance policy'.

To ensure ownership of decisions, risk analysts and decision-makers should consult with stakeholders throughout the whole risk analysis process so that risk management strategies address stakeholder concerns, and decisions are well-understood and broadly supported.

INCORPORATING RISK ANALYSIS INTO THE CONTINGENCY PLAN

The results of the risk analysis for the appropriate disease should be incorporated into the specific disease contingency plan. With its discussion of risks and consequences, the risk analysis should prove to be a powerful weapon in persuading government decision-makers to approve the contingency plan.

Prevent



INTRODUCTION

The old maxim that "prevention is better than cure" is very relevant when dealing with TADs and other emergency diseases. Quarantine and other prevention strategies are the first line of defence against these diseases. They protect valuable national livestock industries and human health and support exports. Prevention strategies should be considered to be an integral component of contingency plans, and countries should devote appropriate resources to ensure that they implement effective quarantine policies and programmes to prevent the introduction of serious animal diseases.

Prevention strategies should be applied at several levels. These include:

- import quarantine programmes;
- international border security;
- quarantine procedures at international airports, seaports and mail exchanges;
- disease prevention strategies at the national and local level; intelligence-gathering;
- cross-border and regional cooperation; and
- on-farm disease biosecurity.

Risk analyses should provide an estimate of the degree of risk of introduction of the target disease(s), the more likely mechanisms and portals of entry and the potential seriousness of the consequences should the disease enter the country. This should provide the basis for designing and implementing appropriately resourced prevention strategies.

The disease prevention strategies should be documented as a component of the overall preparedness plan.

IMPORT QUARANTINE POLICY

The importation of animals, animal products (e.g. meat, dairy products and eggs), genetic material (e.g. semen and eggs/ova) and biological products (e.g. vaccines) pose an inherent risk for the introduction of serious infectious animal disease agents. These risks need to be avoided, or at least significantly minimized, by sound import quarantine policies and procedures.

Import risk analyses should form the basis for deciding from where animals and animal products can be safely sourced and under what quarantine protocols. They also provide a scientifically defensible case for decision-making. The OIE/TAHC provides guidelines for carrying out such analyses.

Sound import quarantine strategies should be negotiated with exporting countries. They normally include the following procedures:

- pre-export health inspection, disease testing and quarantine;
- proper identification of the animals or products to be exported;
- animal health certification by the competent veterinary authority of the exporting country;
- safe transit from the collection/processing point in the exporting country to designated arrival points in the importing country; and
- post-arrival health inspection, disease testing and quarantine.

Any required "on arrival" disease testing and quarantine of animals should occur at approved sites, preferably near the border, isolated from other susceptible livestock, secure and subject to the ready control of the movement of humans and equipment. While efforts should be made to ensure that adequate quarantine provisions are applied for such animals, a degree of sensitivity is required. The application of quarantine restrictions that are too harsh may encourage smuggling and be counterproductive.

The OIE/TAHC and Aquatic Animal Health Code provide detailed import quarantine guidelines that veterinary authorities should seek to follow.

INTERNATIONAL BORDER SECURITY

Ideally, animals and animal products should be permitted entry only through international borders at designated points, often called border inspection points. Animals and animal products should be subjected to health inspection and should satisfy the import quarantine standards established by the importing country. Countries should use the norms detailed in the current TAHC. The World Trade Organization (WTO) has adopted these as part of the Sanitary-Phytosanitary (SPS) agreement, so trade between WTO members is governed by the OIE guidelines and standards.

The uncontrolled movement of animals and animal products across national borders presents a particular problem for many countries from an animal health perspective. This often occurs through illegal trading when there is a price difference between countries for live animals or animal products. It may also be a result of nomadism, transhumance, civil disruptions or inflows of refugees.

This problem is compounded when borders are easily crossed and therefore porous, even more so where such areas are inaccessible to the relevant authorities. In these circumstances, it is recommended that close relations be developed between local animal health authorities, livestock traders and livestock communities that are likely to bring animals across borders. This should include an education campaign about the dangers of serious TADs. Cooperation leading to simple, practical quarantine and disease surveillance procedures should be encouraged. At the same time, a good working relationship should be developed with animal health authorities in neighbouring countries, both at the national and local levels, for cooperation on quarantine and exchange of early warning information on disease occurrences near mutual borders.

QUARANTINE AT INTERNATIONAL AIRPORTS, SEAPORTS AND MAIL EXCHANGES

The rapid growth in fast mass international transportation of people and their goods over recent years has markedly increased quarantine risks for all countries.

Efforts should be made to reduce these risks by requiring appropriate certification by incoming passengers and consigners of goods (which must be obtained from the veterinary authorities of the country of origin) and by providing adequate resources at international airports, seaports and mail exchanges for quarantine inspections.

Consideration should be given to running public awareness programmes on board planes and ships. Clear signage about the legal limits for the personal importation of products of animal origin should be prominently placed at arrival points.

The desirability of carrying out disinfection/disinsection procedures for international aircraft, as approved by WHO and the International Air Transport Association (IATA), may also be investigated.

It may be possible for some quarantine risk items to be safely disinfected and then released. However, other quarantine risk materials should be safely disposed of, or re-exported to the country of origin, if acceptable to the country of origin. Facilities should be made available for the incineration or safe burial of food scraps or waste food from these aircraft or ships and for animal products confiscated from incoming passengers by quarantine officials. Every effort must be made to prevent these products from being used for swill feeding to animals (see below).

ILLEGAL IMPORTS

By their nature, the full extent of illegal imports of animals and animal products is unknown – but this will always occur to some extent. How can this be controlled and minimized? It is important to understand the motivation that creates the impetus and incentive to engage in such illegal activities. These motives can be cultural and/or financial. This understanding should be used to gather intelligence and to direct activities aimed at discouraging and intercepting illegal imports.

There are two levels of illegal imports. Imports for commercial use will enter in relatively large batches in containers or hidden as part of another shipment, whereas imports for personal use tend to be small and carried in personal luggage or sent through the post.

Where there is no risk of discovery, there is no incentive to abide by the regulations on imports which inevitably bear some cost in terms of time, trouble and often out-of-pocket expenses. It is important for legal importing to be relatively easy and not overly expensive compared with the value of the import. It is important to have clear policies on permitted levels and types of personal imports, and there should be clear signage on this at the points of arrival (e.g. at airports, seaports and land border posts). Some countries provide disposal bins for passengers to voluntarily surrender non-permitted items before entering the country.

There must be a system of checks, either random or targeted, which should have the ability to detect illegal batches. This will often require working with customs authorities at border posts, seaports and airports. Sniffer dogs are good at detecting meat and other animal products.

A significant driver for the import of live animals or animal products is price differentials. If a commodity fetches a higher price in country A, there will be an incentive to send it from country B despite it being illegal, and particularly if country B neighbours country A. It is not possible for veterinary authorities to influence the cost of commodities directly, but

good market intelligence will indicate which animals and animal products are likely to be in high demand within their country compared with world demand and, in particular, in neighbouring countries.

A second common driver is cultural. Human beings crave the foodstuffs they grew up with and will go to great lengths to obtain them. This can lead to the import of either small quantities or large shipments of prohibited materials. These shipments, particularly personal imports, can be targeted by authorities through knowledge of communities who travel to and from their place of origin.

Understanding both price and culture drivers requires having a good intelligence system and, in particular, collaboration with veterinary authorities in neighbouring countries and countries with significant shared populations.

Intelligence gathering should be maintained for early warning of changes in distribution, virulence or epidemiology in affected countries and trading partners.

There should be a section within the veterinary authority tasked with gathering intelligence about disease occurrence in neighbouring countries and trading partners in particular. This can be a separate section, but if the authority has an epidemiology unit (which is strongly recommended) the unit should have sufficient staff so that this can be part of its responsibilities.

There are various sources of information about the occurrence of disease. These include the FAO EMPRES-i system, the official disease reporting system (i.e. OIE's WAHID), WHO, the media, the Internet and others. Embassies in countries also can provide information on the status of a certain number of diseases and this is especially true if there is a veterinary or agricultural attaché. Information from these should be collated and kept over time, and regular updates of the disease situation as it affects the country should be produced – at least once a year and more often when risk of infection appears to have increased.

DEVELOPING CROSS-BORDER CONTACTS WITH NEIGHBOURING ADMINISTRATIONS

Often local veterinarians working on either side of a land border have good unofficial contacts, but communication between the central veterinary authorities is often less close.

An essential element of prevention is to have close relations with neighbouring veterinary authorities. This provides several benefits, including:

- early warning of disease in neighbouring countries;
- harmonization of border activities;
- possible exchange of specialist staff during "peacetime" and outbreaks;
- shared simulation exercises.

There may be the possibility of regional as well as bilateral contacts. There are often regional organizations (e.g. the Southern African Development Coordination Conference in southern Africa, the South Asian Association for Regional Cooperation in South Asia and Organismo Internacional Regional de Sanidad Agropecuaria (i.e. or the International Regional Organization for Agricultural Health) in Central America.

CONTROLS ON FEEDING UNPROCESSED MEAT PRODUCTS AND WASTE FOOD (SWILL)

The swill feeding of food scraps, which may contain animal products, to pigs or poultry is a very important way by which a number of serious TADs may be introduced into a country or into a disease-free area of a country.

TADs which may be transmitted by feeding unprocessed meat products, waste food and offal include:

- foot-and-mouth disease (FMD);
- swine vesicular disease;
- vesicular exanthema;
- classical swine fever;
- African swine fever;
- Newcastle disease;
- highly pathogenic avian influenza (HPAI); and
- African horse sickness.

Consideration should be given to banning swill feeding where this is feasible and can be enforced, or at least implementing controls that will make it safer. The most important areas to concentrate on are food scraps from international airports, seaports and restaurants. Illegally imported meat and other animal products also pose a high risk of potential infection. A third important source is the raw internal organs from hunted wild animals, including wild birds.

The usual control for making waste animals products safer is heating them to a specified temperature and duration, such as requiring them to be boiled for at least one hour. These are difficult to police, and records can be falsified. In many countries, the feeding of animal products or any mixed food waste to livestock and, in particular pigs, has been banned, and this is certainly a strong method of disease prevention.

In countries with a developed pig industry, where pig farming is a business, it is possible that the law will guide farmers, and banning swill feeding might be relatively easy to achieve. For many pig producers in rural, peri-urban and urban situations, economic circumstances dictate that any affordable available food source should be used. This type of small-scale pig production – often fattening a few pigs bought from breeding establishments – may well depend on the use of food scraps. There are often many such producers who may be highly dependent on their pigs for extra income and who may raise pigs on a sufficiently informal basis. These will be beyond the effective monitoring of day to day actions and implementation of regulations. Only when the producers comprehend the risk and when there is a practical means to overcome that risk, will they comply with regulatory measures. This will require a positive public awareness campaign. The most practical way to decrease the risk is for pig owners to understand the dangers and to opt voluntarily to boil the swill for at least one hour before cooling and feeding it to their pigs.

CONTAINMENT OF LIVESTOCK

The presence of large numbers of uncontrolled or poorly controlled livestock in an area constitutes a high risk for the establishment and rapid spread of serious animal diseases. These may also cause significant delays in the recognition of the disease. Elimination of

the disease will be much more difficult. Livestock farmers should be encouraged through public awareness and extension programmes to contain their animals properly and to prevent them from roaming and mingling with other livestock and feral or wild animals. Of particular importance in the context of HPAI (e.g. H5N1) is the physical separation of domestic poultry from wild water birds, particularly wild ducks.

UNCONFINED PIGS

Swine merit special mention. The omnivorous nature of pigs means that they will eat meat and other animal materials if allowed access to them. The issue of swill feeding has been discussed above, but a further issue arises if domestic pigs are allowed to roam as part of the production system. This may happen either in urban situations, where pigs may scavenge on rubbish, or in rural situations where pigs may be allowed to feed on natural crops such as acorns. Such pigs may have access to the carcasses of dead animals that are disposed of in the bush or to garbage dumps, where they may be exposed to contaminated food scraps. This can be important in the transmission of diseases such as FMD, African swine fever and classical swine fever.

Countries should take measures to encourage the development of properly constructed pig pens and farms and to reduce the numbers of scavenging pigs, particularly in areas which are considered to be at high risk for entry of FMD and other diseases.

However, it must be accepted that the traditional ways of keeping pigs in many developing countries will not be changed overnight, and that permanent confinement of pigs imposes obligations to provide feed and water that owners may be unable to meet. The merit of pigs is their ability to convert low-grade feed, including human detritus, into high-quality protein, and until much more research has been done on alternative feeds for pigs, many producers will not find it worthwhile to confine their pigs. Additionally, in a number of countries, sanitation is not readily available, and pigs provide a valuable cleansing service.

The best that can be hoped for in the short term is that informed pig owners in villages will understand the dangers of disposing of the carcasses, offal and remnants of dead/slaughtered animals on garbage dumping areas where pigs scavenge. A national policy for upgrading pig production that includes identifying sources of cheap feedstuffs should be put in place where possible.

LIVE ANIMAL AND BIRD MARKETS AND SLAUGHTER PLACES

Live animal markets and slaughter places are a frequently identified source of spread of infection.

Live animals are the most serious source of infection to other animals, and markets and slaughter places provide ideal mixing conditions and act as sources of indirect spread via fomites such as clothing, footwear, vehicles, etc. Uncontrolled markets and slaughter facilities for livestock constitute a problem for disease prevention and spread. These should be progressively brought under official animal health inspection and supervision. This is not an easy process and may be complicated by different control systems and ownership of markets, some of which are informal, and others which are either privately owned or owned by local government bodies. Many of the formal markets are under the official control of the local government bodies rather than under veterinary authority control. Informal mar-

kets, by their nature, are not under any form of control, although there may be customary informal regulation by the community.

From a disease management point of view, the ideal is that all live animal markets and slaughter places are licensed and that all sales be recorded by the veterinary authority to ensure health status. But this requires a considerable infrastructure to create and enforce regulations. This is possible in circumstances where markets are well-identified and small in number and where effective measures are available against those who break the law. But in many countries, the locations are numerous, access is frequently difficult and veterinary services are overstretched, so this is not possible. Even where it is possible, overzealous enforcement of regulations without the support of traders will create parallel trading systems which may create a greater problem.

Markets should also be seen as a potential source of information on trading patterns and disease reports, and as concentration sites where diseases can be detected. Gaining the cooperation of market traders can perhaps be as important as controlling their activities. Trading patterns change, and unless there is close contact with traders, entire parallel trading systems may grow up outside the purview of the veterinary or other authorities.

Nonetheless, a degree of control is necessary and must be sustainable. It is important to understand the entire production and marketing network in order to identify the most important nodes where the use of resources will be most likely to detect problems early and where enforcement is most likely to prevent spread through the system.

LIVE BIRD MARKETING SYSTEMS

The wide spread of H5N1 HPAI in domestic poultry (commencing in the late twentieth century) highlighted the role of selling live birds in markets in the spread and maintenance of the infection. Likewise, this may be a source for spread of other diseases such as Newcastle disease.

Healthy birds come in close contact with potentially infected birds, and birds that are not sold for immediate slaughter are taken back home, thus spreading infection. The live bird marketing system is complex and each stage often has links to another.

While it is often thought that the poultry sold in live markets is from small-holder or backyard farms, in some countries many of the birds come from large-scale, commercial farming systems.

The term "live bird markets" is frequently used, but most of the markets where live birds are sold are daily general markets, often in urban areas ranging from villages to cities.

Many of the large specialist live bird markets may be held weekly at any one location but can be effectively a daily market held in a different location each day, moving around a regular circuit of locations, with a wide area of supply and a carryover of birds from day to day and location to location. Specialist wholesale poultry sellers are commonly found, usually in urban areas, supplying large areas or regions.

This complex marketing system is a difficult challenge for disease management, not capable of easy resolution. Bans or strict limitations on the selling of live birds may be applied, but these are unlikely to be effective unless they can be properly enforced and may lead to the emergence of further, less formal but equally risky marketing practices. Restrictions are likely to be more effective if supported by public awareness campaigns, and

particularly if safer methods and facilities can be devised and developed for the controlled marketing and slaughter of poultry, with the possibility of cleansing and disinfection at the end of each marketing day.

LIMITING CONTACT OF LIVESTOCK WITH WILDLIFE RESERVOIRS

Countries that have reservoirs of infection of important livestock diseases in wildlife or feral animal populations need to consider what can be done to limit the possible close contact between potentially infected wild animals and susceptible livestock. Examples would be FMD, classical swine fever and HPAI.

This may involve limiting livestock farming in some areas of the country, development of immune or buffer belts, or even the erection of physical barriers such as fencing. However, these methods should be approached with caution. Limitations on grazing in certain areas may affect the rights and livelihoods of minority groups. There also may be environmental concerns about the construction of physical barriers because they may restrict natural wildlife migration patterns.

ON-FARM DISEASE BIOSECURITY

Livestock farmers should be encouraged to undertake biosecurity on their farms or homes. This is most applicable for commercial-scale farms and particularly where intensive farming practices are followed (e.g. commercial poultry and pig farms). This will not only help to protect against serious TADs, but also against the more common endemic infectious diseases. The investment in biosecurity will pay dividends directly to the farmer, and it is important to promote biosecurity in this way.

The basic principles of biosecurity are segregation, cleansing and disinfection.

1 Segregation — The creation and maintenance of barriers to limit the potential opportunities for infected animals and contaminated materials to enter an uninfected site. This step, properly applied, will prevent most introductions.

2 Cleansing — Materials (e.g. vehicles, equipment) that have to enter (or leave) a site must be thoroughly cleaned to remove visible dirt. Proper cleansing will remove nearly all of the pathogens that are contaminating the materials.

3 Disinfection — Properly applied, disinfection will inactivate most remaining pathogens which are present on materials that have been thoroughly cleaned.

Although much emphasis in biosecurity is placed on disinfection, the best biosecurity levels are achieved by preventing the possible incursion of disease into livestock premises.

The following on-farm biosecurity practices should be encouraged:

- As far as practicable, farms should be run as closed herds or flocks with limited new animal introductions;
- Any introduced animals should be sourced from known farms or areas of clean animal health status;

- Introduced animals should be physically isolated and quarantined on the farm for a period of 7-14 days. The enclosure should not allow nose-to-nose/beak-to-beak contact between newly introduced animals and those previously present, or water run-off from this area to other areas containing animals. It is best practice to have separate workers for the different facilities. If this is not possible, have workers attend to previously existing animals first (i.e. water, feeding and cleansing) prior to going to the quarantine area for similar chores or inspection;
- The farm perimeter and intensive animal sheds should be secured by appropriate fences and it is highly desirable that there should be a single entry point with disinfection points established. Livestock-free buffer zones around the farm could be considered;
- Staff should be trained in good zoosanitary and hygiene practices, e.g. disinfection of hands and equipment before coming in contact with animals, as well as in disease recognition;
- Farm sheds and equipment should be regularly cleaned and particularly kept free of spilled feed;
- Wild birds, vermin and other animals should be kept away from animal sheds and from animal feed and water supplies;
- Visitors should be kept to a minimum and, where possible, should be kept away from direct contact with animals. High-risk visitors (e.g. livestock owners and animal health professionals) should be required to apply personal disinfection and wear protective clothing; and
- Trucks and equipment brought on to the farm should be cleansed and disinfected on entering and leaving. High-risk things, such as dead-animal pick-up trucks, should be kept well away from animals.

While many of these procedures may be impracticable for small-holder or semi-commercial animal farmers, even the simplest precautions can go a long way to preventing the introduction of serious diseases. Of particular importance is to encourage farmers to purchase only healthy animals from reliable sources and to keep newly introduced animals physically separated for an appropriate period. They should also be encouraged to keep their animals physically contained and to prevent them from mingling with other animals.

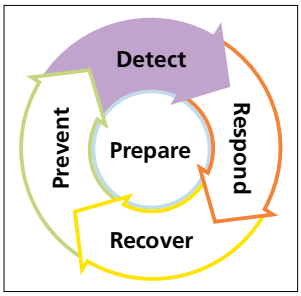
OTHER STRATEGIES

Other disease prevention strategies may be applicable in special circumstances. If there is a very high and immediate threat of introduction of a serious livestock disease to a country or a region of a country, strict quarantine controls or bans could be placed on the movement of livestock and livestock products from these risk areas.

The development of disease-free zones with strong safeguards against disease introduction could also be considered. Such standards have been published by the OIE.

Pre-emptive disease management techniques and targeted vaccination campaigns could be considered. An example of this might be if weather patterns and/or mosquito population densities indicated that there was an imminent threat of Rift Valley fever or African horse sickness epidemics in high-risk areas. If structures are available, animals can be housed in screened stables at early morning and evening times when vector activity is highest and insect repellents could be used.

Detect



INTRODUCTION

The aim is to develop a comprehensive disease surveillance system within the country that is capable of detecting an occurrence of a target high-threat animal disease(s) and any other unexpected serious exotic or emerging disease, at an early stage. This may be termed "general" or "non-targeted" surveillance. The key is that the surveillance system needs to be comprehensive and include:

- a wide geographical range and coverage of livestock populations (however, risk analyses may indicate the need for enhanced surveillance in one or more areas);
- a training programme for veterinarians, veterinary paraprofessionals and others involved in handling animals for detecting and reporting unusual animal health incidents;
- a legal obligation for private veterinarians in relation to the veterinary administration;
- a timely reporting system for events to the veterinary services;
- the ability to undertake effective disease investigation and reporting;
- access to laboratories capable of diagnosing and differentiating relevant diseases;
- the ability to properly determine the significance of the results produced.

Some of the features of the surveillance system for early detection are elaborated upon in the following subsections. Coverage of this material should be included in the veterinary and animal health curricula of the corresponding educational and training programmes.

SURVEILLANCE: PASSIVE VS. ACTIVE

Surveillance has traditionally been split into passive and active. Passive surveillance is when the occurrence of a disease or suspected occurrence is reported to veterinary authorities by the animal keeper or an animal health worker, such as a private veterinarian. Active surveillance is when disease occurrence is detected through planned visits to premises where animals are kept that are specifically for the purpose of detecting a specific disease or syndrome.

The term "passive" may suggest to some people that no specific activity is taking place. In reality, livestock-keepers and their animal health providers check animals regularly. All livestock are seen most days. The potential sensitivity of the system is quite high, as long as those involved know what to look for, have incentives to report and have no disincentives. This implies that the veterinary authorities are running an active campaign covering:

- the signs of notifiable diseases to report;
- how to report suspected notifiable diseases or syndromes;
- the way in which a suspect case is handled;
- publicity of compensation arrangements;
- publicity of the penalties for non-reporting;
- awareness of the negative impacts of notifiable diseases; and
- the control measures to be used in the event of an outbreak.

All of these will encourage reporting of notifiable diseases. The system has the potential to be highly sensitive and to detect disease rapidly, which is one of the key requirements for the detection of highly infectious diseases such as classical swine fever and FMD. Passive surveillance is likely to generate a significant number of false positive results. All suspect cases should be investigated and the outcome recorded. These, including the negative results, should be published. Doing this will indicate to producers, government, trading partners and international organizations that the "passive" surveillance system is functioning.

Active surveillance normally focuses visits at locations regarded as high risk, although what "high" means compared with "low" is rarely clear. The visits also may be focused at concentration points such as markets. Active surveillance is costly and resource-intensive making it more appropriate for diseases that have long preclinical phases or have signs that are common and non-specific. These include diseases such as bovine tuberculosis and brucellosis, which, in some countries, are notifiable diseases. National or regional disease-control campaigns may require specific active surveillance activities. The visits seek to detect specific instances of disease, but unless wide coverage can be achieved, the speed of detection is likely to be slower than with a well-functioning passive surveillance system.

To summarize, passive surveillance is not really passive and requires investment by government and the collaboration of livestock-keepers and their animal health providers. Active surveillance is independent of these latter groups (although it might use animal health providers), but it is resource-intensive and likely to be slower at detecting highly infectious diseases. Active surveillance is very important towards the end of an eradication campaign or when attempting to gain international recognition of freedom from a specific disease.

INTERFACE BETWEEN FIELD VETERINARY SERVICES AND LIVESTOCK FARMERS/TRADERS

It is very important that regular contact be established between field veterinary services staff (professional and/or paraprofessional) and livestock farmers, farming communities and livestock traders. This should be both in the form of routine visits and preparedness to promptly investigate and provide assistance on disease problems. In this way, a comprehensive knowledge of endemic diseases will be accumulated and farmers will have the confidence to seek official veterinary help when they are confronted by an unusual, and potentially serious, disease occurrence. Some countries rely heavily on the private sector for the provision of official veterinary services and an additional interface between them and the veterinary authority is needed.

This interface should include farmer awareness programmes. This is one of the most critical, but sometimes neglected, aspects of preparedness planning for emergency dis-

eases, and for fostering 'ownership' and support for emergency disease-control/eradication campaigns from 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 transboundary and emerging animal 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 preventing and fighting a disease epidemic. Ideally, this should result in farmer sanitary defence groups and farmer organizations.

One of the important messages to get across is that it is essential to notify and seek help from the nearest government animal health official as soon as an unusual animal disease outbreak is seen (and how to do so). Publicity campaigns should be directed towards farmers, local authorities and livestock traders.

Livestock traders/dealers/marketers are important target groups for public awareness campaigns and are often overlooked. The movement of animals through livestock traders is often a key epidemiological factor in the spread of epidemic livestock diseases. The need for building up a climate of trust and confidence between animal health officials and livestock traders is as important as that discussed for farmers. The general themes for emergency disease awareness should be similar, although emphasis should be placed on the importance of doing the 'right thing' about sourcing animals from disease-free areas where possible, not buying any sick stock or selling stock from groups where some have been sick, following any rules about quarantine, vaccination, testing or identification of animals, and the keeping of records. The potential consequences of the occurrence of a disease for internal and international trade should be emphasized.

TRAINING VETERINARIANS AND OTHER ANIMAL HEALTH STAFF

In many countries, including developing countries, it is likely that very few veterinarians or other animal health workers in either the public or private sector will have had any direct, first-hand experience with transboundary or other emergency animal diseases, because these diseases may never have occurred in the country or may have been absent for a considerable period of time. 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 neither be practical nor necessary to train personnel to a high level of expertise in these diseases, their risk or response management. In most cases, it is sufficient that trainees be familiarized with the basic clinical, pathological and epidemiological features of risk diseases and about what they need to do if they suspect one of these diseases. Perhaps the most important thing to establish in people is a 'mind-set' that if they are confronted by an unusual disease outbreak, either in the field or in the diagnostic laboratory, they should include emergency diseases in the range of their differential diag-

nostic possibilities and act accordingly. This is especially true of increased numbers of sick or dead animals, or of specific disease syndromes for key diseases such as foot-and-mouth disease. They should be trained before and after graduation in the steps that 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 suspected disease outbreak site. More specialized training will be needed for those professionals who are nominated as members of specialist diagnostic teams (see below). Training should also be intensified for those diseases which are judged to be of very high and immediate threat.

TRAINING FOR VETERINARY AUTHORITY VETERINARIANS

There are a number of training possibilities which may be selected as appropriate. These include:

- **Sending key field or laboratory staff to another country to gain first-hand experience when there is a major disease outbreak in that country.** While this is a useful type of training, it is opportunistic and expensive. Nevertheless, this possibility should be explored when there is a disease emergency in a neighbouring country. Not only would the people be able to observe the disease and disease-control procedures in a similar environment, but this would also provide valuable extra manpower resources for the recipient country in responding to the emergency;
- **Other international training opportunities** that may present from time to time;
- **National emergency disease training workshops.** These should be organized as the mainstay of training and should be targeted at government field and laboratory veterinary officers, public health and quarantine veterinarians (including those stationed at abattoirs, markets, border posts and air and seaports), veterinary practitioners and industry veterinarians. Formal presentations and discussion sessions on the major emergency diseases should be supplemented as much as possible with audio-visual teaching aids. The presentations should include discussion of the basic principles and strategies for preventing and eradicating the diseases. Practical demonstrations may be carried out on the correct methods for collecting and dispatching diagnostic specimens;
- **Academic education.** Training in emergency disease recognition and management should also be an integral part of the curriculum of undergraduate veterinary students in universities.

Instruction should be provided on disease investigation techniques, disease reporting responsibilities and procedures, disease surveillance and other field epidemiology methods and immediate disease-control actions at the outbreak site(s). Similar, although simpler, training workshops should be carried out for veterinary auxiliary staff.

FIELD DIAGNOSTIC MANUALS

These are most useful if they are prepared in a simple, practical and graphic format so that they can be carried in the vehicle and 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

and submission of diagnostic specimens for each of the emergency diseases. Laminating the pages in these manuals so they can be disinfected is highly recommended.

OTHER SOURCES OF EPIDEMIOLOGICAL DATA

Veterinary practitioners, and veterinarians and other animal health staff in the employ of commercial farming enterprises are a valuable source of epidemiological information and early warning of new diseases. Regular liaison should be maintained with them and they should be involved in the whole preparedness process for emergency animal diseases. At the same time, they should be reminded of their obligations to officially report any notifiable or unusual animal diseases.

Abattoirs or slaughterhouses also are an important source of epidemiological information. Inspection staff at these establishments also should be 'tapped' for any pre- or post-slaughter disease information.

Another useful source of early disease warning would be through official animal health inspection at animal sale yards and markets.

For the early detection of wildlife-related diseases, communication with hunter associations and wildlife rangers is of value.

EMERGENCY DISEASE REPORTING

Key transboundary and other emergency animal diseases should be made compulsorily notifiable within the country. Most, if not all, countries have evolved disease reporting mechanisms that are designed primarily for the more routine, endemic disease occurrences. These mechanisms suffer from one or more deficiencies, including long reporting chains from local to district to provincial and finally national offices, with the opportunity for delays and distortion of information at each level. The collection and transmission of information is often 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 directly, 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. In any case, local and regional veterinary offices should be provided with the necessary communications equipment, and mechanisms should be put in place so that field and laboratory staff know who to contact (with a list of alternatives). At the central level, there should be a known, central and single address to which such information should be sent, preferably in the office of the CVO, so that emergency disease reports are received and acted upon quickly at their destination. The report may be sent simultaneously to provincial veterinary offices and to the national headquarters directly, unless other arrangements are legislated.

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 locations of the disease outbreak(s), including global positioning system (GPS) coordinates when available;

- the names and addresses of affected farmers, farms or villages;
- the livestock species affected;
- approximate numbers of sick and dead animals;
- approximate numbers of similar or susceptible animals in the area;
- brief descriptions 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;
- details of any recent movement of trucks and/or people from or towards other farms;
- any other key epidemiological information, such as presence of the disease in wild or feral animals and abnormal insect activity; and
- initial disease-control actions taken, including where and when.

STANDARD OPERATING PROCEDURE FOR INVESTIGATING SUSPECT CASES

When a suspect case is reported or detected, it must be investigated properly. To do this requires a SOP which should include:

- the safety of the investigator and animal owners;
- a list of equipment to be taken, including sample handling equipment;
- criteria for establishing the extent of the infected locality and from this, the biosecurity entry point;
- biosecurity precautions to be taken when entering and leaving the location;
- restrictions on movements of livestock, products, staff, vehicles and equipment to be imposed on arrival;
- the examinations to be undertaken (numbers and types of animals), especially in the case of equivocal signs;
- samples to be taken from animals with compatible signs;
- sample handling;
- procedure for submitting samples for test; and
- procedure for communicating interim findings to the appropriate authorities.

It is best to keep an investigation kit maintained in each local veterinary office so that the attending veterinarian can leave with minimal delays to undertake the investigation. The equipment should ideally include a digital camera, a GPS unit and a means of rapid communication (often a mobile phone but could be a radio), as well as all the equipment needed to take, safely package and transport samples.

SPECIALIST DIAGNOSTIC TEAM

It is recommended that a specialist diagnostic team (or teams) be nominated within the country that can immediately be mobilized when the initial investigation of a suspect case cannot rule out the presence of a priority disease. The establishment of such a team should be made as part of the preparatory phase (i.e. during "peacetime") and the members should be available and equipped to travel to a suspected disease outbreak site at short notice. This deployment should include all the equipment needed for the preliminary investigation of a disease, for collection and transport of diagnostic specimens and for rapid and

immediate communications. While the initial investigation will have already undertaken much of this, it is wise to allow for a secondary investigation as the situation develops.

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 trans-boundary and emerging diseases, particularly the disease suspected;
- a veterinarian with extensive experience with endemic diseases in susceptible livestock species; and
- any specialist required for special examinations.

The team would travel to a disease outbreak site with local veterinary staff, including the local veterinary practitioner, if so directed by the CVO (and would be provided with the transport to do so). The specialist diagnostic team would be expected to make clinical examinations, collect histories, make preliminary epidemiological investigations, trace back and trace forward suspect animals and collect a range of diagnostic specimens, both specifically for the suspect disease and for any endemic or exotic diseases that might be included in the differential diagnosis. It should transport these samples back to the laboratory.

The team also should be able to take any immediate disease-control actions at the outbreak site that are necessary and should have the necessary authority and legal powers to do this. They should also be empowered to provide any immediate instructions to local animal health officials.

The team must report back immediately to the state/provincial/regional veterinary officer and the CVO on their assessment of the disease outbreak, including steps taken to secure a confirmatory diagnosis and on their advice on further disease-control strategies, including declaration of infected and surveillance zones. They also may advise on any necessary measures to improve disease reporting from the outbreak area and on the desirability of setting up an LDCC.

ANIMAL HEALTH INFORMATION SYSTEMS

Animal disease emergencies generate a great deal of epidemiological and other data which must be transmitted, stored, collated and interpreted. This can best be done by the use of an animal health information system, which is installed and made fully operational in advance of any disease emergency. It is generally recommended that a computerized system be used.

This will enable 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.

The information that is captured in this system should be limited to that which is essential 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 involve 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.

Several computerized animal health information systems are available. One possible system is the transboundary animal disease information system (TADinfo). This has been developed by FAO and is particularly useful for handling disease emergency situations. It is also used for routine/endemic diseases. The programme can be obtained from FAO[2], and FAO can provide assistance in installing it.

LABORATORY DIAGNOSTIC CAPABILITIES

The rapid and definitive diagnosis of diseases can only be assured in properly equipped laboratories. Such a laboratory will have a capacity to conduct a range of standardized diagnostic assays, with trained, experienced staff and a sufficient throughput of diagnostic specimens to maintain proficiency. There are many different types of assays, but on many occasions, definitive diagnosis will depend on detecting the presence of the organism (i.e. tests that detect part or all of the organism rather than antibodies). Assaying antibodies is also important, often simpler to carry out, and is important in the 'proof-of-freedom' phase.

Development of diagnostic expertise for TADs for assays which require handling the live agent should only be attempted in microbiologically highly-secure (biosafe) laboratories. This is particularly true where the organism has zoonotic potential. Biosafety (biocontainment) is important.

The tests to be used should be internationally validated and must be safe for the operators and sustainable. It may not always be possible to have fully confirmatory tests for all the pathogens responsible for the priority diseases. Recent developments, such as polymerase chain reaction (PCR)-based assays, offer the possibility of rapid, sensitive and specific tests for pathogens, but maintaining such a facility is not always easy. Reagents are expensive and go out of date, and maintaining a sufficiently trained staff requires frequent refresher or training courses.

It would therefore 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. For very high-threat TADs, consideration should be given to developing capabilities for some key diagnostic tests (e.g. antigen and antibody detection tests).

The OIE Manual of Standards for Diagnostic Tests and Vaccines provides authoritative information on diagnostic procedures for a range of important diseases.

Laboratories should make specimen transport containers readily available for field veterinary officers and specialist diagnostic teams. These should ideally consist of leak-proof primary containers, such as polystyrene or polyurethane universal bottles with a screw-cap. These are then packed into a leak-proof secondary container (e.g. a wide-opening canister) with absorbent material and an ice pack (where chilling is required). This is finally placed into a robust outer container with good labels. Specimen advice notes should also be provided.

It should also be normal practice to send samples to regional and world reference laboratories for confirmation of test results and also to ensure that a complete database of pathogens and regional and worldwide patterns of occurrence can go on record. IATA transport regulations are a specialist area and require conforming to different international

[2] http://www.fao.org/ag/AGAinfo/programmes/en/empres/tadinfo/default.html

regulations, depending on the pathogen involved[3]. FAO offers advice and help with international shipment of samples to reference laboratories. Veterinary authorities should contact FAO to establish links on how to access this assistance (EMPRES_shipping-services@fao.org).

CONFIRMATION OF A SUSPECT REPORT

All suspect case investigations will require that an outcome be reached, either positive or negative. It is important that criteria are established for this and this must be done as part of the preparatory phase. Confirmation can be made on clinical and post-mortem grounds, epidemiological information, laboratory test results or a combination of these. There may also be a two-stage confirmation process with an initial confirmation on supportive, but not definitive, clinical and epidemiological findings, which leads to the implementation of local control measures as a precaution. A final confirmation usually can be obtained when a definitive laboratory result is obtained, at which point full national control measures and international notification will be made.

For example:

- **FMD** in unvaccinated populations would be clinically obvious in cattle and swine, particularly when linked to a possible source. It would be wise to start control measures at this stage rather than wait for full laboratory diagnosis, which may take another one or two days (and sometimes more).
- **HPAI** cannot be diagnosed from clinical signs alone, but a combination of compatible clinical signs and a positive rapid test might be sufficient to commence local controls (e.g. culling of the affected flock and strict local quarantine). Full national controls would be implemented if samples sent for further testing (e.g. PCR, egg inoculation) gave positive results for notifiable avian influenza. Some of this testing might need to be carried out in international reference laboratories, which may introduce delays.
- **Small ruminant brucellosis (B. melitensis)** requires laboratory tests for diagnosis, although some of these are simple to carry out if reagents are available.

INTERNATIONAL NOTIFICATION

It is important that outbreaks of TADs and other epidemiologically significant events be notified internationally and regionally as soon as they are confirmed within a country. There are several reasons why this is the case, many of which are to the advantage of the reporting country. These reasons include the following:

- Any country which is a member of the OIE has an obligation to report diseases that meet the criteria detailed in the OIE TAHC, and others may do so voluntarily;
- Early international reporting will enable early access to international assistance, such as vaccines, diagnostic reagents and specialist manpower from international and regional organizations;
- The reputation of the country as a safe and reliable neighbour will be established. This has further benefits of greater trade possibilities during "peacetime", as there will be trust in a country's self-stated animal health status.

[3] The International Air Transport Association standards may be found at http://www.iata.org

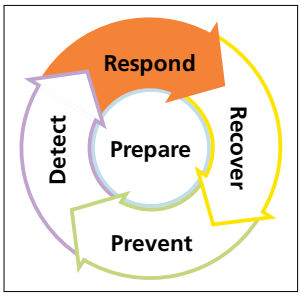
Rapid and full transparency is a difficult policy for some countries to introduce for various reasons, but its benefits offset the problems. Few countries that have established a policy of transparency return to a policy of concealment. There is often a natural tendency to not want to admit to problems, particularly in the higher tiers of government, but the CVO should work to prevent this by stressing the benefits of transparency in the short, medium and long term.

SUBMISSION OF SAMPLES FROM INITIAL EVENTS TO REGIONAL AND WORLD REFERENCE LABORATORIES

An understanding of the source of an outbreak can be greatly assisted through characterization of the pathogen from the early outbreaks, particularly if the primary outbreak site can be identified and sampled. Certainly, samples from the index case(s) should be submitted to reference laboratories as soon as possible. As well as having importance from an international point of view, this also aids the submitting country – by helping to identify the initial source (and so an ongoing risk) and vaccine selection, where appropriate, and by helping to build an international understanding of transmission routes to enable better focus on measures aimed at preventing an incursion.

If background information relating to the case is also sent with the samples, more informative results might be achieved.

Respond: The Basics



INTRODUCTION

While response depends greatly on preparing fully during "peacetime", there are some basic principles of disease control that shape the organization of the response plan.

THE THREE PILLARS OF INFECTIOUS DISEASE CONTROL

Controlling an infectious disease, such as HPAI or FMD, does not require anything technically innovative or particularly difficult in principle. But it is difficult to achieve because it requires the effective application of logistics and no one action alone will do the job. There must be a series of measures that are operating at the same time, each to a high level of efficiency and fully integrated with each other. This requires keeping clear objectives in mind and the efficient application of resources. For the whole process not to become overwhelming, there needs to be a relatively straightforward way of thinking about, and assessing the progress of, disease control. This can be done by keeping simple, easily understood principle objectives, or pillars, in mind.

All three are important. They are:

- find infection fast;
- eliminate infection quickly; and
- stop infection spreading.

They are like the legs of a tripod. If one leg is not functioning, the whole effort will collapse.

Those charged with managing disease control should bear these three objectives in mind. Everything they do or direct should be aimed towards one of these. Their management information systems, however basic, should be aimed at defining how well each objective is being met. They should constantly be asking for information that answers the questions:

- How fast are we finding it?
- How quickly are we eliminating it?
- How effectively are we stopping the spread?

It is strongly recommended that the NDCC and LDCCs have sections charged with responsibility for each of these three main areas. There should be sections responsible for: (1) surveillance, (2) culling and disposal, and (3) biosecurity. The head of each section will report to the local head of the unit formally on a daily basis.

In turn, each of the three pillars is made up of, or supported by, different activities, some of which contribute to more than one.

Find it fast	Surveillance Public awareness
Eliminate it quickly	Culling and disposal Cleansing and disinfection Compensation
Stop the spread	Biosecurity Movement restrictions Public awareness Vaccination (treatment)

ASSESSING THE SIZE OF THE INITIAL OUTBREAK

The policy used to control and eradicate a disease will be greatly influenced, at least initially, by how widespread and serious the initial incursion is before it is detected. The wider the spread of the disease and the more locations affected, the less likely it will be that culling as a main eradication tool will be effective. Culling is most effective when it can be carried out within the first few days that a location is affected. This requires that the disease is found fast and that detected, affected animals can be culled quickly with compensation. If this cannot be achieved, it is likely that it will be necessary to use movement controls or vaccination, either in conjunction with culling or alone.

It is therefore vitally important to establish the geographical spread and number of affected locations early in the outbreak. This means that as well as containing infection, surveillance over a wide area is required at the outset. It is almost always the case that the index case (the first case found that indicates to the veterinary authorities that infection is present) is not actually the primary, or first-occurring, case. There have been many examples where the two are widely separated, either in space or time or sometimes in both. It is important to find the primary case because it will give a good indication of how severe the outbreak is likely to be and what control measures are likely to be necessary to achieve control.

MOVEMENT RESTRICTIONS

The modes of transmission of disease vary according to how the disease-causing organisms have evolved with their hosts. The mechanisms include direct (close) contact, fomites, arthropod vectors (e.g. insects) and wind-borne spread. A combination of factors (e.g. wind-borne and direct contact) is possible.

In most cases, diseases will spread between animals in close contact in the same herd or flock and sometimes over long distances as infected animals are moved. Little influence can be had over the organisms that are carried by the wind, but often the control of other mechanisms is possible and risks can be reduced. Disease spread due to the movement of live animals and animal products can be controlled by movement restrictions that are adequately enforced.

Such movement restrictions need to be well-supported by legislation. It is best if the owners of the animals or animal products understand the need for restrictions and that complying with the requirements will be in their own interests.

Inspecting animals and setting up checkpoints are important parts of the process of implementing movement controls; however, sometimes it is not possible to contain all animals and animal products. Checkpoints on major roads may cause unacceptable disruption, be too expensive to maintain or simply lead to people redirecting their animals onto minor roads where control points are known not to be present. Small livestock and poultry are readily concealed in vehicles and can be smuggled outside restricted areas.

Movement restrictions will be most effective when they have minimal impact on the animal owners. Restrictions that are considered to be temporary or of short duration are likely to receive more popular support. Perhaps an assessment of the relative risks will suggest that some animal products could be allowed to move with little risk of disease dispersal (e.g. those that are routinely treated so that they would be made safe or extremely unlikely to contaminate animals given their destination). Allowing a low level of risk, such as the movement of pasteurized egg products, might encourage compliance with some other measures that would have much greater useful impact.

Fear of losing their animals is an incentive for owners to move them away from an outbreak. This can be reduced if culling strategies are only applied to the extent necessary and where compensation is adequate and rapidly delivered. Further, effort must be taken to reassure owners that their animals will only be culled when it is really necessary and that they will be compensated.

When applying movement restrictions, good communication is essential and it goes hand in hand with disease control.

CULLING AND DISPOSAL

For most animal disease emergencies, some degree of culling is likely to be necessary. The greatest source of the infectious agent is actively infected and excreting animals. These animals are the most dangerous direct source of infection, but they may also lead to indirect infection through the movement of the infectious agent on inanimate objects (i.e. fomites), including vehicles, clothing and particularly people's footwear. Production of the infectious agent effectively ceases when the animal is killed, although the carcasses may remain contaminated for a period after death.

Disposal of the dead animals is not an essential element of disease control, but it is important. Communities will usually object to dead animals being left lying exposed for more than a couple of days and the environmental impact of this is also great. There is a risk of disease being spread from these carcasses by scavengers, but most organisms of concern are relatively sensitive to the changing conditions in a carcass. For instance, FMD virus is destroyed quickly at a pH below 6 and most of a dead carcass achieves this quite quickly in most tissues. So the ability to dispose of culled animals must be taken into account as well as the ability to kill them.

Culling[4] must be carried out in a humane manner. The actual method used varies from situation to situation. Where killing by free bullets is to be used, a careful assessment must be carried out to ensure that the firing lines are clear of people who could be accidentally injured. Those shooting the animals must be trained marksmen with experience in shooting

[4] Culling methods vary and further advice may be obtained from the Terrestrial Animal Health Code and other GEMP materials.

animals. The use of free bullets inside buildings or farmyards is rarely acceptable. If this is required, it must be carried out by very specialist marksmen and with special permission from appropriate authorities.

Where animals are to be brought together for killing by captive bolt pistols, adequate handling facilities are required for the numbers and types of animals to be killed. Barriers and crush systems that might be adequate for sheep or regularly-handled dairy cattle will be completely inadequate for rarely-handled adult beef cattle and there will be a risk of escape and injury to operators.

Killing large commercial pig herds or poultry flocks is not easy and requires careful planning. It is strongly recommended that culling and disposal plans for large units be discussed with owners of such units as part of the preparation and planning process rather than waiting until the outbreak has occurred. Depending on the method chosen for culling, it may be necessary to involve others in this process (e.g. suppliers of carbon dioxide if poultry flocks are to be killed through this method).

THE GEOGRAPHICAL EXTENT OF CULLING: WIDE AREA CULLING OR ON A RISK-ASSESSED BASIS

It is important to emphasize that "eliminate it quickly" does not refer to, imply or require widespread culling of livestock. Culling of animals or groups of animals should be limited to those that are found to be actively infected, and in some situations, those at locations that have been found to be at high risk of having been infected through a veterinary risk assessment. There is rarely, if ever, a place for wide-area culling based purely on geographical location such as ring culls. It has been used in some situations, but there is little evidence that it was necessary and there is certainly evidence that control is achieved as effectively when contacts and geographical aspects are promptly assessed, based on risk.

Additionally, while it is easy to explain the principle of wide-area culls to policy-makers and relatively easy to then identify the premises where livestock are to be culled, it has the disadvantages of requiring more resources and time to complete than risk-based targeted

TABLE 2
Advantages and disadvantages of wide-area and targeted culling

	Wide-area culling	Targeted culling
Advantages	Simple to define the area to be culled	Can be explained to owners
	Easy to explain to policy-makers	Compliance encouraged
	Feeling of security	Lower socio-economic impact
		Lower level of resources required
Disadvantages	Hard to explain to owners	Requires good information
	Discourages reporting	Can be more complex to organize
	Encourages dispersion and concealment of animals	
	High socio-economic impact	
	Requires a high level of resources for culling	

culling and will almost inevitably alienate livestock-keepers who will seek to avoid culling and hide or move their stock, potentially spreading disease. A basic principle is that if you cannot easily explain and justify to the livestock-keepers why you propose to kill their livestock in order to prevent disease spread, it is probably not necessary to cull those animals.

Wide-area culling may distract the effort away from more important tasks. For example, the infectious agents may have been spread well beyond the culling zone by contaminated vehicles, equipment or the movement of incubating animals, and tracings will evaluate these risks. So, it is vital that all the tracings from infected farms are carried out. The number of scarce resources required for area culling (because of the number of locations to be culled) may compete with this activity.

Such area culling also discourages early reporting because of the severe outcome for the neighbours of the reporting farm. It also often leads to concealing or moving animals from the area to be culled, which can possibly spread the disease.

BIOSECURITY

Biosecurity is difficult to quantify, but it is undoubtedly one of the most important components of disease control during an outbreak. Generally, biosecurity levels should be raised during an outbreak and particularly in the protection and surveillance zones. Infectious disease clusters in time and space. The locations at highest risk of infection are those close to locations where active infection is ongoing. Even from infected farms to neighbouring farms, most disease spread occurs through indirect fomite-mediated routes rather than through direct animal-to-animal contact across farm boundaries. Improved biosecurity can dramatically reduce this risk.

Biosecurity is relatively inexpensive and cost-effective in the short and long term. Thus, expenditure on helping livestock-keepers improve their biosecurity during outbreaks is a sensible investment. The basic principles of biosecurity have been discussed in an earlier chapter and apply just as much during an outbreak as during "peacetime".

VACCINATION

One of the key decisions to be made in an outbreak response is the policy to be used in regard to vaccination. The benefits obtained by reducing clinical signs and losses due to the disease often make vaccination an attractive option and this option may be demanded by livestock owners.

Vaccination in the face of an outbreak is a difficult, resource intensive and expensive task. It requires previous planning to identify potential sources of vaccine and to plan the possible strategies for application. The properties of the vaccines must be well-understood. Do they prevent infection as well as disease? Is it possible to differentiate the immune response produced by the vaccine from that produced by infection with the field virus?

Vaccination may change the epidemic from an obvious, rapid-spreading event to a slowly smouldering incident with a slow, but steady, rate of disease transmission. A disadvantage of many vaccines may be that the disease controllers are not able to ascertain where the disease is and where it is not. It may also not be possible to differentiate with available laboratory assays, vaccinated animals from those infected. So, vaccination can "mask" the disease, creating greater problems in the long term. However, vaccination may

produce a decreased disease reproductive rate which could be advantageous in getting ahead of the infection.

Whenever vaccination is to be used, there must be an attempt at defining an exit strategy, i.e. when and how to stop the vaccination. It is not possible to maintain high levels of vaccination in a large population over a long period, nor is it desirable – unless it is not possible to eradicate the infection. It is rare that vaccination alone will eradicate infection. When there is a high level of infection such that stamping out by culling alone is not feasible, vaccination can be used to reduce the circulation of the infection until levels are low enough for targeted culling.

RESOURCE PLANNING

At the start of the outbreak, there should be a known stock of resources (e.g. people, materials and money) that can be accessed immediately. These should have been calculated from previous experience. However, it will immediately become necessary to assess what level of resources will be required in the immediate future. It is vitally important to have the required resources ahead of time by assessing the trends in the outbreak and arranging during the current week for the resources that are likely to be required next week. Seeking resources to deal with the situation after it has become apparent means that there will be delays in all departments, particularly surveillance and culling. This will mean that the disease may spread ahead of the control programme rather than the other way around. The most cost-effective disease control programmes have resources that are idle for some of the period, which means they are available to be deployed immediately. If there are never any spare resources, control will be prolonged and more expensive in the long run.

The way to assess the resources that are likely to be required is to maintain a real-time assessment of how the outbreak is progressing and how effectively the various control measures are being implemented.

DISEASE REPRODUCTIVE RATES

Infectious diseases spread from one location to another by various routes. The levels of disease will increase when the reproductive rate is greater than one. That is, each infected location infects, on average, more than one previously uninfected location. Equally, it will decrease (and eventually die out) when each infected location infects, on average, less than one uninfected location.

There are various measures of reproductive rates. The simplest and, perhaps, most useful in the field is the estimated dissemination rate (EDR). This is a simple measure that is calculated by dividing the number of outbreak locations (i.e. newly infected premises) in a given period by the number of outbreak locations during the equivalent previous period. It is worth noting that an EDR of 0 would lead to an instant halt in the epidemic, which is unrealistic. Control and elimination can be achieved without stopping all transmission events, so long as the EDR becomes less than 1.

There are other measures of reproductive rate such as "R_0", but these often require a detailed and confident knowledge of which location infects another (i.e. the actual links have to be known). While this is possible within experimental models of disease transmission, and may be possible to determine retrospectively for an outbreak, it is rarely possible

in the midst of an outbreak. EDR is a robust and simple measure of the reproductive rate and is adequate for most disease management information systems (see next section).

Where possible, the EDR (and all other date-based indicators) should be calculated using the actual infection date. This is rarely possible, so the next best indicator will be the date of first clinical signs. This should be calculated from the outbreak investigation (see below).

MANAGEMENT INFORMATION SYSTEM: THE KEY INDICATORS OF PROGRESS

Good decision-making has its foundations in a step-wise process, based on information:

- Decisions about control policies must be knowledge-based.
- Knowledge is built from reliable information.
- Information comes from the analysis of data.

Find it fast	1. Ratio of positive to negative reports 2. Surveillance methods that are detecting cases 3. Days from onset of first signs to day of reporting
Kill it quickly	4. Days from report received to end of culling 5. Days from end of culling to end of disposal 6. Days from end of disposal to end of cleansing and disinfection
Stop it spreading	7. Numbers of cases (i.e. outbreak locations) during a given period compared with the number of cases in the previous period (Note: The period most often used for highly infectious diseases is a week). 8. Routes of spread between infected sites

It is important to monitor progress and to make conservative predictions about what is likely to happen in the next period. A key element of resource planning is to have the required resources available before they are needed, not after. This can be done only by close monitoring and interpreting the effectiveness of the current measures. This sort of analysis requires a management information system.

It is important to collect and routinely analyse a standard set of data from all outbreaks in order to create a comprehensive set of indicators. These indicators serve the various phases of a comprehensive response, as follows:

Knowledge comes from the analysis of data. Without data there can be no information, although there is often misinformation. Data that are not analysed are useless. The collection and analysis of disease data is a key function of the epidemiology unit. Others should be collecting and analysing data on how field activities are being implemented. The use of these sets of information will give policy-makers the ability to plan ahead, another key requirement for disease control. The resources required for tomorrow must be sourced today so that they are available when needed.

If all of these simple targets are being achieved, then disease will come under control. If one or more is not being met, this should be investigated and corrected.

These indicators and actions are the major first-order actions and indicators. Managers with overall responsibility for the control programme should look at these first-order indicators every day, and not only at their actual value compared with the desired level, but also the trend in each indicator.

It is not possible to achieve this kind of structured response on an ad hoc basis in the face of an outbreak. The key to response is to have an adequate contingency plan and operations manuals created and tested before an incursion occurs.

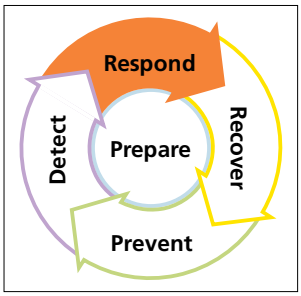
The roles in preparing the contingency plan and operations manuals were detailed in the section called "Prepare". The following chapter gives greater detail about the structure and contents of a contingency plan.

OUTBREAK INVESTIGATION

In order to gather the information required for even a basic management information system, one of the main sources is an epidemiological investigation of each outbreak. This is a specialist activity that requires staff to have been trained in how to conduct it and the use of the standardized data collection forms involved.

Ideally these investigations should be carried out by staff from the LDCC epidemiology unit specially allocated to gather this information, rather than being done by all of the personnel who are working. The smaller team allows for a more uniform set of results and also allows the epidemiology unit to build up a detailed first-hand, field-based knowledge of how the disease is being transmitted.

Respond: Contingency plans – their nature and structure



INTRODUCTION

Contingency plans are the cornerstone of any effective response to emergency animal diseases. They are sets of well-structured and clearly-stated documents that describe policies, strategies and procedures for effective disease-control response to one or more high-threat diseases. They are often generated by governments using international guidelines or are adapted from the contingency plans of other countries.

Contingency plans are usually prepared for specific high-threat diseases (e.g. an FMD contingency plan or an avian influenza contingency plan). Contingency plans should be prepared for each of the emergency animal diseases which are identified by risk analysis as constituting the highest threats for the country.

The plans need not be voluminous documents. They should be written in simple, straightforward language, so that all stakeholders will understand:

- the overall control strategies;
- how programmes will be implemented and coordinated; and
- their roles and responsibilities.

It is recommended that contingency plans should not be too rigid, because it is impossible to exactly predict how disease emergencies will present themselves and how they will evolve. Where appropriate, they may include different disease-control options and suggest under what epidemiological and socio-economic circumstance each option may be preferred.

It is extremely important that the contingency plans be considered by all major stakeholders, including the political, financial, legislative and bureaucratic arms of government and the private sector, particularly livestock organizations. All stakeholders should have the opportunity to contribute to the plans either during their formulation or by consultation before they are finalized. Finally, contingency plans should be approved at the highest level of government. This process should assure that there will be acceptance of their implementation in an emergency situation.

After they have been prepared, key staff should be trained so that they can properly carry out their expected duties within the contingency plan.

STRUCTURE AND FORMAT OF CONTINGENCY PLANS

There is no ideal 'one size fits all' format for an animal disease contingency plan. There is no single list of what a contingency plan should contain. Undoubtedly, no single list can be perfect for all situations or suitable for all countries.

Every country has its own unique set of circumstances, and the contents of the contingency plan need to be tailored to best meet the requirements of individual countries. The contingency plan is only produced to be of use to those who develop it. But there are certain elements that are required to be present in a contingency plan if it is to have the required effect of enabling rapid control of an outbreak. The following extensive list attempts to show what elements could be covered and some elements that may be useful. Since the contingency plan should be concise, achievable and readily understood, perhaps only some of these elements might be considered initially.

CONTINGENCY PLAN CONTENTS

Required chapter headings

1. Legislation
2. Finance
3. Command and control
4. Nature of the disease
5. Size, structure and movements and trading patterns of relevant live stock populations
6. Wildlife
7. Policy
8. Resource plans
9. Laboratories
10. Vaccination
11. Public awareness
12. Communication
13. Establishing disease freedom
14. Recovery
15. Other possible contingency plan chapters

Specific chapter contents

1. Legislation
    - 1.1 Disease(s) of interest included in the official list of notifiable diseases
    - 1.2 Powers to enter and take samples on suspicion
    - 1.3 Powers to impose quarantine on infected and suspect premises
    - 1.4 Powers to impose movement controls
    - 1.5 Powers to cull all susceptible stock on infected premises/units/villages
    - 1.6 Powers to require compulsory vaccination
    - 1.7 Powers to regulate importation of animals, animal products and other sources
    - 1.8 Compensation for culled animals and materials destroyed in disease-control options
    - 1.9 Importation of biologicals, reagents and therapeutic agents in the event of an emegency
2. Finance
    - 2.1 Agreed initial emergency funding for a limited epidemic
    - 2.2 Legislation

- 2.3 Sources of funding for operations for a large-scale epidemic
- 2.4 Mechanism to access funds for operations for a large-scale epidemic
- 2.5 Sources of funding for compensation for a large-scale epidemic
- 2.6 Mechanism to access funds for compensation for a large-scale epidemic

3. Command and control
   - 3.1 Command and control structure
   - 3.2 Criteria for declaring a national emergency
   - 3.3 Criteria for involvement of national emergency committee (NEC) established
   - 3.4 Roles and responsibilities of NEC
   - 3.5 Establishment of NDCC
   - 3.6 Roles and responsibilities of NDCC established
   - 3.7 Establishment of LDCC(s)
   - 3.8 Roles and responsibilities of LDCC(s) established
   - 3.9 Establishment, membership and roles of expert advisory group
   - 3.10 Establishment, membership and roles of epidemiology group at natioal and local levels
   - 3.11 Communication between command levels
   - 3.12 Meeting and communication schedule defined for Gold command
   - 3.13 Meeting and communication schedule defined for Silver command
   - 3.14 Meeting and communication schedule defined for Bronze command
   - 3.15 Communication structure between strategic and tactical command defined
   - 3.16 Local authorities
     - 3.16.1 Plans for collaboration with local authorities
     - 3.16.2 Role and responsibilities of local authorities defined
   - 3.17 Collaboration with other organizations
     - 3.17.1 Plan for collaboration with Ministry of Environment
     - 3.17.2 Plan for collaboration with police (i.e. security forces)
     - 3.17.3 Plan for collaboration with army (i.e. armed services)
     - 3.17.4 Plan for collaboration with non-governmental organizations (NGOs)/industry groups
4. Nature of the disease
   - 4.1 Causative organism, species affected, clinical signs and post-mortem finings
   - 4.2 Details of sources and persistence in the environment for given pathogens
   - 4.3 Routes of spread: major and minor
   - 4.4 Worldwide distribution and record of national disease events
   - 4.5 Risk assessments for routes of introduction
   - 4.6 Assessment of national territory identifying high–risk areas
   - 4.7 Susceptibility to physical agents (e.g. acid/alkali, detergents, disinfectants and heat)
   - 4.8 Known treatments or prophylaxis
5. Size, structure, movements and trading patterns of relevant livestock populations
   - 5.1 Structure of the population
   - 5.2 Distribution of the population
   - 5.3 Marketing systems (formal and informal) for live animals and their products

5.4 Movements of live animals and their products within the country
5.5 Routes, sources and size of imports and exports of live animals, genetic material and products

6. Wildlife
   6.1 Structure of the known or likely susceptible population
   6.2 Distribution of the population (including zoological collections)
   6.3 Movements of wild animals and contacts with livestock
   6.4 Assessment of risk of introduction, spread and maintenance by wildlife
   6.5 List of contacts (e.g. conservation groups, hunting clubs, Ministry of the Environment)

7. Policy
   7.1 Policies for actions up to confirmation
      7.1.1 Case definitions for suspect, clinically-confirmed and laboratory -confirmed case
      7.1.2 Actions on suspicion
   7.2 Criteria for confirmation of disease and infection
      7.1.3 Actions on confirmation
   7.3. Policies for culling and disposal
      7.2.1 Culling methods for livestock, including poultry
      7.2.2 Disposal methods for livestock, including poultry
      7.2.3 Disposal methods for infected materials such as fodder, housing materials and manure
   7.4 Policies for outbreak investigation and tracing Dangerous Contacts
      7.3.1 Field epidemiologist roles and responsibilities
      7.3.2 Outbreak investigation requirements
      7.3.3 Tracing and follow-up of possible sources (backward tracing) and spread (forward tracing)
      7.3.4 Criteria for declaring a tracing to be a Dangerous Contact
      7.3.5 Policy for control measures on Dangerous Contacts
   7.5 Policies for cleansing and disinfection
      7.4.1 Cleansing and disinfection of buildings and equipment
      7.4.2 Cleansing and disinfection for contaminated areas
      7.4.3 Cleansing and disinfection of equipment used in control procedures
   7.6 Policies for surveillance and movement controls
      7.5.1 Declaration of protection and surveillance zones (PZ and SZ)
      7.5.2 Declaration of restricted/infected area (RA/IA)
      7.5.3 Surveillance and control measures in PZ
      7.5.4 Surveillance and control measures in SZ
      7.5.5 Surveillance and control measures in RA/IA
      7.5.6 Movement controls in PZ, SZ, RA/IA and nationally
   7.7 Policies for compensation strategies
      7.6.1 Mechanism of payment for monetary compensation agreed
      7.6.2 Rates of payment to be made

- 7.6.3 Payment only for animals culled
- 7.6.4 Valuation methodology
- 7.6.5 Alternate means of supporting farmers (e.g. microcredit, restocking, tax relief)

8. Resource plans
   - 8.1 Establishment of high-level command centre
   - 8.2 Establishment of NDCC command centre
   - 8.3. Establishment of LDCC command centre(s)
   - 8.4 Veterinary staff and equipment for initial phase
   - 8.5 Veterinary staff and equipment for large-scale epidemic
   - 8.6 Culling and disposal staff and equipment in initial phase
   - 8.7 Culling and disposal staff and equipment for large-scale epidemic
   - 8.8 Cleansing and disinfection staff and equipment in initial phase
   - 8.9 Cleansing and disinfection staff and equipment for large-scale epidemic
   - 8.10 Staff and equipment for implementing vaccination
   - 8.11 Staff, equipment and consumables for maintenance of diagnostic capabilities
   - 8.12 Staff, equipment and consumables for performing diagnostic tests in initial phase
   - 8.13 Staff, equipment and consumables for performing diagnostic tests for large-scale epidemi
9. Laboratories
   - 9.1 Description of the national laboratory system
   - 9.2 Details of available diagnostic assays (including rapid test) and interpretation of results
   - 9.3 Contingency plan for laboratory capacity for initial phase of an outbreak
   - 9.4 Contingency plan for laboratory capacity for a large-scale epidemic (including importation of diagnostic kits and reagents and their sourcing)
   - 9.5 Details of samples required from suspect cases
   - 9.6 Transport instructions for samples taken from suspect outbreaks
   - 9.7 Laboratory biosecurity measures
   - 9.8 Health and safety of laboratory workers, including use of personal protective equipment (PPE)
   - 9.9 Source for diagnostic consumables for initial phase
   - 9.10 Source for diagnostic consumables for large-scale epidemic
   - 9.11 Agreement with international laboratory for confirmatory testing
   - 9.12 Mechanism for shipping samples internationally
10. Vaccination
    - 10.1 Vaccination policy for susceptible livestock in infected area
    - 10.2 Vaccination policy for susceptible livestock outside infected area
    - 10.3 Vaccination policy for susceptible captive and zoological collections
    - 10.4 Types and source(s) of vaccine identified
    - 10.5 Agreement with vaccine supplier to provide vaccine for large-scale epidemic
    - 10.6 Importation, storage, distribution and delivery procedures

10.7 Surveillance strategy to accompany vaccination (e.g. differentiation of infected from vaccinated animals (DIVA))

11. Public awareness
    - 11.1 Establishment of a communications working group
    - 11.2 Key public awareness messages to be used
    - 11.3 Methods of communication to be used for public awareness
    - 11.4 Materials produced and ready for distribution (or can be quickly produced)
    - 11.5 Arrangements for coordination of messages with Ministry of Health and Ministry of the Environment (where appropriate)
12. Communication
    - 12.1 Establishment of a report hotline
    - 12.2 Identification and training of press officer(s)
    - 12.3 Criteria for public announcement of outbreak
13. Establishing disease freedom
    - 13.1 Active clinical surveillance around outbreak areas
    - 13.2 Sero-surveillance around outbreak areas and countrywide
    - 13.3 Publication of results of surveillance to confirm absence of disease
    - 13.4 Inclusion of OIE standards for claiming freedom from disease
14. Recovery
    - 14.1 Policy for lifting quarantine and movement controls
    - 14.2 Restocking policy and protocols
    - 14.3 Use of public awareness campaigns to support recovery of markets and consumer confidence
15. Other possible contingency plan chapters
    - 15.1 Surveillance systems (may also be in the preparedness plan)
    - 15.2 Detection of heightened risk
    - 15.3 Increased activities in response to heightened risk (e.g. surveillance, border controls, public awareness)
    - 15.4 Training of government veterinarians, private veterinarians and livestock-keepers to detect the disease (more properly part of the preparedness plan)
    - 15.5 Decision matrix for use of different control methods in different out break situations (with advantages and disadvantages)

OPERATIONAL MANUALS (OR STANDARD OPERATING PROCEDURES)

These are detailed sets of instructions for carrying out the key programmes and activities within the contingency plan.

SOPs may be prepared for programmes such as:

- organization and operation of the NDCC;
- organization and operation of LDCCs;
- emergency disease reporting and information systems;
- laboratory diagnosis and surveillance;
- field diagnosis and surveillance;
- zoning;
- quarantine and movement controls;

- livestock destruction and disposal of carcasses;
- biosecurity, including cleansing and disinfection;
- planning and performance of vaccination programmes;
- valuation and compensation; and
- extension and public awareness campaigns.

The operations manual contains the detailed instructions for procedures to be carried out in the field. It is made up of a series of SOPs. In some countries, the operations manuals are separate documents, and in others, they are appended to the contingency plan. The second is perhaps more appropriate, but because many SOPs will be the same for many diseases (but not all), a separate series of documents is acceptable.

Suggested chapters for an operations manual include:

1. Actions before an outbreak is confirmed;
2. Actions after an outbreak is confirmed;
3. Laboratory procedures;
4. Health and safety;
5. Biosecurity;
6. Culling, disposal, cleansing and disinfection.

The following lists of SOPs detail suggestions for each chapter:

1. Actions before an outbreak is confirmed
    - 1.1 Actions to take at heightened level of threat, including border posts
    - 1.2 Protocol for investigation of suspect cases
    - 1.3 Protocol for clinical inspection and examination of animals in the protection and surveillance zones
    - 1.4 SOP for taking and submitting samples (sampling) from suspect cases
    - 1.5 SOP for sampling from dead birds or animals
    - 1.6 Actions on a confirmed outbreak site
    - 1.7 Detailed methodology for outbreak investigation, including identifying tracings
    - 1.8 Detailed methodology for tracing disease forwards and assessing dangerous contacts
    - 1.9 Detailed methodology for tracing backwards to determine possible sources and spread from these
    - 1.10 Detailed methodology for producing updates of the disease situation for policy-makers
    - 1.11 Protocol for establishing geographical location of outbreaks (e.g. GPS and/or physical maps)
2. Actions after an outbreak is confirmed
    - 2.1 Protocols for disease reporting nationally and internationally
    - 2.2 Actions to take at border controls, including land border crossings, seaports and airports
    - 2.3 SOPs for active surveillance in the surveillance zone
    - 2.4 Detailed methodology for establishing protection zones
3. Laboratory procedures
    - 3.1 SOPs for all available laboratory
    - 3.2 Lab submission forms

3.3 Lab reporting formats
3.4 SOP for shipping samples to international reference laboratory[5]

4. Health and safety
   4.1 Health and safety for veterinarians and paraprofessionals
   4.2 Health and safety for culling sta
   4.3 Health and safety for disposal staff
5. Biosecurity
   5.1 Biosecurity for veterinarians visiting suspect case
   5.2 Biosecurity for veterinarians and others attending an infected site
   5.3 Biosecurity for culling and disposal staff attending an infected site
   5.4 Biosecurity for suspect and infected premises
   5.5 Biosecurity for keepers of suspect and infected animals
   5.6 Biosecurity for suspect and infected villages
   5.7 Biosecurity procedures at uninfected livestock sites
   5.8 Biosecurity procedures at uninfected slaughterhouses
6. Culling, disposal, cleansing and disinfection
   6.1 Detailed methodology for all culling methods
   6.2 Detailed methodology for all carcass disposal methods
   6.3 Detailed methodology for treatment and disposal of manure and animal products
   6.4 Detailed methodology for cleansing and disinfection of equipment
   6.5 Detailed methodology for cleansing and disinfection of commercial housing
   6.6 Detailed methodology for cleansing and disinfection of common areas
   6.7 Detailed methodology for cleansing and disinfection of vehicles

RISK ENTERPRISE MANUALS

These are codes of zoo-sanitary practice and instructions for situations that could be deemed as 'risk enterprises' in a disease emergency. They should cover acceptable and unacceptable zoo-sanitary 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;
- small goods (meat) processing plants;
- dairy factories;
- feedlots;
- egg hatcheries and processing plants;
- artificial breeding centres;
- animal quarantine stations;
- livestock traders and transporters;
- zoos, wildlife parks and commercial aviaries; and

[5] International reference laboratories will have their own procedures to receive samples from other countries. SOPs should account for these differences, depending on the disease agent and reference laboratories used.

- veterinary clinics.

Appendices should include:

- lists of names of key people and their contact details;
- details for ancillary organizations and other key government agencies;
- regional and international reference laboratories; and
- international or regional organizations for possible assistance.

RESOURCE PLANS

The first step in preparing a resource plan is to make a resource inventory. This is a listing of all the resources that will be needed to respond to a moderately-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 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; communication equipment to local headquarters (e.g. facsimile, e-mail)
- **Local Disease Control Centres:** Senior disease-control veterinarians and epidemiologists, technical support and administrative personnel; suitable offices; office equipment; maps; computers; communication equipment with headquarters (facsimile or e-mail) and field staff (radio or mobile phones); proformas for various disease-control operations
- **Diagnostic laboratories:** Trained laboratory staff; standard laboratory equipment plus any specialized equipment for key emergency diseases; diagnostic reagents for molecular, antigen and antibody detection
- **Diagnosis/surveillance:** Veterinarians and support veterinary auxiliary staff; transport; maps, communication equipment; leaflets or posters on the disease(s); diagnostic collection kits and transporters; blood collection equipment; animal restraint equipment; animal identification equipment (e.g. ear tagging, tattoos), digital cameras, GPS machines, biosecurity equipment (e.g. boots, overalls), PPE for zoonotic diseases
- **Vaccination:** Vaccination teams; vaccines; central and local refrigeration storage; transport; maps; cold storage transporters; vaccination equipment; animal restraint equipment, if appropriate
- **Animal identification:** Equipment (e.g. ear tagging, tattooing), digital cameras, GPS machines, biosecurity equipment (e.g. boots, overalls), PPE for zoonotic diseases, means of recording and retrieving data
- **Slaughter, disposal and disinfection:** Supervising veterinarian, personnel, transport; humane killers and ammunition and/or other approved means of humane killing (e.g. carbon dioxide gassing of poultry); protective clothing; animal restraint equipment; front-end loaders and earth-moving equipment; approved disinfectants, soaps and detergents; shovels and scrapers; high-pressure spraying equipment, digital cameras, GPS machines, biosecurity equipment (e.g. boots, overalls), PPE for zoonotic diseases
- **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. In the case of specialist staff, a register should be maintained of the staff, and their qualifications and expertise/experience with key emergency diseases. These resource lists and staff registers should be maintained at the NDCC and, where appropriate, at regional offices.

Comparison of the inventory lists of needed and available resources will inevitably highlight many deficiencies. This should be a part of the preparation phase. There should be a defined minimum stock to be held and a defined way of increasing the availability of these resources when an outbreak occurs. The resource plan and associated inventory lists need to be regularly updated and reviewed. It must be remembered that some stocks will pass their maximum use-by dates and so a constant turnover will be necessary. This should be calculated and planned for.

While these standing stocks will allow rapid initial mobilization, further resources will be needed if the incursion spreads.

There are several options for accessing the necessary extra resources:

- Prepare a list of where essential equipment and stores may be purchased, hired or borrowed;
- Maintain a central store of hard-to-obtain items (e.g. disinfectants) and items which take some time to prepare (e.g. forms, signs);
- Make arrangements for supply of personnel and equipment through the national disaster plan;
- Make arrangements through veterinary associations, veterinary colleges and other countries for the temporary employment or secondment of veterinary practitioners, veterinary students and other animal health personnel in an emergency.

Supply of vaccines and diagnostic reagents presents special challenges, as international sources of these are limited for a number of diseases. Sources of high-quality products (i.e. meeting specified standards) are even more limited. These sources, as well as 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.

GEMP CHECKLIST

In order to cover all of the needs in developing good emergency management practice, it is helpful to consider if all needs have been addressed. Annex D is a GEMP checklist. Under the stages described in this manual (i.e. Prepare, Prevent, Detect, Respond and Recover), and the general areas that are detailed here (Bodies and Organizations, Documents and System/Logistics and Activities) a checklist of issues is covered. This is designed to assist those responsible for emergency management but it also provides managers with a summary of the issues covered in "GEMP – The Essentials".

CONTINGENCY PLAN AND OPERATIONS MANUAL ASSESSMENT TOOL

A useful check on any draft or proposed contingency plan and operations manual is to assess them against some prepared criteria. This will allow both internal checking and pro-

TABLE 3
Four assessment levels

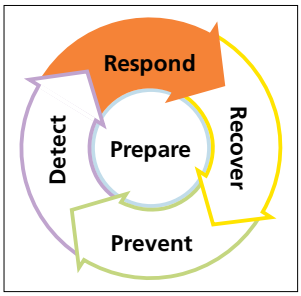
Assessment level	Description
0	Not ready
1	Poor
2	Moderate
3	Fully ready

vide some degree of quality assurance for outside authorities. Annex E is a tool developed by FAO. Each point is assessed as present at one of four levels as described in the Table 3.

It is not the intention that all contingency plans and operations manuals that are assessed should score 100 percent, nor that the answer is final. Rather, the assessment should highlight areas of strengths and weaknesses in the plan judged from the situation in the country to which it applies.

The assessment tool should not be either too general or too detailed. A balance must be struck between what is useful and what is too daunting to be used.

Respond: Command, control and communicate



THE NEED FOR A COMMAND STRUCTURE FOR EMERGENCY RESPONSE

Fighting a disease epidemic or combating other animal health emergencies is, in many respects, like a military operation and requires the same level of discipline. It requires the same ability to rapidly make decisions based on analysis of the best information available from all sources. It requires the capacity to convert those decisions into clear orders which can be conveyed down the chain of command to those who are charged with the responsibility of carrying them out, and the ability to know that orders have been carried out and with what results.

Therefore, there must be efficient mechanisms in place for transmission of information and instructions from the national veterinary services headquarters right down to the 'front line' of the disease eradication campaign in the field and laboratory and for feedback of information to headquarters. Equally important is an efficient mechanism for the transmission of information and responses from the field and laboratory to the national headquarters, either directly or via the LDCC. Communication must be a two-way process.

It is clear that for these activities 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 in such a way that they can best handle routine activities such as endemic disease control, veterinary public health, quarantine, etc. Over recent years, government veterinary services in many countries have also been restructured in many ways including:

- **Regionalization:** In many countries, the authority and responsibility for the delivery of animal health services has been devolved to provinces or regions that match newly 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;
- **Downsizing of government services:** This has 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:** This has led to the transfer to the private

sector of many animal health programmes and functions which have traditionally been the responsibility of governments, including field veterinary services, veterinary diagnostic laboratories and meat inspection;

- **Separation of policy functions from operational functions:** The 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. The CVO may be in either section; however, it is preferable for the CVO to be part of the central policy unit in order to have full influence at that level.
- **Separation of veterinary laboratories from the field command:** In many countries, national veterinary laboratories are under the authority of or have been transferred to research administrations, thus weakening linkages 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 establishing the most appropriate structures and lines of responsibilities which 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 the national level, and that the CVO will assume overall responsibility and have the authority for responding to the emergency, and will 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 not already so) for the purposes of the emergency response;
- Pre-existing contractual agreements for private-sector veterinary organizations, universities and other academic institutions and research institutes to provide essential services during an animal health emergency;
- Negotiation with the national veterinary association or national veterinary governing body (if one exists) of terms and conditions, including conditions of remuneration, for hiring of practitioners and other private-sector veterinarians as temporary government veterinary officers if needed.

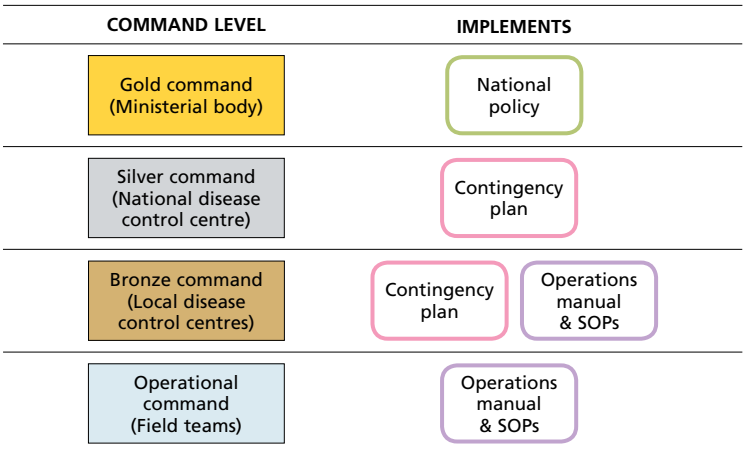
COMMAND AND CONTROL DURING AN OUTBREAK

It is common for the chain of command to include three levels, sometimes described as Gold, Silver and Bronze. This is the same as the structure proposed during the preparation and planning phase, although the functions change. As well as being functionally appropri-

TABLE 4
Command levels during an outbreak

Gold command	Gold command consists of the national emergency committee (NEC), which is made up of the highest level of policy-makers and is often headed by the head of government or his/her deputy. Other members are often ministers and state secretaries.
Silver command	Silver command consists of the national (animal) disease control centre (NDCC), which is usually headed by the CVO and is composed of senior government veterinarians. This command is responsible for implementing the contingency plan nationally and the policies decided upon by the Gold command.
Bronze command	Bronze command consists of the local (animal) disease control centres (LDCCs), which are normally headed by a senior government veterinarian. They are responsible for implementing the contingency plan locally and the instructions received from the NDCC and for ensuring that field activities are undertaken fully and correctly with all tasks recorded, allocated and their completion noted.

FIGURE 4
Roles and responsibilities of command levels during an outbreak



ate in both phases, having the same structure during "peacetime" as during an emergency means that relationships and communication channels have already been established and practised.

The following diagram shows which level of the command structure implements which elements of the control plan.

INCIDENT COMMAND SYSTEM

Within the Silver and Bronze command (the NDCC and LDCCs), a modular command system should be established that can grow and shrink as required. This is the basic format of a rapid response command and control system originally developed for fighting forest

fires called the Incident Command System (ICS). An outbreak of an infectious disease has many parallels to a forest fire in that it starts small and spreads, sometimes rapidly, and may also start up in areas distant from the initial outbreak. Both require speed and flexibility of command and control structures to achieve effective control and eradication. The ICS is a "standardized on-scene emergency-management concept specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries."[6] The following text is the overview of ICS Wikipedia[7] in April 2010.

> *ICS consists of a standard management hierarchy and procedures for managing temporary incident(s) of any size. ICS procedures should be sanctioned by legitimate authorities, and then applied in training well before an incident occurs.*
>
> *ICS includes procedures to select and form temporary management hierarchies to control funds, personnel, facilities, equipment and communications. Personnel are selected according to standard rules previously sanctioned by legitimate authorities. ICS is a system designed to be used or applied from the time an incident occurs until the requirement for management and operations no longer exist.*
>
> *ICS is interdisciplinary and organizationally flexible to meet the following management challenges:*
>
> – *Meets the needs of a jurisdiction to cope with incidents of any kind or complexity (i.e. it expands or contracts as needed);*
> – *Allows personnel from a wide variety of agencies to meld rapidly into a common management structure with common terminology;*
> – *Provides logistical and administrative support to operational staff;*
> – *Be cost-effective by avoiding duplication of efforts and continuing overhead;*
> – *Provide a unified, centrally authorized, legitimate emergency organization.*

The key elements of ICS can be summarized as:

- the modular structure;
- scalability;
- integration of logistics and operations; and
- the multidisciplinary element.

While ICS may or may not be formally adopted, a modular command and control system is needed. This is the principle behind the structure discussed above of having separate units for surveillance, culling, biosecurity, etc. Each unit has a defined responsibility that is discharged by the head of that unit and each unit should be allowed to grow to meet the size of the task. Within each unit, the head of the unit has day to day operational responsibility with a system of regular reporting back to and receiving instruction from the next level of the hierarchy.

NATIONAL (ANIMAL) DISEASE CONTROL CENTRE

Countries should establish a permanent NDCC. In the event of an outbreak of an emergency animal disease, the NDCC should be responsible to the CVO for coordinating all emergency disease-control measures in the country, and it should be in proximity to the

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[6] Source: Justice Institute of British Columbia, Canada, on ICS.

[7] http://en.wikipedia.org/wiki/Incident_Command_System

office of the CVO. The epidemiology unit should either be attached to the NDCC 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 most likely also be the Director of Field Veterinary Services. The NDCC also should have an experienced communications officer who serves as an advisor to the CVO in relation to media and public information and may be designated as spokesperson for the event.

The responsibilities of the NDCC in the emergency response would include:

- implementing the disease-control policies decided by the CVO and the Consultative Committee on Emergency Animal Diseases (CCEAD);
- directing and monitoring the operations of LDCCS;
- 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;
- liaising with other groups involved in the emergency response, including those that may be activated as part of the national disaster plan;
- preparing international disease reports and, at the appropriate times, cases for recognition of zonal or national freedom from the disease;
- managing farmer awareness and general publicity programmes, including press releases;
- conducting general and financial administration, including the keeping of records.

The NDCC 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 liaising with LDCCs, veterinary laboratories, etc. by telephone, radio, e-mail and facsimile, as appropriate. The Centre should also be linked with the management information system previously described in this manual.

LOCAL (ANIMAL) DISEASE CONTROL CENTRES

During an emergency, one or more LDCCs should be set up within easy reach of, and preferably within, the infected zones of the disease outbreak. If at all possible, they should be sited such that teams are able to travel to and from any site that they need to for surveillance or any other disease-control activities on the same day. In some circumstances, where distances are not great, these LDCCs could be established on a permanent basis in a regional or district veterinary or agricultural office. Otherwise, possible locations for temporary LDCCs (e.g. local government offices) should be identified and negotiated in advance.

The LDCC should be fully equipped with:

- offices;
- meeting rooms;
- maps of the local area (consider 1:50,000 and 1:10,000 scale);
- map preparation facilities enabling disease development to be recorded and displayed;
- communication equipment to contact field personnel and the NDCC;
- vehicles; and
- fully stocked central stores.

Cold storage facilities for vaccines should also be located at or within easy access of the LDCC. It should also have simple equipment that will allow it to process and dispatch diagnostic specimens, including serum samples. The LDCC should designate a "clean" area for personnel not going to the field, and a "dirty" area for personnel who have visited potentially contaminated sites.

Each LDCC should be under the control of a senior, experienced field veterinary officer. He or she should be given the responsibility (i.e. delegated authority) for directing the emergency disease-control and eradication programme within the area, under the general supervision of the NDCC and the CVO. All staff allocated to an LDCC for the period of the disease emergency should be under his or her command for the duration of their attachment. The officer-in-charge of the LDCC should be given the authority to:

- designate a farm, herd or community as an infected premises (after consultation with, and the agreement of the NDCC, if that is considered necessary);
- designate dangerous contact premises using agreed guidelines for veterinary risk assessment;
- quarantine infected and dangerous contact premises;
- send surveillance teams to any place where there are susceptible species of livestock;
- deploy the necessary staff to infected premises to arrange valuation, slaughter and safe disposal of animals, and cleansing 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 biosecurity restrictions on, livestock markets, abattoirs and other risk enterprises;
- designate selected slaughterhouses for sanitary slaughter of animals from affected farms, municipalities or regions, if such slaughter is conditionally sanctioned;
- 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; and
- carry out local publicity campaigns using agreed messages, including sending messages to the media and to stakeholders.

The LDCC 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 LDCC should also have veterinary epidemiologist(s), who can provide specialized advice to the officer-in-charge and be responsible for disease reporting and the emergency disease information system.

Depending on what disease-control strategy is 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, cleansing and disinfection), administrative staff (stores and general administration), and a public relations/education officer.

COMMUNICATION BETWEEN COMMAND LEVELS

It is important that a regular timetable of communications between command levels is established and laid out in the contingency plan. This should include information flows from lower to higher levels and instructions from higher to lower levels. Communication must be two-way to work. It is also important to avoid duplication of communications and one way to do this is to have standardized distribution lists for reports and instructions ready defined so that the information goes to the required point but is copied to the other interested parties.

A "battle rhythm" of meetings within command levels and communication between them needs to be established to ensure that all relevant areas are regularly reported on and progress reviewed.

INTERSECTORAL COORDINATION AND STAKEHOLDER GROUPS

As indicated in the planning phase, sectors other than the veterinary services play a vital role in disease control, particularly if the initial outbreak spreads. It is rare that government veterinary services have sufficient infrastructure and resources to deal with an outbreak without assistance from other sectors of the government; they will always need to work with local authorities in the affected areas. The police and armed services are likely to become involved, and there will be a need for collaboration with the ministry responsible for the environment. It is advisable to establish a working group that involves all these sectors at both NDCC and LDCC levels that meets on a regular basis (at least weekly). As and when each sector becomes involved intimately in the control work, a new section of the NDCC and LDCC should be created for them to ensure a close day-to-day working relationship.

NON-GOVERNMENTAL STAKEHOLDERS

The most important of these are clearly the livestock-keepers of the species affected by the disease. Other stakeholders, such as those involved with slaughterhouses, dairy plants, processing plants, rendering plants, marketing and storage of manure, are also important.

It is recommended that some of these, including private veterinarians, should be permanently represented in the NDCC and LDCC and potentially within the Gold Command as well. There should be regular meetings with wider groups of these stakeholders, particularly at the LDCC level, to explain progress in controlling the disease and any significant changes in the control policy. Their responses should be listened to carefully. It is unlikely that these stakeholders will wish to impede the control programme, but they will be careful to protect their livelihoods as well. They may also be able to suggest options for achieving control.

ADVISORY GROUPS

There are further advisory groups that should be established at the beginning of an outbreak:

Disease expert group: The expert group established during an outbreak is made up of specialists in all aspects of the disease and its control. It acts as an advisory group to the Gold Command and to the NDCC. These people maintain their expertise during the inter-

vals between outbreaks because of their professional positions. This group should meet regularly, e.g. weekly, according to the requirements of the situation.

Epidemiology group: The epidemiology group consists of trained epidemiologists. It should have staff at the NDCC and LDCC levels and is responsible for the collection and analysis of epidemiological data – a key tool in understanding the progress of the disease and the effectiveness of the control programme. It is recommended that potential members of this group be identified between outbreaks and that they receive regular specialist training and undertake practice investigations and analysis in "peacetime" to ensure a sufficient cadre of well-trained staff available from the first days of an outbreak. They may be government, university or even private veterinarians. The skills in epidemiology they develop through this programme will help to strengthen their normal day-to-day work for the government or other institutions.

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

A suggested composition of the CCEAD might be:

- CVO (serving as Chairman);
- Director of Field Veterinary Services/Director of Disease Control;
- Head of the Epidemiological Unit, Import/Export Unit and Animal Welfare Unit;
- Directors of State, Provincial or Regional Veterinary Services;
- Director of the National Veterinary Laboratory;
- Director of Meat Inspection/Animal Products Control;
- 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 (e.g. wildlife, environmental protection, risk communication).

If the command structure recommended above cannot be implemented for one reason or another, it becomes more essential that a CCEAD be established so that there can be a consensus approach to the conduct of the emergency response campaign.

All these stakeholder and advisory groups may seem like a very time-consuming and complex structure. In reality, they do take time, but the structure should not be complex. Their major function is to maintain collaboration and communication, and these are two of the major tools for achieving effective disease control. They are a productive investment of time; there will be a greater return than there is cost.

DIFFICULT OR MARGINALIZED AREAS

Countries may be faced with a situation where they have to deal with an outbreak of an epidemic livestock disease outbreak in areas which are difficult to work in by virtue of the

fact that they are relatively inaccessible for geographical reasons or because of the practice of nomadism or transhumance or because of civil unrest. Such areas frequently have little contact with outside government officials. The conventional approaches recommended above will need to be modified in these circumstances. Only those staff who are experienced in the local conditions and who can gain the confidence of local communities should be used for these areas.

Sometimes the main outside contacts of such communities will be through agricultural and other specialists employed by 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.

Communication guidelines – press and public during outbreaks

An important aspect of disease control is communication with stakeholders at all levels, from producers to the general public. It is best to agree on who will provide interviews and restrict media communications to those designated and trained. The following guidelines are adapted from WHO's "Best Practices for Outbreak Communication" and the Centers for Disease Control and Prevention's "Crisis Emergency Risk Communication". They form the basic principles of emergency outbreak communication.

Basic principles of emergency outbreak communication

1. TRUST is the goal	Each communication builds or erodes trust
2. TRANSPARENCY is the tool	Tell stakeholders everything that you can, proactively and voluntarily
3. Announce EARLY	Even with incomplete information, to control rumours and establish leadership; provide frequent updates
4. LISTEN to the public and respond	Build messages to show you are listening to the public's concerns, even when those concerns seem unreasonable
5. PLAN your communications for the extreme demands of an outbreak	

Be First. Be Honest. Be Right. Be Credible. Be Consistent.

Build trust and credibility, expressing:

- empathy and caring;
- competence and expertise;

- honesty and openness; and
- commitment and dedication.

Top tips:

- Tell the full truth. Be transparent and accurate.
- Don't over reassure.
- Acknowledge uncertainty.
- Express wishes ("I wish I had answers").
- Explain what is being done to find answers.

Guidelines for interviews with the press:

- Before the interview, write your main messages.
- Repeat them during the interview.
- Prepare to answer these questions:
  - Are my family and I safe?
  - What can I do to protect myself and my family?
  - Who is in charge here?
  - What can we expect?
  - Why did this happen?
  - Were you forewarned?
  - Why wasn't this prevented?
  - What else can go wrong?
  - When did you begin working on this?
  - What does this information mean?
- Say clearly what you don't know and what you are doing to learn.
- Share dilemmas with the public.
- Remember, outbreaks are evolving and unpredictable – always leave room for the unexpected.
- Never over-reassure or mislead.
- Acknowledge people's fear.

THE ROLES AND RESPONSIBILITIES OF KEY PERSONNEL

All key staff should have a detailed job description that details what their roles and responsibilities should be. These will vary from situation to situation and may also change as the structure of the NDCC and LDCC changes with the different stages of the outbreak. As the outbreak grows, the structure will grow and duties will be taken over by staff in the new units, reversing as the structure decreases at the end of the outbreak. Lists of these responsibilities should be drawn up for each post by a combination of the NDCC and LDCCs.

THE END PHASE

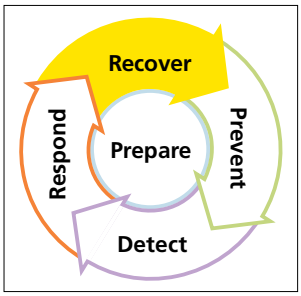
This is often the most critical phase of the eradication campaign and occurs when the clinical disease has apparently disappeared. If the wrong actions are taken at this stage and undetected pockets of infection are left, many of the benefits that have accrued from the eradication campaign may eventually 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 and the socio-economic losses are over, scarce financial and other resources might be better diverted elsewhere or reverting to their normal use. If disease-control activities are prematurely wound down leaving undetected infection, the disease is likely to flare up into further serious outbreaks.

The second, at the other end of the spectrum, is that disease-control programmes, such as vaccinations, may be maintained indefinitely (and often progressively in an increasingly less consistent fashion) 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 and the need for ongoing, increased surveillance. There may also be an impact on the ability to export animals from a vaccinated population.

To avoid these problems, it is important to maintain active surveillance for disease and an adequate level of resources in order to respond until certainty of eradication is achieved. This transition phase from control to establishment of eradication is an essential first step of the recovery stage.

Recover



VERIFICATION OF FREEDOM

When it is believed that infection has been eliminated, a series of verification programmes should be carried out. An important aim of these will be to provide objective proof to other countries and to the international community that the country has regained freedom from the disease. This may provide the foundation for export trade in livestock and animal products to be restored and/or developed.

This may involve:

- demonstration that the country has a capable veterinary service and comprehensive disease-surveillance programmes;
- statistically based serological surveys; and
- active clinical surveillance.

Reference should be made to the OIE Terrestrial Animal Health Code[8] for more specific guidelines on acceptable international disease freedom verification procedures for each disease.

The first, and most important, aim is to ensure that the causal agent of the disease (and not just the clinical disease) has been eliminated. There have been many occasions in which eradication efforts have been stopped when the disease seems to have disappeared. However, small pockets of active infection have been left to smoulder and have flared up as susceptible populations re-establish.

It is therefore vital that as disease-control measures diminish towards the end of the campaign, there should be a shift of emphasis towards active disease surveillance to detect any residual infection and retention of sufficient capacity to respond quickly to these. The surveillance involves continuing visits to detect clinical disease within the infected area and taking samples from a statistically valid sample (i.e. of holdings and individual animals) to show that those surviving the outbreak have not been exposed to the infectious agent.

The exact design of such a sero-survey will vary from situation to situation and whether it is to demonstrate freedom from disease locally or for the resumption of an export trade. The latter tends to require a larger sample size to give a high level of reassurance to the trading partners that there will be no risk to imports from the previously affected country. The overall design used is usually a two-stage design.

First, a number of locations are selected at random that would be expected to detect an infected holding with a given degree of confidence. The second stage is that within

[8] Terrestrial Animal Health Code - http://www.oie.int/international-standard-setting/terrestrial-code/

each selected location, a sample size of animals is taken that would detect infection given that if the infection is present within the location, a given proportion of animals would be expected to be infected and at a given level of confidence. For example, it may be decided that if the infection is present, at least 1 percent of locations would be infected and that within an infected location, at least 5 percent of animals would become infected. The level of confidence of detection is often 95 percent at both levels. This design would then be described as being 95/1 at the level of the location and 95/5 within each sampled location.

It is recommended that the exact design and sample size estimation be undertaken by an experienced epidemiologist with training in this type of sample design and that local conditions be well-understood by this person during the design phase.

Sample size tables are easily available, as is software that can generate sample sizes for very large or smaller population sizes; however, their use without taking local conditions into account will often lead to a sample size which is either too large for the available resources or too small for the degree of confidence required. The major factors influencing the size of the sample are the expected prevalence within a herd if it were to be infected and the degree of certainty of detecting an infection if it is present. The expected proportion of herds that would be infected is also important.

Also important are the characteristics of the assay used and, particularly, the sensitivity and specificity of the assay. Ideally, the assay would be both highly sensitive and highly specific in order to avoid false positive and false negative results, but this is not always available, technically possible or within the budget available. In all designs, the sensitivity of the test must be taken into account when selecting the sample size, resulting in an increased size to prevent a herd being identified as negative when it is, in fact, infected.

A more difficult problem is that of false positive results. Virtually no test is 100 percent specific, and given the often large numbers of negative samples that are tested, some false positive results are to be expected. How these animals and herds are dealt with can be politically difficult. They should certainly be revisited and carefully examined for signs of disease. Known susceptible sentinel animals could be introduced. It may be possible to rule out infection through careful analysis of the results or through the use of complementary assays (i.e. enzyme linked immunosorbent assay (ELISA) and virus neutralization).

For all of the above reasons, it is strongly recommended that an experienced epidemiologist be closely involved in the design of the survey and the analysis of the results.

STOPPING VACCINATION

The use of vaccination during an outbreak can complicate the move from control to recovery phases. The issue of an exit strategy from vaccination should be considered before it is commenced, as mentioned in the planning stage.

Vaccination may make the demonstration of absence of infection difficult to achieve. Many vaccines are known to prevent disease, and while they decrease shedding and spread of the pathogen, they may not eliminate all infection. In these circumstances, the vaccine may mask infection, so that the demonstration of antibodies will not necessarily be equivalent to a demonstration of freedom from infection.

In some cases, there are assays that can differentiate between infection with field pathogens and response to vaccination, which would allow a DIVA testing regime. These

are available for diseases such as FMD, based on antibody types produced by field virus but not by the vaccine (antibodies against non-structural protein) or for HPAI through the use of non-homologous vaccines (i.e. a vaccine containing a virus with a different N protein than the field virus). In both of these cases, vaccinated animals that have also been infected with the field strain can be identified and so removed. Clearly, the use of a DIVA strategy needs to be decided before vaccination commences because of the need to select the correct vaccine, and so this should have been part of the planning process. It should be noted that using a DIVA strategy requires substantial resources. An alternative might be the use of unvaccinated sentinel animals or birds to detect disease in vaccinated groups.

In the absence of a DIVA strategy, it can be difficult to know how to deal with vaccinated animals if there is a requirement to have a population that is free of antibodies as an essential part of demonstrating freedom. This is a major reason for not using vaccines unless control cannot be achieved without doing so. If there is no possibility of a DIVA strategy and it is certain that vaccination prevents infection as well as clinical disease, it will be important to identify animals at the time of vaccination. This does not need to be an individual identification (although this is preferable), but some form of permanent mark. It may also be desirable to introduce known uninfected and unvaccinated animals into a vaccinated population as sentinel animals that can then be closely monitored over at least the known maximum incubation period for disease, and blood sampled at a given time after this period to demonstrate a lack of sero-conversion and exposure.

Alternatively, if strategic vaccination has been used as part of the control programme, it may prove desirable to maintain strategic vaccination if there is still a high risk of a new incursion of the disease, for example from a neighbouring country. If neighbouring countries are free of infection, stopping vaccination programmes altogether can be considered, diverting the resources that have been devoted to the vaccinations to enhanced early warning activities and intensified surveillance. In this way, preparedness for the disease recurrence will be maintained at a high level and any disease breakdowns can be detected and eliminated quickly, either by 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, the carrying out of well-planned serological surveys giving negative results and follow-up on false positive 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 people reporting a clinical episode of what might be the disease in question with a larger offering if the reporting leads to actually finding the disease. However, the advantages and disadvantages should be carefully evaluated before embarking on this course.

DECLARATION OF OFFICIAL RECOGNITION OF ANIMAL DISEASE STATUS

Recommended standards for epidemiological surveillance in order to obtain official recognition of animal disease status have been laid down by OIE for bovine spongiform encephalopathy (BSE), rinderpest and FMD. To obtain OIE's recognition, the applicant country

should follow the relevant OIE requirements as laid out in the latest version of the TAHC. For contagious bovine pleuropneumonia (CBPP) in particular, a detailed "pathway" has been described. In addition to the above, a country is eligible to declare, at an earlier stage, "provisional freedom" regarding CBPP, in case that country is satisfied that it can provide the necessary sanitary guarantees to its trade partners that its self-declaration of provisional freedom meets the requirements for freedom as outlined in the relevant chapters of the Terrestrial Code. This self-declaration does not confer OIE's "official status of freedom".

For other diseases, the OIE does not grant official recognition of animal disease status, but for some, such as Newcastle disease and HPAI, details are given in the TAHC for recommended surveillance measures to follow when seeking to self-declare freedom from disease and/or infection. For many other diseases, the TAHC gives general guidelines for the conditions to be met for self-declaration. This self-declaration does not confer OIE's "official recognition of animal disease" status, which applies only to the four aforementioned diseases. Self-declarations serve the bilateral relations between the declaring country and its trade partners and it is a matter between the two countries. The OIE can provide a mediation role if the two countries cannot reach an agreement.

It is sometimes possible to foreshorten considerably the periods for declarations of freedom to be made if a "stamping out" policy has been followed; this should be taken into account when a vaccination policy is being decided.

RECOVERY AND REHABILITATION OF AFFECTED FARMING COMMUNITIES

Epidemic animal diseases may reach magnitudes of major catastrophes with long-term economic implications at the individual and national levels. During the outbreak, the losses are caused by the disease itself, but also by man-made activities such as culling. Heavy economic losses result from the quarantine measures imposed, such as banning the transportation of meat, eggs and milk products and restricting animal movement, which will affect producers (the farmers), first users (e.g. laying farms, the broiler industry, feedlots and fattening units, dairies and slaughterhouses), second users (e.g. food processors, the retail market) and prices to the consumers (or their perceived or real food-safety threats). Other stakeholders in the production and marketing chain (e.g. transporters, animal markets and traders and feed mills) also will be seriously affected during the outbreak.

In some countries, non-agricultural industries, such as tourism, may be affected, sometimes severely, but the recovery of these is usually not the responsibility of the veterinary authorities or agricultural ministry.

The day on which an outbreak is declared over is the first day on a long and sometimes difficult road to recovery and rehabilitation of severely damaged livelihoods and, in many cases, spirit. Public assistance is needed to help the affected populations towards recovery, rehabilitation, development and a capacity to satisfy future needs.

Not all those affected will wish to return to their previous engagement. Following a massive animal disease outbreak accompanied by mass mortality or mass destruction of livestock, a certain percentage of the owners do not wish to restock or to continue animal breeding. But the majority will wish to return to their traditional way of life, i.e. tending animals as livelihood. They will have to restock.

RESTOCKING

Restocking is a complex activity. Targeting, implementation and sustainability are key questions that arise again and again wherever restocking takes place. Too often, the push to replace livestock has resulted in hasty decisions being taken without due consideration to the types of animals that are required and the existing resources and knowledge of the people to whom they are to be given. FAO, in combination with other organizations, has published Livestock Emergency Guidelines and Standards (LEGS).[9] This tool, designed originally for natural disasters such as floods or droughts, provides helpful decision-support tools for the provision of livestock as part of the recovery process.

In general, and where possible, it is better to provide compensation for culled animals (and other items which may have been destroyed) rather than animals. This allows the livestock-keepers to choose the type and numbers of livestock they wish to buy, and, as importantly, control the timing. However, the disbursement of cash is open to mismanagement (i.e. corruption and theft). It is sometimes the case that the money is not paid to the primary caregiver and beneficiary of the livestock. For instance, poultry are usually the responsibility of women who may not control much of the family income. If compensation is paid to their husbands (which may be required by local custom), the women (and so also the children) may not have access to the compensation for restocking. Cash compensation is best paid when it can be given directly, with few or preferably no intervening levels of officials or others, from the source of the funds to the actual keeper/beneficiary of the livestock that have been culled.

Where direct payments, either in cash or, increasingly, bank transfers, are not possible, it may be preferred to give replacement livestock to the producers. However, the difficulties in this should not be underestimated. The keepers must be closely involved in selecting the type of animals and the source(s). They will want to be consulted about the timing of replacement. Some will want immediate replacements, others will want to delay. Incorporating these wishes in a government-run livestock purchasing programme can be difficult. Also, when governments buy livestock, they usually prefer to buy as many as possible at the same time from as few locations as possible. The sellers are aware of this and will use their control of supply to drive up prices and to use the opportunity to sell lower-quality animals.

Whether to supply stock or money to farmers who have had their livestock culled therefore depends on the local situation, but where possible it is almost always better to give the keepers money rather than livestock so that they have choice and flexibility.

Before any restocking, the premises must be free of the pathogen. This can be achieved through thorough cleansing and disinfection, often carried out twice. It may be required to keep susceptible sentinels for a given period (two or three incubation periods are recommended for the given pathogen) before restocking, to make sure there is no residual infection. Another approach is that the replacement animals should be vaccinated and immune prior to their introduction. This should be a definite, unconditional requirement when the farm has not been completely depopulated, which is often the case in developing countries where "modified stamping out"[10] is applied.

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[9] Livestock Emergency Guidelines and Standards - http://www.livestock-emergency.net/

[10] Elimination only of clinically affected animals in the infected flock/herd/

Livestock for restocking should, if possible, be bought locally or in neighbouring areas. These animals are adapted to local conditions, the risk of transmitting disease is minimized and they are usually those that farmers know best. However, some may feel that restocking may provide a chance for upgrading and improvements. One common example is replacing the local, low-production stock with imported breeds with a greater genetic potential in order to "improve" the national herd. Long experience has shown that this must be accompanied by a sustainable improvement in nutrition and husbandry facilities as well as an adequate regime of disease prevention if it is to be successful at both the national level and for individual producers. In many cases, it has ended in a failure to achieve a desired objective. Great care should be exercised in using restocking after an outbreak as a "development" tool, including to improve the genetic composition of the restocked population.

The purchase of large numbers of livestock to replace whole herds may bring diseases that are unfamiliar or even unknown in an area. This is particularly true for diseases with few prominent clinical signs and/or long incubation periods such as bovine tuberculosis, small ruminant and bovine brucellosis, infectious bovine rhinotracheitis (IBR), paratuberculosis (Johne's disease), porcine respiratory and reproductive syndrome (PRRS), porcine circovirus type 2 (PCV2) and bovine viral diarrhoea (BVD), all of which cannot be readily recognized without specific tests which may not always be readily available. It is difficult to be sure that livestock are disease-free, but the risks and consequences of introducing disease can be minimized with careful planning. It is important that livestock-keepers be advised of the issue of disease introduction and, where necessary, controls imposed to limit the risk posed by this large-scale movement of animals.

Buying livestock from several sources will inevitably mean that animals will be of different health and immune statuses, and mixing them under stress can lead to cross-infection.

Restocking, therefore, presents many issues and challenges that need to be discussed with stakeholders, particularly livestock holders and potential traders (sources). Nonetheless, in the absence of restocking, other alternatives would have to be found to sustain the livelihoods of people who have to find some means of surviving in the aftermath of the disease epidemics – similarly to other natural disasters.

TECHNICAL AND FINANCIAL SUPPORT

Rehabilitation of farms and farmers affected by a major animal disease catastrophe deserves to be seen as the same as rehabilitation of populations hit by other catastrophes. The damages are not readily obvious to outsiders, but they can be devastating. For instance, although FMD is rarely fatal in adult animals, the after-effects are serious. Affected animals lose body condition and secondary bacterial infections may prolong convalescence. The most serious effects of the disease are seen in dairy cattle, and reduced milk yields are almost inevitable. Chronic mastitis may develop and the value of a cow is permanently reduced.

Culling remains the basic control policy because widespread disease throughout the country would pose a serious economic threat, but this is not always feasible, particularly in developing countries. The owners are left with a burden where the animal has to be fed rather than being a producing animal with a profitable performance (e.g. weight gain, milk yield, offspring, transportation or tilling of land for crops). Helping farmers by slaughtering and compensating for such animals will be a well-deserved investment.

Government funding of fodder-support schemes should be given greater priority. Management and veterinary advice could be made available to farmers within the efforts to maintain the disease freedom.

The recently accepted concept of compartmentalization opens new avenues for the provision of international help to developing countries. The establishment of disease-free subpopulations within such countries – a costly but productive investment for the longer term – will enable such countries to continue exporting from recognized production compartments, in spite of the fact that their territories are not and cannot be declared free of disease, at least in the short term.

PSYCHOLOGICAL SUPPORT

In developing and developed countries alike, experience has shown that life after a serious animal epidemic may be accompanied by flashbacks, distress, feelings of bereavement and sometimes a fear of a new disaster. Trust in authority may often be damaged unless the outbreak is well-managed.

The collateral damage may affect the farmers, their family members and the entire farming – and perhaps the entire rural – community. Such distress could be experienced well beyond the farming community. The slaughter, clean up and disposal operations can have a serious level of stress for farmers and their families, individuals or groups of veterinarians, clean-up workers and even council and utility workers.

Those observations demonstrate the need for the intervention of trusted informal and formal support networks. This implies that statutory and voluntary organizations have a more complex and enduring role after a disaster than often has been understood. People who have experienced a disaster may not be clinically sick as a result, but they often need careful and appropriate support to rebuild their lives and regain confidence.

STAYING FREE

Lessons from the disease outbreaks and the campaigns to prevent and control them should be learned so that the country will be in a better position to stay free of the disease and to respond more quickly and effectively to any further introductions.

A thorough after-action review or 'post-mortem' of the manner in which the response progressed should be carried out while the events are still fresh in peoples' minds.

This review should be commissioned by the CVO who might also lead it, but preferably would appoint an experienced facilitator to run the process. The review should include key representatives of those involved in the disease-control campaign (head office and local), those affected by the disease outbreaks and other experts as needed.

Issues to be considered in the after-action review include:

- epidemiological analysis of how the disease may have entered the country and the subsequent methods of spread, with a view to strengthening border controls and other internal preventive measures against future disease incursions;
- determination of how disease surveillance and other early warning procedures can be improved and on which geographical areas to concentrate efforts, based on the results of the above and on other experiences;
- revision of contingency plans and operational manuals;

- strengthening of public extension/education programmes;
- determination of whether legislative and other support frameworks need to be improved; and
- further training programmes.

Annex A

Animal disease emergencies: their nature and potential consequences

WHAT ARE ANIMAL DISEASE EMERGENCIES?

Disease emergencies can occur when there are unexpected outbreaks or epidemics of serious animal diseases or the occurrence of animal health-related events which have the potential to cause serious socio-economic consequences for a country.

There are two main features that differentiate animal disease emergencies from the more routine endemic disease occurrences:

Animal disease emergencies cannot be effectively handled at a local level by livestock farmers and their immediate animal health advisers, be they governmental or private. They can only be resolved by a national response, coordinated by the country's veterinary services with the support of other agencies. In the case of major epidemic livestock diseases, they may further require an international response involving a number of countries in a region, with the external assistance and possible coordination of appropriate international agencies.

Animal disease emergencies require an immediate national response, so as to minimize the serious socio-economic and public health consequences that they may cause. Any delays may lead to disease outbreaks spreading over larger areas, making their control and eradication much more costly and difficult, or even impossible to achieve, leading to an endemic situation.

THEIR NATURE

The most likely cause of a disease emergency is an incursion into a country of a transboundary animal disease (TAD). TADs are defined by FAO as those "infectious diseases that are of significant economic, trade and/or food-security importance for a considerable number of countries; and which can easily spread to other countries and reach epidemic proportions; and where control/management, including exclusion, requires cooperation between several countries." Some examples of TADs are: African horse sickness, African swine fever, highly pathogenic avian influenza, bluetongue, classical swine fever, contagious bovine pleuropneumonia, foot-and-mouth disease (FMD), Newcastle disease, Nipah virus disease, peste des petits ruminants, and Rift Valley fever.

Alternatively, it may even be the introduction of a new antigenic strain or biotype of an animal pathogen that is already in the country. An example of the latter might be the introduction of a new serotype of FMD into a country, for which there is no pre-existing immunity either from vaccination or past infection. The appearance of a highly infectious

animal disease in a neighbouring country or within the region may also constitute an emergency situation for other countries in the region and dictate not only enhanced quarantine measures, but also may create the need for other preparedness measures, such as preventive vaccination.

Animal disease emergencies may also be caused by other than disease incursions from beyond the country's borders. They may be caused by a sudden resurgence of an endemic animal pathogen, resulting from changed environmental or epidemiological conditions. Prime examples of these are bluetongue and Rift Valley fever. Unusual climate patterns (e.g. rainfall and temperature) lead to population explosions of competent insect vector species.

Disease emergencies may also be caused by the spread of serious pathogens from endemic wildlife reservoirs of infection to livestock. Examples have included FMD in Africa and H5N1 highly pathogenic avian influenza in Asia and elsewhere.

Experience over the last 50 years has shown that disease emergencies may result from the sudden emergence of previously unknown diseases, and this trend is likely to continue. This has occurred in both the human and animal health fields. Examples include severe acute respiratory syndrome, Ebola virus, bovine spongiform encephalopathy (BSE) and variant Creutzfeldt-Jakob disease, Hendra virus disease and Nipah virus disease. While a number of new diseases have been primarily in the public health domain, these also need to be supported by an animal health emergency response to trace possible animal sources.

Finally, animal health emergencies may even be caused by non-infectious agents, such as contamination of animal products destined for human consumption by unacceptable chemical residues, or by incidental contamination by microbial pathogens which may not be related to clinical disease in animals. Examples of the latter are salmonellosis from eggs and verotoxic Escherichia coli.

No matter what the nature or source of the emergency might be, it still requires a rapid national response by the animal health services. The basic principles guiding that response, as espoused in this manual, remain the same irrespective of the cause.

GLOBAL TRENDS

The nature and degree of threat posed by emergency animal diseases are not static. The situation is dynamic with a number of global trends contributing to these threats, including:

- **increasing globalization and international transport:** The most important method of spread of TADs is by movement of potentially infected or contaminated livestock, meat and other animal products and fomites. There have been very substantial increases in international movements because of better and higher volume of sea, land and air transport of people, animals and goods and in response to marketing opportunities for livestock and their products. This has led to a change in the volume of both legal and illegal trade in livestock products. Legal trade, if carried out strictly to international guidelines (see below) would carry minimal risk, but this requires sufficiently resourced government veterinary services, which is often not the case. Illegal and informal trade is by nature risky as it is uncontrolled in type and volume. Controlling this is, by definition, difficult and has been affected by the low levels of investment in veterinary infrastructure.

- **political instability:** The movement of refugees with their animals away from wars and civil disturbances also contribute very substantially to the spread of infectious animal diseases.
- **changes in livestock production systems:** In many countries, there is a trend towards increased intensification and commercialization of livestock production, particularly in peri-urban areas. The greater concentration of animals that this entails means that there is far greater opportunity for TADs to move very rapidly and for greater economic losses to occur.
- **decline in government veterinary services and other infrastructure:** Also in some countries, public funding of veterinary services is poor and even declining, resulting in uncontrolled livestock movements, weak surveillance, poor diagnostic capacity and the inability to react quickly and effectively to disease outbreaks. If farmers are not properly compensated and legal framework for compensation is not in place in disease-control programmes, they tend to sell still healthy-looking livestock to reduce their financial losses when a disease problem is occurring on their farm. Since some of these apparently healthy animals may be in the early stages of infection where clinical signs are not yet apparent, this behaviour of farmers may significantly contribute to the spread of diseases.
- **international trade pressures:** The fear of losing vital export markets for animals and animal products may lead countries to try to conceal new diseases or disease outbreaks from international attention for unacceptably long periods, with potentially disastrous consequences.
- **spread of livestock or domestic poultry farming into new ecosystems:** In some regions of the world, tropical rain forests and other wilderness areas are being converted to livestock farming. This places human communities and their farm animals in close contact with a completely new range of pathogens which may have previously only circulated in wildlife reservoirs and which may be completely unknown. Some of these diseases may be transmissible to humans, livestock and/or domestic poultry, in which they may spread very rapidly in the new, fully susceptible hosts.
- **environmental changes:** Climate change may change temperature, rainfall and weather patterns in a number of regions. This will influence the types of animal farming practised in different areas. It may also have a major effect on the global distribution of arboviral vectors (e.g. mosquitoes, ticks and Culicoides midges) and subsequently of important viral and protozoan TADs that they transmit. Other man-made environmental changes also change disease threats. For example, the damming of rivers may result in major outbreaks of Rift Valley fever.
- **changes in animal product processing and the increased application of recycling techniques:** These have led to new and emerging disease and/or food-safety threats (e.g. BSE and cryptosporidium).
- **bioterrorism risks:** These include the use of animal pathogens (e.g. anthrax), and such risks have remained a potential threat over recent years.

Many of these place a great strain on countries in maintaining effective quarantine barriers at airports, seaports and along international borders.

However all is not 'doom and gloom'. There are some positive trends. These include:

- **new tools:** There have been major advances in the technologies available for combating animal diseases, mainly stemming from the biotechnology and computer sciences, and this trend will only accelerate. These are leading to faster and more accurate diagnostic methods, better vaccines and improved epidemiological tools.
- **better international cooperation:** There has been an increasing awareness of the need for regional and global cooperation in combating major TADs, particularly after the FMD and highly pathogenic avian influenza pandemics over recent years. The Global Rinderpest Eradication Programme, coordinated by FAO in collaboration with the OIE and the United Nations International Atomic Energy Agency, has resulted in the eradication of this terrible animal plague.
- **improved guidelines for safer international trade in animals and animal products:** Through the OIE guidelines, including the adoption of the compartmentalization concept, will enable a partially continued export from infected countries, in spite of disease situations which were blocking such trade in the past.

In summary, the global threat posed by serious animal diseases is, on balance, increasing, but it is also changing in character. Some of the more traditional disease threats will tend to 'drop off the radar screen' and are being replaced by new ones. It has been the experience that many of the latter also have human health implications.

THE SOCIO-ECONOMIC CONSEQUENCES

The occurrence of one of these diseases may be disastrous for a country, as it may:

- compromise food security through serious loss of access to high-quality animal protein and/or loss of draught animal power for cropping or transport;
- cause major production losses for livestock products (e.g. meat, eggs, milk and other dairy products), wool and other fibres and skins and hides;
- cause losses of valuable livestock of high genetic potential. They may restrict opportunities for upgrading the production potential of local livestock industries by making it difficult to import exotic high-producing breeds which are susceptible to transboundary or emerging animal diseases, as well as to diseases endemic in the importing country;
- add significantly to the cost of livestock production through the necessity to apply costly disease-control measures;
- seriously disrupt or inhibit trade in livestock, germplasm and livestock products (e.g. meat, eggs, dairy products, hides and skins), either within a country or internationally. Their occurrence may thereby cause major losses in national export income in significant livestock-producing countries;
- inhibit sustained investment in livestock production, thus preventing small-scale farmers from investing in a move from subsistence to production for the market;
- cause public health consequences in the case of those diseases which can be transmitted to humans (i.e. zoonoses);
- cause environmental consequences through die-offs in wildlife populations and disease-control efforts, such as mass disposal of carcasses by burial or burning; and
- cause unnecessary pain and suffering to many animals.

Annex B
Risk periods

This section uses the concept of risk periods that is found in published literature on disease outbreaks, but expands it to illustrate the importance of planning to decrease the probability and impact of incursions.

The time period before and during the incursion of a disease can be split into several critical risk periods. Actions taken, before and during these, affect the size of the epidemic and the impact of the disease incursion.

The concept of a high-risk period (HRP) has been used when discussing the incursion of a transboundary disease. This is the period between introduction of a disease and the full implementation of effective measures to control spread. The length of this period is critical in determining the scale and duration of an epidemic. The HRP has been further subdivided into HRP1 and HRP2. HRP1 is the time between the first infection and first detection of the disease, the period of "silent spread". HRP2 is the period between first detection and when control measures are put into effect. HRP2 represents the initial stages of controlling an already disclosed incursion.

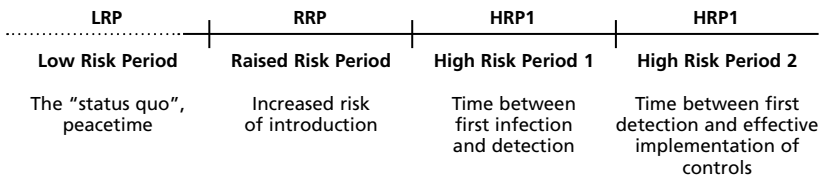
It is possible to add further periods before first infection. The low-risk period (LRP) is the period in which measures are applied to prevent incursion and routine surveillance for detection. This is also sometimes referred to as "peacetime" and is the status quo.

In some cases, where the disease is present nearby or in the countries of trading partners, there may be a raised-risk period (RRP) during which a greater risk of introduction is recognized, and this should lead to heightened import and border controls, a campaign to raise awareness and increased vigilance.

This gives four periods that are illustrated in Figure 5 below:

There are different objectives during each of these periods and activities to achieve them, as indicated below:

FIGURE 5
Risk periods



Low Risk Period	Raised Risk Period	High Risk Period 1	High Risk Period 2
The "status quo", peacetime	Increased risk of introduction	Time between first infection and detection	Time between first detection and effective implementation of controls

LOW RISK PERIOD

During this period, the major objectives and activities are:

- Prevent
  1. Prevent entry of the disease agent in legal imports.
  2. Prevent entry of the disease agent in illegal or "informal" imports.
  3. Maintain intelligence-gathering for early warning of changes of distribution, virulence or epidemiology in affected countries and trading partners.
  4. Establish, strengthen and maintain cross-border contacts with neighbouring administrations.
  5. Promote and strengthen routine biosecurity measures.
- Detect
  6. Maintain disease awareness in key staff and stakeholders.
  7. Maintain routine scanning and targeted surveillance as required.
- Plan and practise response
  8. Prepare and review contingency plans for disease control.
  9. Undertake table-top and field simulation exercises of disease incursion.

(1) and (2) are aimed at decreasing the risk of introduction.
(3) and (4) are aimed at identifying when a move into the RRP is advisable.
(5) is aimed at limiting the spread if incursion occurs.
(6) and (7) are aimed at minimizing the length of HRP1 should the disease occur.
(8) and (9) are aimed at minimizing HRP2 should the disease occur.

RAISED RISK PERIOD

During this period, the major objectives and activities, in addition to those of the LRP, are:

- Prevent
  1. Prevent entry of the disease agent through additional restrictions on imports.
  2. Prevent entry of the disease through tightened and targeted inspections for illegal imports.
  3. Implement raised biosecurity measures, particularly at locations identified as high risk (e.g. border areas, markets, traders).
- Detect
  4. Raise disease awareness with staff, stakeholders and the general public.
  5. Intensify surveillance to ensure early detection of any incursion.
  6. Cooperate closely with neighbouring administrations, exchanging information on any suspected or confirmed outbreaks.
- Respond
  7. Review contingency plans and make staff aware of their roles should the disease occur.
  8. Start to put initial structures in place for contingency plans.

(1) and (2) are aimed at decreasing the risk of introduction.
(3) is aimed at limiting spread.
(4), (5) and (6) are aimed at minimizing HRP1.
(7) and (8) are aimed at minimizing HRP2.

HIGH RISK PERIOD 1

This is the period of undetected presence and potentially "silent" spread. The final severity (i.e. duration and spread) of a disease epidemic is strongly related to the duration of HRP1.

By its nature, this is a period in which extra activities are not triggered beyond those implemented in the LRP and any RRP. However, as indicated, activities in the LRP and RRP are aimed at minimizing the duration of HRP1 and at minimizing the amount of spread that can take place during it. Surveillance is the tool used to minimize this period, and biosecurity is the method of limiting spread.

Most infectious diseases are first detected by on-farm surveillance carried out by farmers and animal health workers during routine activities ("passive" surveillance). Some diseases may be detected by regular ongoing targeted active-based surveillance, such as abattoir or live market surveillance, but this is less common. The importance of a strong and alert field-based passive surveillance system cannot be overstated.

HIGH RISK PERIOD 2

This period commences when the disease is first detected. The objective in this period is to implement effective measures that will bring the disease under control.

- Respond
  1. Activate contingency plans.
  2. Assess the initial outbreak (e.g. size, geographical spread, epidemiology) to judge what control measures may be required.
  3. Implement the control measures as quickly and completely as possible.
  4. Continue exchanging information and data with neighbouring administrations.

Actions taken during the LRP to create an effective response system and during any RRP to start to gear up the contingency plans will minimize the length of HRP2. These plans should be such as to minimize HRP2.

To restate:

Surveillance aims to minimize HRP1 and current contingency plans to minimize HRP2. By minimizing both HRP1 and HRP2, the overall size of the epidemic will be kept to the minimum possible.

Biosecurity aims to limit the scale of (undetected) spread, which again will limit the size of the overall outbreak.

HRP1 and HRP2 are not independent; HRP2 will be affected by HRP1. If there is considerable spread during a prolonged HRP1, HRP2 is likely to be extended, as systems chase to catch up, particularly if there has been no RRP. And the measures required to achieve the end of HRP2 will vary on the situation at the end of HRP1 (i.e. how much "silent spread" has taken place). Spread is related to time from first infection to detection, but will also be affected by the species involved, the farming system, contact rates and methods of spread. Large amounts of silent spread may overwhelm even the best contingency plan. The European Union now requires that FMD contingency plans be adequate to cope with a "worst case" scenario (2003/85/EC, Section 12, Article 72, paragraph 3), further defined as "a large number of outbreaks occurring in a short time and caused by several antigenically distinct serotypes or strains" (2003/85/EC, Annex XVII, paragraph 12).

Although it is not exact, there is a reasonable correlation between the concepts of HRP1 and HRP2.

Of course, there are other measures that are applied during RRP and HRP2 that are not so easy to evaluate, such as biosecurity and others that are blanket in nature such as movement controls. It is important to be aware that although HRP2 seems, in some definitions, to depend mainly on when movement controls are put in place (see below), it also may be defined as when sufficient measures are in place to either:

- reduce the reproductive ratio of the outbreak below 1 (i.e. it is "under control"); or
- eradicate the disease.

MOVING FROM HRP2 TO LRP

- Recovery
  16. Undertake planned surveillance activities to demonstrate freedom.
  17. Conduct sentinel restocking.
  18. Conduct full restocking.
  19. Carry out post-outbreak analysis to assess the pre-outbreak practices and issues that led to the outbreak and any problems encountered in detecting and responding to it.
  20. Revise legislation and plans to correct deficiencies, make risky practices safer and introduce new practices as required.

The concept of risk periods is a useful one that helps to identify the actions required to minimize the chance of a disease incursion, spread prior to detection and speed with which it is brought under control. Actions during all four stages are vital if the impact of emergency diseases is to be minimized.

Annex C
Risk analysis

Resources are always limited and so must be targeted to where they are most likely to have an impact. Risk analysis is an important tool for focusing resources on priority issues.

Equally, in terms of keeping a disease out of a country, it is sometimes hard to justify the ongoing expenditure, and this becomes increasingly so the longer it has been since a previous outbreak. It is a form of preventive medicine. Although it is widely accepted that prevention is better than cure, this is a lesson too often learned after the event. Regular updating of risk analysis will demonstrate to policy-makers and stakeholders an ongoing need for maintaining vigilance, or it will provide justification for switching resources to different disease threats.

Risk analysis is commonly used in disease preparedness to identify the highest risk/priority diseases for which planning is required and to identify potential preventive measures. Risk assessment can seem like a complex topic, but it can be carried out with relatively

TABLE 5
Comparison of qualitative and quantitative risk analysis

	Qualitative risk analysis	Quantitative risk analysis
Advantages	Less data-intensive Fewer resources required Advanced mathematical skills not necessary Usually need to do first anyway Often all that is required to make a decision Everyone can understand the output and reasoning	Can give numerical bounds to uncertainty and variability Allows sensitivity testing which identifies key parameters and also crucial data deficiencies Can undertake "what if" testing for both risks and risk reduction Comparisons seem easier
Disadvantages	High/medium/low risk description is subjective (hence the need for full transparency) Comparisons are difficult	Data-intensive (and data often not available) Resource-intensive Mathematical skills required (i.e. probabilities) For complex stochastic assessments, specialist software is required Numbers can be misleading; assumptions are often ignored Can be difficult to explain acceptable risk ranges (probabilities) May not be necessary (often?)

TABLE 6
Definition of qualitative risk levels

Level of risk	Description of term
Negligible	The risk is very low, too low to cause concern
Low	There is a significant risk, but at a level that does not justify further measures beyond those already in place.
Medium	There is a significant risk at a level high enough to cause active concern. Further measures should be considered.
High	There is a significant risk at a level high enough to cause active concern. Further measures should be considered.

FIGURE 6
The four components of risk analysis (OIE TAHC 2009)

Hazard Identification	The process of identifying agents that could potentially produce adverse consequences associated with the import of a commodity
Risk assessment	The evaluation of the likelihood and the biological and economic consequences of entry, establishment or spread of a pathogenic organism
Risk management	The process of identifying, selecting and implementing measures that can be applied to reduce the level of risk
Risk communication	The interactive exchange of information on risk among risk assessors, risk managers and other interested parties

few resources. It combines a standard accepted methodology and set of concepts, which are laid out in the OIE Terrestrial Animal Health Code Chapter 2.1. The process is summarized in Figure 6.

There are two broad methods of risk analysis: qualitative and quantitative. Qualitative risk analysis describes risk in broad categories such as negligible/low/medium/high (see Table 6). Quantitative risk analysis, which, as its name suggests, attaches values and ranges to variables. Table 5 outlines the pros and cons of the two methods.

Quantitative risk analysis is seen by some as preferable, but others feel that it can produce a spurious level of precision which can often be confused with accuracy. It is certainly

data- and resource-hungry. The methodology can be difficult to explain to a non-technical audience, and so it is hard for people who may be expert in the disease but not in the mathematics to make useful comments on the output.

Qualitative risk analysis is much simpler to carry out and requires fewer resources. However, it will always contain a subjective element. This is not a problem so long as the assumptions made are explained and justified. With the level of resources available to most veterinary authorities, risk assessment will mostly be qualitative, and it is adequate for the purpose for which it is being used.

The most important distinction is between negligible and the other levels. It should be stressed that even a low risk is considered significant and reason to be actively prepared for the entry of disease into the province, particularly for those diseases that are capable of rapid spread and establishment. Any risk above negligible is unacceptable for such high-impact diseases and requires that some action be taken.

HAZARD IDENTIFICATION

Hazard identification is the first step in any risk analysis. Which diseases will require inclusion? In practice, this is mostly based on the likely impact if the disease were to be introduced and this usually leads to the list being comprised of some or all of the TADs and those with a significant zoonotic potential. However, the initial list can contain as many diseases as wished.

This is done through a transparent prioritization exercise assessing probable impact. This should be done by using expert opinion and experience. Where possible this should involve a wide range of opinions and stakeholders, including producers' associations, either in the actual process or in a consultation of the outputs. This will help to ensure cooperation and collaboration in the steps taken subsequently.

Prioritization is most commonly based on an assessment of the likely impact of a disease should an outbreak take place. A suggested methodology for a prioritization exercise is included below, but this is only one example.

IMPACT ASSESSMENT

It is important to keep in mind when assessing the potential impact of a disease all the possible areas which may suffer a consequence as a result of the disease occurring. While the major focus of veterinary services is on the control of diseases on-farm and the prevention of entry of disease, there are other important areas that must also be included. These various areas have been termed, for lack of a more elegant phrase, "consequence categories". These cover the livestock, non-livestock and environment/wildlife sectors and are shown in Table 7.

Definitions of these categories are given in Table 8. They have been constructed to have as little overlap as possible. Since this is to be a qualitative assessment of potential impact, the impact on each category is to be selected from the same risk levels described above (i.e. negligible, low, medium or high). For each consequence category for each disease of interest, select a ranking in each consequence category. It may be easiest in this case to give these rankings a numeric value (e.g. 1 to 4) and to add up the total of the twelve categories for each disease, giving a range of 12 to 48.

TABLE 7
Consequence categories that may be impacted by livestock diseases

Livestock	Non-livestock	Environment / wildlife
Animal health cause concern	Non-agricultural economy concern	Environment
Animal welfare	Human health	Wildlife
Farm economy	Health services	
External trade	Public opinion	
Agrifood business	Government resources	
	Consumer confidence	

These data can be used as they stand or extra weighting may be given to some or all of the categories. The use of weighting is subjective, and caution should be used as it can have unexpected outcomes. As with all qualitative ranking, a degree of judgement is required in the interpretation of the results.

Once the level of impact has been established, the priority diseases for which further planning, prevention and surveillance are needed, can be selected. These normally would be those that have an impact assessment score above a predetermined level. This completes the hazard assessment stage.

RISK ASSESSMENT

The first step is to characterize the "natural history" of the disease and the causal agent (although some of this probably already will have been done in the impact assessment). This includes:

- the species affected;
- details of the causal agent;
- survival in the environment;
- patterns of the disease;
- brief description of the life cycle;
- known routes of transmission;
- occurrence in world regions; and
- availability of therapeutics or prophylaxis.

This information can be gathered from the literature, combining standard texts with recent reviews of the epidemiology of the disease.

The next step is to use this information to undertake the risk assessment phase. This identifies the routes by which each disease might enter and the likelihood of:

- release (introduction);
- exposure and infection;
- spread;

TABLE 8
Definitions of consequence categories

Impact on:	Definition
Animal health	What impact does the disease have on animal health (i.e. how much actual disease does it cause, short term and long term)? This is a combination of morbidity and case fatality (which determine mortality).[11]
Animal welfare	What impact does the disease have on animal welfare? Most serious diseases, as well as affecting animal health, will have a negative impact on welfare.[12]
Farm economy	What impact does the disease have on the overall farming economy? This may be much greater than its impact on animal health may seem to suggest (e.g. BSE, salmonella in poultry). And it will be greater for more valuable stock than for less valuable ones (e.g. a disease which kills many sheep will have less economic impact than a disease of cattle with the same mortality). This category includes livestock markets and feed mills as their business is wholly related to farming.
External trade	What impact does the disease have on the ability of a country or region to export livestock?
Agrifood business	What impact does the disease have on the agrifood in the food processing industry? This includes food processing companies, dairies, abattoirs and butchers.
Non-agricultural economy	What degree of impact would the presence of the disease have on the non-agricultural economy, both rural and urban?[13]
Human health	What amount of zoonotic potential does the disease have? How many people could it affect and how severely?
Health services	How much impact would the disease have on human health services? This may be much higher than the actual potential impact on human health.
Public opinion	What impact would the disease have on public opinion?[14]
Government resources	What amount of government resources would be needed to control and/or eradicate the disease? This includes staff, equipment and compensation. It should also take some note of the opportunity costs (i.e. what else might have been done with that money?). There may also be an element of time required to deal with the problem and so a lack of staff to undertake other work.
Environment	What impact does the disease have on the overall environment? This would also include the environmental impact of control measures.
Wildlife	What impact does the disease have on wildlife populations? This refers to direct impact through infection crossing into the wildlife population and causing either disease or creating the necessity to control wildlife populations

[11] Rabies has a very high case fatality but an overall low morbidity and mortality, so a low impact on animal health.

[12] Diseases such as sheep scab may be seen as having little impact on health, but a large impact on welfare.

[13] Tourism and access to attractive areas of a country under restricted quarantine.

[14] FMD had a strong impact on public opinion although it had no human health risks. BSE had a severe impact on public opinion because of uncertainty over risk. TB has a much lower impact on public opinion than either

FIGURE 7
Components of risk assessment (OIE TAHC 2009)

Risk Assessment

- Release assessment
- Exposure assessment
- Consequence assessment
- Risk estimation

Release assessment	The process of describing the biological pathway(s) necessary for an importation activity to "release" (that is, **introduce**) pathogenic agents into a particular environment and estimating the probability of that complete process occurring
Exposure assessment	The process of describing the biological pathway(s) necessary for exposure of animals and humans in the importing country to the hazards released from a given risk source and estimating the probability of the exposure(s) occurring
Consequence assessment	The process of describing the potential consequences of a given exposure and estimating the probability of them occurring
Risk estimation	The process of integrating the results from the release assessment, exposure assessment and consequence assessment to produce overall measures of the risk associated with the hazards identified at the outset

- establishment; and
- potential to become endemic.

The formal steps are shown in Figure 7. The risk in each stage is due to a combination of different factors, outlined in Figure 8.

Some points to highlight from this diagram are:

1. Release

   The agent enters by whatever route and in whatever amount.

2. Exposure

   Livestock (or wildlife) are exposed to the agent (i.e. there is a feasible route from the entry of the agent to its coming into contact with susceptible livestock via a possible infection route). By implication, this means that the dose to which they are exposed is capable of causing infection.

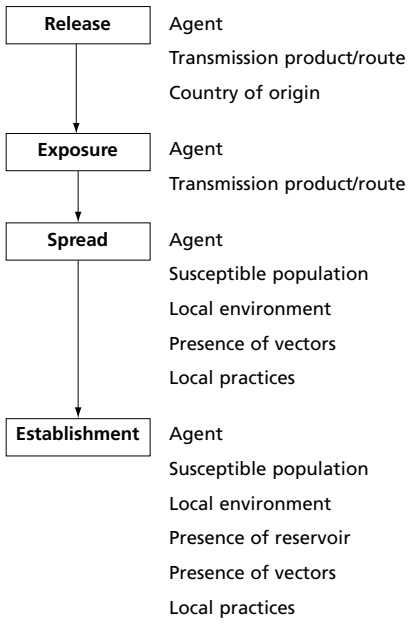
3. Spread

   Having infected livestock (or wildlife), the agent could then spread to other susceptible individuals and/or premises unless steps are taken to prevent this.

4. Establishment:

   Having entered the livestock population and spread, the agent would become

FIGURE 8
Factors affecting risk of incursion to endemicity



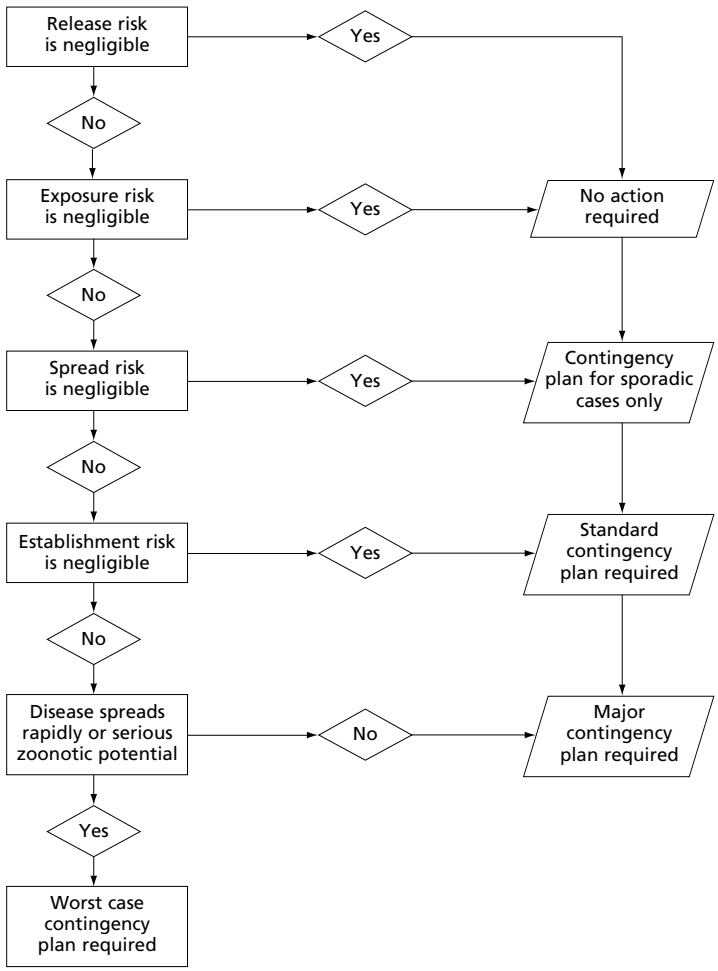
established and endemic unless measures are taken to eradicate it (i.e. there is no self-limiting step).

Figure 8 shows the major factors that influence whether each step will occur. Note that the route of importation and the country of origin are only of importance in the release and exposure stages. The properties of the agent and its lifecycle requirements are important in all the stages.

Combining these four stages described in Figure 8, the following scenarios are possible (Figure 9):

1. If the risk of either release or exposure is negligible, then there is negligible risk of the disease occurring. No specific control measures are required.
2. If there is a risk of release and exposure, but the risk of spread is negligible, then only sporadic cases would occur. Measures that act to decrease the risk of release and exposure will be required, but a contingency plan is not a priority.
3. If release, exposure and spread risks are greater than negligible, but there is only a negligible risk of establishment, then the disease would be expected to spread for a time but would be self-limiting. A contingency plan to deal with spread will be required.
4. If none of the four steps carries a negligible risk, the disease could enter the province, spread and become established, causing serious consequences. These are the most threatening diseases. A worst-case scenario contingency plan is required.

FIGURE 9
Decision tree flow chart for level[14] of contingency plan required



RISK MANAGEMENT

Exposure and release routes

Import regulations should be designed to ensure that all legal imports of animals and animal products carry a negligible risk of introducing a disease (i.e. they minimize the risk of exposure). Other regulations, such as a swill feeding ban and channelling of products, are aimed at minimizing the risk of exposure.

Channelling of products means that products pass from one controlled point to another

[14] Levels are: (1) none required; (2) plan is not a priority; (3) standard plan; (4) major plan

without the consignment being broken up or dispersed. These movements should be subject to audit controls. The most common example of this would be by-products channelled so that they do not enter the food chain (food or feed) (i.e. either the physical conditions during processing and/or the final product mean that the residual risk of entering the food chain, even accidentally, is negligible).

It is important to understand and accept this proactive principle of ensuring that the regulations reduce the risk of importation of exotic disease to a negligible level. In this situation, so long as regulations are complied with, all legal imports carry a negligible risk. The only time this will not be the case is if there is a new disease or an undetected outbreak of a known disease.

Some legal shipments could pose a problem if full precautions were not taken or if the disease is present but undetected in the country of origin and time of export checks. However, once import regulations are properly drawn up, the greatest risk lies in illegal imports and uncontrollable introductions, such as via wild animals and vectors.

The risks of introduction via illegal routes are several fold. The highest-risk import is a live animal that is carrying a pathogen because:

- pathogens survive and multiply in live animals;
- live animals tend to be mixed with other animals;
- the most efficient form of transmission is from one live animal to another, directly or indirectly; and
- it is important to consider the routes by which live animals could enter a country illegally.

Cattle, horses, sheep and pigs are relatively large and difficult to hide. They would be likely to enter in less well-controlled border areas and at times of the day when surveillance is less intense. Poultry are easier to smuggle, and while their individual value is much lower, substantial smuggling may occur when there is sufficient price differential between markets.

Captive wild birds and some reptiles are relatively small and can be smuggled fairly easily, either in commercial-size batches or in personal imports. They may be of high value, which creates an incentive to smuggle them.

The second-highest risk of transmission is in animal products. This is mostly a risk for diseases that infect pigs and poultry and can be transmitted via the oral route. An absolute ban on swill feeding would reduce this risk greatly but may not be practical or enforceable in all countries. There is also a small risk of contaminated swill being used by people with backyard animals. However, on the whole, the stock belonging to these individuals have little contact with commercial stock, so the risk is thought to be slight, but not negligible.

The lowest risk of introduction and exposure is by contaminated articles, such as clothing or machinery, which have been in contact with, and contaminated by, infected animals. However, it should be borne in mind that for some diseases, such as FMD, this is the most common form of spread once movement controls are in place and can be the source of significant outbreaks. It may be the lowest risk, but it is still significant.

Some diseases can be carried by wild animals (i.e. influenza in birds, classical swine fever in boars) as well as other routes. There is, therefore, a low but constant and uncontrollable

risk that these diseases can be introduced. Newcastle disease and avian influenza viruses are circulating constantly in wild birds. There exists a low risk of virus introduction via wild birds which is difficult to control, although the role of people in bridging between wild and domestic fowl should not be ignored.

Spread and establishment

This can take place only after release and exposure. The likelihood of spread and establishment depends on the epidemiology of the disease and the conditions in each country which have an impact on this (e.g. climate, presence of vectors, presence of reservoir hosts, livestock density and marketing system).

It is arguable that if a disease does not spread, it is of little importance, as it will only occur as sporadic cases. However, this depends on other factors such as public perceptions.

If a disease spreads but cannot establish, this implies that it will eventually die out of its own accord. The onset of a cold season would be one example of this, stopping insect activity for a disease which requires constant cycling of the agent between host and vector. In other cases, where the pathogen can survive within the vector for long periods, it is possible that "over-wintering" can occur and the disease later might re-emerge from the vector. Equally, hot dry seasons tend to decrease indirect transmission of pathogens because of less favourable environmental conditions.

If natural circumstances cannot be relied upon to prevent spread, a contingency plan will be required to enable rapid and efficient control. If spread is likely to be anything other than limited, a recovery plan will also be required.

RISK COMMUNICATION

This is an important part of risk analysis but is too often neglected. Communication is a two-way process of exchanging information and opinions. It is increasingly difficult for central veterinary authorities to impose decisions on stakeholders, and the range of stakeholders they have to include is growing as agricultural enterprises become more intertwined with other spheres, such as human disease, tourism and processing industries.

It is important to consult with and involve all stakeholder groups in risk analysis. The hazard identification stage has perhaps the least need for this, but the risk assessment will require wide consultation to understand all the possible risk pathways; there are often significant routes of introduction and risky practices that are difficult to discover without this. Equally, some stakeholders may need to be convinced that there is not a significant risk where they feel there is one.

Risk management cannot be achieved without risk communication. Firstly, the risks that are to be ameliorated have to be explained to those stakeholders who are part of the process; if they do not accept that there is a real risk, they will almost certainly not collaborate. The measures that are proposed to decrease the risk of introduction or to facilitate control in the event of an introduction will equally need to be discussed, explained and justified. The simple imposition of measures is not recommended and is increasingly recognized as being impossible to achieve in practice.

Annex D
GEMP checklist

PREPARE

Bodies/organizations – Have I established?

- NADEPC
- NDCC
- advisory groups
- enabling legislation

Documents/system/logistics – Do I have?

- list of priority diseases
- list of notifiable diseases
- specific legal framework
- compensation policy and finance plans
- emergency preparedness plan
- contingency plans
- strategy of vaccines supplies
- operational manuals

Activities – Have I or will I:

- determine a command structure within the veterinary services, including veterinary laboratories
- perform risk analysis and recurring updates
- establish criteria for case confirmation
- undertake recurring meetings between stakeholders
- carry out desktop and field simulation exercises
- design and implement a scanning surveillance to ensure early detection
- equip LDCCs with IT, meeting rooms, cold storage facilities, etc.
- determine the type and quantities of vaccine needed
- publish results of investigations
- conduct public awareness campaigns

PREVENT

Bodies/organizations – Have I established?

- NDCC
- an early warning system
- international border security

Documents/system/logistics – Do I have?

- import quarantine policy
- biosecurity policy including wildlife component

Activities – Have I or will I:

- implement border inspection points
- provide capacities to carry out disinfections at border inspection points
- perform intelligence-gathering of distribution, virulence or epidemiology in affected countries for priority diseases
- establish and strengthen cross-border contacts with neighbouring countries
- ensure the availability of import quarantine policy at all veterinary services, etc.
- perform training of livestock farmers and other stakeholders on proper containment methods
- conduct public awareness campaigns

DETECT

Bodies/organizations – Have I established?

- NADEPC, NDCC, LDCCs
- advisory groups, specialist diagnostic team including laboratory expertise

Documents/system/logistics – Do I have:

- biosecurity policy, including wildlife component
- field diagnostic manuals
- template for disease reporting, suspected and confirmed cases (electronic and hard version)
- SOPs for investigating suspect cases and shipment of samples (in-country and foreign shipments)
- computer-based animal information system

Activities – Have I or will I:

- perform passive and active surveillance
- report all notifiable diseases on a regular basis
- organize training sessions for animal-health officers including paraveterinarians, including the use of the animal health system
- keep regular contacts between veterinarians, paraveterinarians and livestock farmers and traders
- ensure the availability of templates for disease reporting at all veterinary services, SOPs, etc.
- develop capabilities for some key diagnostic tests (e.g. antigen and antibody detection tests)

RESPOND

Bodies/organizations – Have I established?

- NEC
- NDCC
- LDCCs
- security forces
- advisory groups
- NGOs

Documents/system/logistics – Do I have?

- contingency plan for each animal disease identified

- resource plans, including resource inventory
- operational manuals
- series of SOPs
- compensation policy, including funding details

Activities – Have I or will I:

- ensure the availability of a known stock of resources (e.g. people, materials and finance)
- ensure that the series of SOPs are covering the whole field needs for emergency disease control
- establish a working group composed of NDCC, LDCC and livestock farmers
- hold recurring meetings (at least on a weekly basis)

RECOVER

Bodies/organizations – Have I established?

- NEC
- NDCC
- LDCCs
- NGOs
- farmers groups and/or beneficiaries representatives

Documents/system/logistics – Do I have?

- restocking policy, including alternatives
- DIVA strategy

Activities – Have I or will I:

- carry out active surveillance
- prepare a declaration of freedom of disease as per OIE standards
- coordinate with beneficiaries to agree on timing and nature of compensation
- undertake psychological support for affected communities/ fragile people
- carry out an after-action review

Annex E
Planning – assessing needs

TABLE 9
Assessment plannning tool

Capability	Score 0 - 3
Legal powers	
Financial provision	
Chain of command	
Gold Command: National animal disease emergency planning committee (NADEPC) and National Emergency Committee (NEC)	
Silver Command: National Animal Disease Control Centre	
Bronze command: Local Disease Control Centres	
Expert advisors	
Competent personnel	
Equipment and facilities	
SOPs or "How to" manuals for each type of TAD emergency	
Diagnostic capability (laboratory)	
Emergency vaccination	
Emergency vaccination	
Training and/or simulation	
Surveillance and reporting	
Background disease and risk awarenes	
TOTAL:	

You may use the checklist (Table 9) as a planning tool. On a three-point scale (0-3), score your state of readiness under each heading, where the scoring basis is as follows:

- The resultant scores will give you a good indication of your readiness under that heading. You need to concentrate remedial efforts in planning on scores of 1 or lower. You may wish to focus on where you have very low scores (1 or 0).

0 – not ready 1 – poor 2 – moderate 3 – fully ready

As a planning objective, target improvements in your response capability according to specific goals for improvement, section by section. Concentrate your efforts on the lowest-scoring items, notably those you score 0 or 1, but review each section where your score is lower than 2. Distinguish between those goals over which you have direct management control, and those where you are dependent on others.

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A disease emergency is one of the most challenging situations a veterinary service can confront. Veterinary services must be well prepared to deal with such an emergency in order to achieve rapid and cost-efficient control. To do this, the veterinary services must be prepared. They must have a well developed plan and the capacity to implement the plan.

This manual sets out in a systematic way the elements required to achieve an appropriate level of preparedness for any disease emergency in animals. In particular, this manual focuses on the control of transboundary animal diseases. Some of the principles presented may also be helpful in preparing for food safety, zoonotic and even non-infectious disease emergencies.

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