Dealing with animal disease emergencies in Africa: prevention and preparedness

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Summary
Emergency preparedness planning for animal diseases is a relatively new concept that is only now being applied in Africa. Information can be drawn from numerous recent disease epidemics involving rinderpest, contagious bovine pleuropneumonia (CBPP) and Rift Valley fever. These examples clearly demonstrate the shortcomings and value of effective early warning with ensured early reaction in the control of transboundary animal disease events. In concert, the Food and Agriculture Organization (FAO), through the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES), and Organisation of African Unity/Inter-African Bureau for Animal Resources (OAU/IBAR), through the European Commission-funded Pan-African Rinderpest Campaign (PARC), have been actively promoting the concepts and application of emergency preparedness planning and should continue to do so under the proposed successor of PARC, namely: the Pan-African Programme for the Control of Epizootics (PACE). The potential partnership between the normative function of the FAO in developing and promoting emergency preparedness and the implementation of improved national and regional disease surveillance by PACE and other partners could witness the commencement of more progressive control of epidemic diseases in Africa and greater self-reliance by African countries in coping with transboundary animal disease emergencies.

Keywords

Current status of animal disease emergency preparedness

In Africa, just as elsewhere in the world, formally documented planning for animal disease emergencies is a relatively new concept and activity. Until recently, many countries met the risk of epidemics of disease by maintaining an army of veterinarians and auxiliary staff in case they were needed (which was frequently the case). Between emergencies, these teams conducted routine vaccination programmes and subsidised clinical service delivery. From the 1940s, in much of sub-Saharan Africa, the driving force was the need to combat frequent epidemics of rinderpest and contagious bovine pleuropneumonia (CBPP), with foot and mouth disease (FMD) taking precedence in southern Africa. Routine mass immunisation programmes were the prime focus of Veterinary Services. In the current economic climate, public sector Veterinary Services are no longer able to justify, and cannot afford, the expense of maintaining such a veterinary service. Alternative mechanisms must be found to meet the challenge of livestock disease epidemics.

Recent events clearly show the value of, major shortfalls of and need for, animal disease emergency planning in Africa.
The success of rinderpest control in Africa and rinderpest emergencies

The Pan-African Rinderpest Campaign (PARC) (a project funded by the European Commission and executed by the Organisation of African Unity/Inter-African Bureau for Animal Resources [OAU/IBAR]) has progressed to a point where rinderpest now persists only in relatively small foci in East Africa. Many African countries, especially those in West Africa, are now sufficiently confident that rinderpest control will progress to continental eradication in the near future now that they have embarked on the Office International des Epizooties (OIE) Pathway leading to internationally verified freedom from rinderpest. A pre-requisite for this status is to cease vaccination against rinderpest, thereby creating a susceptible cattle population in which the disease would be obvious if present. While essential to confirm rinderpest elimination, this leaves countries vulnerable to re-infection. The challenge for these countries, and the international organisations promoting the campaign, is to ensure that effective emergency preparedness replaces the former reliance on mass vaccination programmes for protection against rinderpest. This was amply demonstrated by the drought-driven events which occurred in the Masai ecosystem of Kenya and Tanzania between 1996 and 1997. In late 1996, rinderpest was confirmed in wildlife and cattle in Kenya in locations along the border with Tanzania. Acting on this information, the veterinary authorities of Tanzania, with assistance from the PARC Co-ordination Unit and the Food and Agriculture Organization (FAO), immediately conducted surveillance in northern Tanzania which confirmed the disease and defined the infected area. The FAO, United Nations Development Programme (UNDP) and PARC assisted Tanzania and Kenya with co-ordinated projects to eradicate the disease. This approach emphasised not only the value of early warning and early reaction (before the disease had spread too far south in Tanzania), but also the importance of a regional and cross-border approach to the control of transboundary diseases.

Contagious bovine pleuropneumonia emergencies – the resurgence in sub-Saharan Africa

In the late 1980s, CBPP made a dramatic resurgence in Africa after decades of progressive control, reversing a favourable situation in which the disease had largely been contained within certain extensive pastoral systems (5). Many factors combined to facilitate re-invasion of territory formerly cleared of the disease, including the following:

- the weakening of Veterinary Services through a lack of prioritisation and resourcing by governments and structural adjustment programmes which failed to adequately protect essential centralised public sector activities

- the compromising of control procedures by civil strife which resulted in the dramatic upsurges in disease in Uganda and Angola with effects being felt as far away as Zambia which was invaded from both the north and west

- the cessation of rinderpest control with bivalent rinderpest/CBPP vaccines (for many years routine rinderpest control programmes relied on mass immunisation using bivalent vaccine which gave a degree of protection against CBPP). Routine rinderpest immunisation is now contra-indicated in most of Africa where the requirement is for demonstration of freedom rather than suppression of disease. Reduction in the use of rinderpest vaccination has resulted in increased susceptibility to rinderpest, a desirable situation for demonstrating freedom from the disease, but at the same time it is thought to have resulted in a reduction in protection of cattle against CBPP and an increase in disease incidence.

On some occasions, CBPP invasions of countries, or formerly-free zones of countries, passed unnoticed for long periods until dramatic epidemics had evolved, whereas on other occasions, although introduction was recognised early, the lack of emergency preparedness mitigated against rapid containment and elimination. The CBPP invasion of Tanzania, Botswana and Zambia in the 1990s, after decades of freedom, was the result of cross-border movements of very small numbers of cattle and, thus, was amenable to rapid elimination. However, the sequelae have been very different in each country. Lack of decisive action in Tanzania allowed covert spread to establish widespread endemicity which will be difficult to reverse, despite major expenditure by national authorities and international organisations. In Botswana, invasion was recognised rapidly but decisive action was delayed by a lack of contingency planning. By the time appropriate action was taken, approximately 320,000 cattle had to be slaughtered, incurring control expenses exceeding US$400 million. In Zambia, the repeated introduction of small numbers of infected cattle from Angola has occurred in the last two years. The CBPP early warning system functioned well but the lack of contingency planning threatened to compromise early reaction. Fortunately, the FAO and the Netherlands Government were able to augment national funding for control activities and the disease incursions have so far been eliminated rapidly by stamping-out ('stamping-out' is used here in accordance with the OIE definition to mean 'elimination of infection by slaughter of infected herds') or selected slaughter of infected cattle, combined with vaccination.

African swine fever emergencies

The soft tick/warthog associated endemic of African swine fever (ASF) in East and southern Africa has been a constraint to swine production for many years. However, with the exception of Cape Verde and a Guinea Bissau-Senegal focus, the swine of West Africa have largely been free from the disease. The damage caused to the Cameroonian swine industry by the epidemic in the early 1980s, and subsequent establishment of endemicity, was not matched by events in
other countries to the west. However, this situation has changed dramatically since mid-1996 when a virginsoil epidemic in the Côte d'Ivoire heralded a succession of ASF epidemics. Stamping-out in the Côte d'Ivoire resulted in eradication by October 1996, with the loss of approximately 122,000 swine (about 30% of the national herd) from the combined effects of disease and control. A direct cost was estimated to be at least US$3.15 million (2). In 1997, similar events were repeated in Togo and Benin with ASF spread to Nigeria. By May 1998, it was estimated that over 60% of the national pig population in Benin (approximately 360,000 pigs) had died from ASF or had been slaughtered in control attempts at a cost of approximately US$6 million. In Nigeria, direct losses due to mortality from ASF were estimated at US$12.5 million between October 1997 and September 1998. The contribution of the FAO in 1997 and 1998 to control ASF emergencies in West Africa, in addition to the national expenditures quoted above, approaches US$2 million, and other organisations have also contributed considerable sums in support of restocking.

The initial spread of ASF in the Côte d'Ivoire, the spread of the disease in Benin and Togo, the spread in Nigeria from initially two to now at least nine states and the massive expenditure incurred for disease control illustrate graphically the consequences of a lack of active disease surveillance for early warning and an absence of emergency preparedness planning on the ability of the countries to detect, contain and eliminate a transboundary animal disease. This is all the more important for ASF in comparison to most other transboundary diseases because there is no alternative control option based upon immunisation with an effective vaccine.

Rift Valley fever emergencies

In East Africa, Rift Valley fever (RVF) epidemics have occurred at prolonged intervals for 70 years or more and the disease caused extensive damage in that region in late 1997 and early 1998 (1). The climatic factors which predispose the emergence of RVF from the areas in which the infection persists during inter-epidemic periods have been well documented. Epidemics always follow heavy and prolonged, often unseasonal, rainfall. Such conditions occurred in the Horn of Africa and East Africa at the end of 1997, in association with the El Niño event. A very serious epidemic resulted. In addition to the direct effects on livestock and human health, occurrence of the disease and uncertainty over its geographic extent (because of inadequate surveillance) combined to result in bans on the lucrative livestock trade on which countries in the Horn of Africa depend. At the end of 1998, another RVF epidemic is evolving, although to a lesser degree, in West Africa where a severe epidemic affected the Senegal River basin in Mauritania and Senegal in 1987. Despite the severe effects of earlier epidemics, neither region had planned for these events.

Meeting the challenge of emergency preparedness in Africa

The feasibility of using remote sensing for predicting the emergence of RVF infections was first demonstrated in Kenya (3) and Zambia in the 1980s. Retrospective analysis of remote sensing data confirmed that suitable conditions for the explosive multiplication of mosquito vectors had existed over extensive areas of Kenya, southern Somalia, south-eastern and southern Ethiopia, eastern Uganda, southern Sudan and northern Tanzania in association with the 1997/1998 epidemic. The distribution of active RVF infection and disease closely matched the high-risk areas suggested by the analysis.

Many of the events referred to above are testimony to shortcomings in national early warning of transboundary disease events and early reaction. The need for regional co-operation in disease intelligence and co-ordination of control is also clearly demonstrated.

Since the inception of the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES), the FAO, together with the Joint FAO/International Atomic Energy Agency (IAEA) Division, and OAU/IBAR have been working together to enhance emergency preparedness in Africa, especially and most urgently for rinderpest but also including other diseases such as CBPP, ASF, RVF and peste des petits ruminants. Regional workshops on emergency preparedness planning have been held in Mali (1995), Tanzania (1995), Senegal (1997), Uganda (1998) and Zimbabwe (1998). A manual on emergency preparedness planning for rinderpest has been produced by EMPRES and countries are beginning to adopt the principles. For example, through the PARC programme, Ethiopia established a position for an Emergency Preparedness Officer to develop the national emergency plan for rinderpest. The PARC has alerted all member countries to the need for emergency contingency plans to cope with an unexpected outbreak of rinderpest after vaccination has been ceased. Although few countries have prepared such plans, including several that have stopped vaccination, all administrations are now aware of the importance of contingency planning.

While it may be appropriate for projects to initiate planning for animal disease emergencies, emergency preparedness planning is not a short-term project activity but rather an essential, core and continuous activity of national Veterinary Services. As such, it needs to be incorporated fully into national programmes of Veterinary Services. Only the public sector can directly and co-ordinate this work which should be one of the key functions of national Veterinary Services. However, cost-effective implementation of emergency plans...
requires evolution of systems which combine the efforts of the public sector Veterinary Service, private veterinary practitioners and all stakeholders in the livestock production systems, including producer organisations and traders.

The PARC Co-ordination Unit is currently preparing its own regional contingency plan to respond to the rinderpest emergencies that will occur almost inevitably. After its inception in 1986, PARC established five vaccine banks in Africa containing up to 12 million doses of rinderpest vaccine that could be used in emergency responses to epidemics such as those that affected Africa in the early 1980s, and which gave rise to the creation of PARC. The progress towards rinderpest eradication under the PARC and the greater awareness of the need for disease surveillance and emergency planning has removed the need for such large reserves of vaccine. As a result, PARC plans to reduce these banks to two, one each in West and East Africa with a quarter of a million doses of vaccine in each. In addition, when the PARC commenced, the campaign was able to respond to several threatening situations with rapid emergency programmes. The importance of this ability to have funds to respond swiftly to emergencies has not diminished. With the European Union, PARC has now secured funds that should be released rapidly to combat any outbreak of rinderpest which occurs in a country that has stopped vaccination.

The FAO and OAU/IBAR have stressed the need for early warning as the essential first step in the active process of preventing or minimising an epidemic of transboundary disease. Unfortunately, many African countries have insufficient resources to develop and conduct the kind of routine, epidemiologically based, active disease surveillance that is required to provide accurate contemporary data for early warning. Recognising this, the OAU/IBAR and the European Union are proposing to follow PARC with a Pan-African Programme for the Control of Epizootics (PACE) that will provide countries with the resources they need to perform this active disease surveillance. Each country will have a national system for continuous epidemiological surveillance of the main livestock diseases, including rinderpest and CBPP. The data generated will not only provide more accurate information on the prevalence (and through further analysis, the economic impact) of diseases within a country, but also will indicate changes in the incidence and distribution of the diseases. These changes will provide the host country and neighbouring states with the early warnings that should activate emergency plans to prevent or minimise epidemics. Developing appropriate emergency plans for the different transboundary diseases will be an essential component of PACE projects.

The geographical and temporal pattern of RVF epidemics makes it difficult to advocate and justify the expense of repeated prophylactic vaccination of susceptible livestock species during the long inter-epidemic periods. A more realistic approach to resolving this dilemma is the prediction of RVF epidemics. There are clear indications that monitoring of meteorological and remote sensing data, within a geographic information system, can show when conditions are suitable for high vector multiplication are developing (4). In addition, sero-monitoring of livestock can indicate periods of increased viral activity. Prophylactic immunisation of livestock and novel forms of vector control could then conceivably be applied in time to avert the most serious consequences. The potential was demonstrated in 1997 and 1998 in Kenya where farmers with improved cattle at risk were warned of the possibility of RVF outbreaks by the Kenya Veterinary Department. Vaccination was implemented and major losses avoided. It is clearly a disease where emergency preparedness procedures can pay dividends as occurrence is almost certainly predictable from monitoring of climatic data. A sub-Saharan monitoring and early warning system could yield significant benefits in limiting the impact of not only RVF but also a number of other vector-borne diseases.

The potential partnership between the normative function of the FAO in formulating guidelines and promoting emergency preparedness, and the implementation of improved national and regional disease surveillance by PACE, could be the beginning of more progressive control of epidemic diseases in Africa. Furthermore, reliance by African countries on the emergency services provided by these and other external organisations may be reduced. The assistance of the FAO to countries in the region which experience epidemic disease emergencies initially came from EMPRES but later the Technical Co-operation Programme (TCP) offered substantial support in the form of national and regional projects. Many of these have been directly in support of PARC and co-ordinated with the PARC Co-ordination Unit and national PARC projects. An important element of these projects, in addition to emergency assistance, has been capacity building and stimulation of national emergency preparedness planning. On occasion, assistance has been provided to countries to prevent the development of disease emergencies. For example, in late 1996 and early 1997, rinderpest was confirmed in wildlife and cattle in Kenya in locations adjacent to the border with Tanzania and action was taken at an early stage in Tanzania by PARC and the FAO to pre-empt epidemic development. Similarly, the FAO was able to assist Malawi in preventing the spread of CBPP from Tanzania from 1996 onwards.

Experiences in southern Africa have also accentuated the importance of emergency preparedness. At a workshop held in 1997 and 1998 to seek solutions to the problem of CBPP spread in southern Africa, the SADC (Southern African Development Community) countries adopted a strategy for the progressive control and eventual elimination of CBPP. The disease is currently endemic in southern Angola, the neighbouring areas of northern Namibia, and large parts of Tanzania, which threaten Zambia, Botswana and Malawi. The strategy involved the vaccination of animals in endemic areas, with eventual stamping-out of residual foci, and heightened surveillance in.
areas immediately adjacent to endemic zones. Threatened countries were to draw up contingency plans to cope with possible incursions.

To date, the value of this strategy has been proven in Zambia where the presence of newly introduced disease was successfully detected on several occasions within a few days of introduction, and very soon after detection the infected foci were eliminated. Increased border surveillance for CBPP in Malawi had an additional and unexpected benefit when the strategy detected an incursion of FMD virtually upon appearance in 1998. Within Namibia, mass blanket vaccinations against CBPP using T1-44 vaccine have proved extremely effective, while intensive surveillance and the maintenance of a strict cordon sanitaire for FMD have simultaneously prevented the escape of CBPP from the infected areas. The existence of a documented contingency plan for dealing with FMD incursions has also contributed to the early detection and elimination of the disease after the occurrence of a number of outbreaks in the north of Namibia in recent years.

Several SADC countries are currently establishing, or reinforcing, national epidemiology units and surveillance systems, in accordance with a recommendation made by the SADC Directors of Veterinary Services in 1997. A regional early warning disease network has also been established.

Nevertheless, experience in the SADC region still indicates the need for further efforts to intensify open and rapid communication between countries on issues of transboundary disease. Regional information networks must be established where they do not exist, and be strengthened and improved where they do. Early reaction to disease incursions can be improved by creating emergency vaccine banks and contingency planning to set aside resources to deal more adequately with disease emergencies.

Conclusions

Although there is a need for more detailed economic analysis, it appears self-evident that preventing incursions of transboundary diseases from developing into major epidemics is far more cost-effective than meeting the costs of control once an epidemic or endemicity is established. Opportunities to obtain the relevant data for economic analysis need to be seized by national veterinary authorities when they arise. The recent dramatically expensive events in Botswana were largely due to the costs of compensation after slaughter. A comparison of the recent eradication of CBPP in Botswana by stamping-out, with what could have resulted from the implementation of stamping-out immediately after introduction, and with what could have resulted from the same sort of strategy as that adopted in Tanzania, could provide convincing arguments for emergency preparedness. It is perhaps relevant to note that countries, such as Botswana and Zambia, which have been able to employ stamping-out in response to incursions of CBPP, have been successful in control, although this involved dramatic expense in the case of Botswana, which would have been impossible to contemplate in most other African countries at present. Had emergency preparedness been fully functional in Botswana, there is no doubt that the cost of stamping-out would have been significantly reduced, as considerable delays were experienced prior to the implementation of stamping-out. Stamping-out is usually considered to be too expensive an option in developing countries, including those in Africa, but arguably investment in national and regional emergency preparedness could increase early warning of dangerous disease events to a point where rapid reaction with stamping-out becomes a cost-effective option.

There is no doubt that the very significant contribution of livestock to food security and the generation of rural income will increasingly be linked to realistic appraisals by trading partners of the animal health status of a country. Ensured emergency preparedness at zonal, national and regional levels to meet and reverse disease incursions, followed by assurance of elimination, must increasingly be a key activity of Veterinary Services if they are to contribute effectively.

It is axiomatic that the progressive control of epidemic diseases demands effective emergency preparedness procedures to safeguard the gains made. A start has been made in Africa to apply emergency preparedness planning to livestock disease control. Both the FAO and PACE will continue this process and emphasise its importance as, it is hoped, will national Veterinary Services and other regional, internationally supported, transboundary animal disease control initiatives, in SADC for example.
Urgencias zoosanitaires en Afrique : prévention et préparation


Resumen
La planificación de la preparación de urgencias zoosanitarias es un concepto relativamente nuevo que comienza sólo a ser aplicado en África. Las epidemias de peste bovina, de perineumonía contagiosa bovina y de fiebre de la Vallée du Rift recientemente survenidas en África permiten hacer el punto sobre la situación en el continente; estos ejemplos han bien revelado el interés, pero también las deficiencias, de un sistema de alerta inmediata que permita una reacción rápida en la lucha contra malas enfermedades transfronterizas. La Organización de las Naciones Unidas para la Agricultura y la Alimentación, a través del Sistema de Prevención de Emergencias contra la Transmisión Transfronteriza de Plagas y Enfermedades Animales y Vegetales (Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases: EMPRES), junto con la Oficina Interfrancesa para los Recursos Animales/ Organización para la Unidad Africana, a través de la Campaña Panaficana de la Peste Bovina (Pan-African Rinderpest Campaign: PARC) con la Comisión Europea, han conjugado sus esfuerzos para promover la idea de la preparación planificada de urgencias y expandir sus aplicaciones. Esta acción debería continuar en el marco del Programa Panfrances para el Control de Épizootias (Pan-African Programme for the Control of Epizootics: PACE) que se espera que pronto reemplace al PARC. La colaboración entre las instancias reguladoras de la FAO que desarrollan y apoyan la preparación de emergencias y los programas mejorados de vigilancia nacional y regional de enfermedades animales llevados a cabo por el PACE y otras organizaciones interesadas debería permitir un mejor control de las epidemias en África y permitir a los países del continente abordar de manera autónoma las urgencias de enfermedades animales transfronterizas.

Mots-clés
África - Fiebre de la Vallée del Rift - Gestion des urgences - Maladies animales - Péripneumonie contagieuse bovine - Peste bovine - Peste porcine africaine - Préparation aux urgences.

Emergencias zoosanitarias en África: prevención y preparación


Resumen
La planificación de la preparación de emergencias zoosanitarias es un concepto relativamente nuevo que apenas ahora está empezando a ser aplicado en África. Las recientes epidemias de peste bovina, de perineumonía contagiosa bovina y de fiebre del Valle del Rift permiten aclarar la situación al respecto en el continente, y destacar las falencias y la importancia de la alerta precoz seguida de una rápida respuesta ante eventos ligados a enfermedades transfronterizas. La Organización de las Naciones Unidas para la Agricultura y la Alimentación, a través del Sistema de Prevención de Emergencias contra la Transmisión Transfronteriza de Plagas y Enfermedades Animales y Vegetales (Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases: EMPRES), junto con la Oficina Interfrancesa para los Recursos Animales/ Organización para la Unidad Africana, a través de la Campaña Panaficana contra
la Peste Bovina (Pan-African Rinderpest Campaign: PARC) subvencionada por la Comisión Europea, obran de concierto para promover y hacer aplicar los planes de preparación de emergencias y seguirán haciéndolo en el marco del Programa Pan Africano de Control de Epizootias (Pan-African Programme for the Control of Epizootics: PACE) destinado a reemplazar al PARC. La colaboración potencial entre el trabajo normativo realizado por la FAO respecto al desarrollo y fomento de la preparación, y el perfeccionamiento de los programas nacionales y regionales de vigilancia de enfermedades por parte del PACE, debería contribuir a mejorar el control de epizootias en África e incrementar la capacidad de los países individuales para afrontar por sí mismos las emergencias ligadas a enfermedades animales transfronterizas.

**Palabras clave**

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**References**


