Disease prevention and preparedness: the Food and Agriculture Organization Emergency Prevention System

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Summary
In 1994, the Food and Agriculture Organization undertook to revitalise its activities in the control of transboundary animal disease by establishing a new special programme known as the Emergency Prevention System (EMPRES) against transboundary animal and plant pests and diseases. The emphasis of the EMPRES livestock component is placed on pre-empting outbreaks and losses experienced by agriculture through the enhancement of local capacity to detect and react rapidly to plague events. EMPRES concentrates on the co-ordination of the Global Rinderpest Eradication Programme – a time-bound eradication programme – whilst addressing the progressive control of the most serious epidemic diseases within a broad framework of emergency preparedness. Programme activities are discussed in relation to early warning, early reaction, facilitating research and co-ordination. In addition to rinderpest, particular attention has been paid to contagious bovine pleuropneumonia, a re-emerging disease in Africa targeted for strategic attention, and foot and mouth disease, for which co-ordinated regional control in Latin America and South-East Asia has been initiated. Tactical responses to other disease emergencies such as African swine fever, classical swine fever (hog cholera), Rift Valley fever, peste des petits ruminants and lumpy skin disease are described.

Keywords

Introduction
The major diseases of farm livestock have been a focus of Food and Agriculture Organization (FAO) involvement in agricultural production for many years. In January 1994, the newly appointed Director-General of the FAO decided that the time had come for the organisation to revitalise its activities in this field, to focus more specifically on championing the goal of enhanced world food security through emergency preparedness for transboundary animal diseases and plant pests, outbreaks of which can result in food shortages, destabilise markets and trigger trade barriers. The emphasis was to be on pre-empting the outbreaks and losses experienced by enhancing local capacity to detect and react rapidly to plague events. Accordingly, the Director-General sought and obtained the mandate of the Governing Council and Conference to establish a new Special Programme to address these fundamental issues. This became the Emergency Prevention System (EMPRES) against transboundary animal and plant pests and diseases. EMPRES is a programme with two components, as follows: the plant pest component focuses on the desert locust while the animal diseases component is driven by co-ordination of the Global Rinderpest Eradication Programme (GREP) whilst addressing the progressive control of a number of the most serious major epidemic diseases within a broad generic framework of emergency preparedness.
For the EMPRES livestock component (referred to here as EMPRES for simplicity), the FAO has established a management unit within its Animal Health Service – the Infectious Diseases/EMPRES Group – to be responsible for the implementation of the programme including liaison with the Joint FAO/International Atomic Energy Agency (IAEA) Division of Nuclear Techniques in Food and Agriculture, based in Vienna, for some of the functions sub-allocated there.

The EMPRES Programme has evolved, aided by a series of Technical and Expert Consultations held in Rome to obtain guidance from leading experts in the control of transboundary diseases. Consultations convened in July 1996 (4, 6), advised EMPRES on strategies and actions needed to achieve and verify global rinderpest eradication by 2010, and strategies, actions and goals to bring under substantial control other high priority animal diseases through the implementation of the EMPRES Global Early Warning and Early Reaction Systems. The Expert Consultations affirmed that transboundary animal diseases have serious economic and international trade consequences. Additionally, they stressed that these diseases pose a serious threat to world food security by virtue of their capacity to spread very rapidly in plague proportions and cause critical shortfalls in the production of milk, meat and other foodstuffs produced with livestock draught power. They therefore recommended to bring to the attention of the World Food Summit the importance for food security of minimising the impact of transboundary livestock diseases, through enhanced emergency preparedness together with well co-ordinated national, regional and global control and eradication programmes, emphasising the critical importance of the GREP. It was also recommended that the EMPRES vision should be ‘to promote the effective containment and control of the most serious epidemic livestock diseases as well as newly-emerging diseases by progressive elimination on a regional and global basis through international co-operation involving early warning, early/rapid reaction, enabling research and co-ordination’.

The strategy for developing national emergency prevention systems was developed further at an Expert Consultation convened in 1997 (7).

Focusing the Emergency Prevention System drive

The core thrust of EMPRES can be viewed as having the following four components:

- **Early warning** refers to the ability to detect rapidly the introduction, or sudden increase in the incidence, of any disease of livestock which has the potential of developing to epidemic proportions. Early warning embraces all disease initiatives, which would be based predominantly on epidemiological surveillance, that would lead to improved awareness and knowledge of the distribution of disease or infection and that might permit forecasting further evolution of an outbreak.

- **Early reaction** is to carry out, without delay, all the control actions necessary for rapid and effective containment of an outbreak leading to the elimination of disease in the shortest possible time-frame, or at least return to the former favourable status quo (and provide evidence that this has been achieved). This includes contingency planning.

- **Co-ordination** is viewed as either co-ordination of global eradication of an identified animal disease, such as rinderpest, or encouraging regional initiatives for the progressive control and eventual eradication of a given transboundary disease.

- **Enabling research** emphasises the collaboration between the FAO and scientific centres of excellence in directing research efforts towards problem solving. The Institute for Animal Health, Pirbright Laboratory in the United Kingdom (UK) has been appointed world reference laboratory (WRL) for rinderpest and foot and mouth disease, and EMPRES is currently strengthening a network of reference and collaborating centres.

Transboundary livestock diseases

Transboundary livestock diseases are ‘those that are of significant economic, trade and/or food security importance for a considerable number of countries; which can easily spread to other countries and reach epidemic proportions; and where control/management, including exclusion, requires co-operation between several countries’. For the purposes of EMPRES, diseases of prime importance have been grouped into:

- **Epidemic diseases of strategic importance**, namely rinderpest, foot and mouth disease and contagious bovine pleuropneumonia

- **Diseases requiring tactical attention** at the international/regional level, e.g. Rift Valley fever, peste des petits ruminants, Newcastle disease, African swine fever and classical swine fever (hog cholera)

- **Emerging or re-emerging diseases** such as bovine spongiform encephalopathy and porcine reproductive and respiratory syndrome.

There is of course considerable overlap and interdependence between these elements; for example, there can be no effective early reaction without early warning and ensuring early warning capability is an essential element of early reaction through contingency planning. Nevertheless this classification has value in focusing and presenting programme activities.
The Emergency Prevention System in support of the Global Rinderpest Eradication Programme

The GREP is accorded priority attention in EMPRES in the light of the fact that rinderpest is the most devastating cattle plague ever known, that a time-bound eradication programme is economically more cost-effective than protracted control based on vaccination and that global eradication is a feasible objective (2).

Rinderpest eradication in Africa has been addressed since 1986 by the Inter-African Bureau of Animal Resources (IBAR) of the Organisation of African Unity (OAU), with funding from the European Commission (EC), through national projects under a co-ordinated Pan-African Rinderpest Campaign (PARC). Regrettably, since the end of the West Asia Rinderpest Eradication Campaign in 1994, funded by the United Nations Development Programme (UNDP), there has been no co-ordinated regional programme of rinderpest eradication in Asia, although the EC has assisted with the funding of campaigns at a national level in a number of South Asian countries. This has scored a major success with the apparent eradication of rinderpest from India. The ultimate success of GREP will depend on the initiation of regional projects for the Arabian Peninsula, West Asia and South Asia, and these are required urgently.

Co-ordination of the Global Rinderpest Eradication Programme

In any major international disease control effort, the need to have a central clearing house for information, to generate guidelines and standards for control procedures and to monitor progress, is self-evident. The EMPRES GREP Secretariat has assumed this role. The aim is to develop systems of co-ordination of rinderpest control programmes concurrently with regional organisations and national Veterinary Services with the subsidiary objective of using the experience gained in facilitating GREP co-ordination as a normative function in developing co-ordination routines for animal disease eradication in general. EMPRES works closely with regional and national organisations, international organisations, non-governmental organisations and funding agencies to facilitate progress.

The proceedings of the series of Expert Consultations, convened to fulfil its mandate for GREP co-ordination, were published to broadcast the findings. The first of these, entitled The world without rinderpest, established a base-line of understanding on disease status, epidemiology, diagnostic methodology and control procedures, to provide a firm foundation of standards for international action (6). The second, Prevention and control of transboundary animal diseases, drew up a ‘blueprint’ for the progressive control of rinderpest on a country-by-country basis until verified global eradication by 2010 (4). This is being used to monitor progress and guide countries in the actions required to proceed in a timely manner along the Pathway of the Office International des Epizooties (OIE) to internationally-recognised freedom from rinderpest infection (10, 14). Progress was reviewed in the third publication, Developing national emergency prevention systems for transboundary animal diseases (7).

The unpalatable but most probable conclusion from the 1996/1997 Kenya wildlife rinderpest outbreaks – that an undetected cryptic endemic focus had existed for over thirty years – demonstrated the ineffectiveness of untargeted vaccinations in the absence of clear delineation of the endemic focus. EMPRES therefore elaborated a focused strategy, synchronised between countries, which involved careful preliminary surveillance to define the endemic focus followed by ‘immunosterilisation’ of the areas affected by the persistence of African lineage 2 rinderpest virus (see below) and epidemic extensions from that lineage. The proposed programme also included an assault on the African lineage 1 rinderpest virus persisting in southern Sudan and contiguous areas, followed by a final phase of careful surveillance to ensure that elimination of the disease had been achieved. PARC has assimilated the strategy and as a result Tanzania has declared provisional freedom from rinderpest for the northern zone of the country; Kenya should soon be able to follow suit for the southern zone of the country.

The truly international and trans-regional involvement of EMPRES enables experience gained from frequent and close contact with countries and organisations which are directly involved in rinderpest control programmes and which have assisted with rinderpest emergencies, to be fed back into refining control strategies. One example is the fielding of Community Animal Health Workers using a thermostable version of the rinderpest vaccine to solve the problem of rinderpest in the relatively inaccessible areas of Africa (12). EMPRES collaborates with PARC and the Office for Foreign Disasters of the United States Agency for International Development (USAID), accessing experience gained from the Operation Lifeline Sudan project operated by the United Nations Children’s Fund (UNICEF), EC-funded PARC projects such as that in Ethiopia and UNDP-funded work in Afghanistan.

Early warning in support of the Global Rinderpest Eradication Programme

At the inception of EMPRES, there was no authoritative knowledge of global rinderpest distribution and country notifications did not accurately reflect the true status of the disease. This was largely due to the absence of early warning and disease surveillance capabilities or under-reporting from
predict possible transboundary spread to Tanzania in 1997. 

Since 1994, EMPRES has devoted considerable and sustained effort to strengthening national and regional capability to undertake disease surveillance and emergency preparedness through regional workshops such as those held in Velingrad, Bulgaria (1995); Bamako, Mali (1995); Hanoi, Vietnam (1997); Dakar, Senegal (1997); and Kampala, Uganda (1998). These workshops were organised in conjunction with regional bodies such as the OAU/IBAR, PARC, the OIE and the Animal Production and Health Commission for Asia and the Pacific (APHCA), in close collaboration with the FAO/IAEA Joint Division.

EMPRES also works closely with the Joint FAO/IAEA Division in conducting workshops in support of IAEA regional technical projects which aim to strengthen disease surveillance for rinderpest. Another outcome of collaboration with the Joint Division is the production of guidelines to reinforce disease surveillance through the use of performance indicators; these standard operating procedures will complement the earlier GREP surveillance guidelines (9) allowing countries to monitor and demonstrate their performance. A multimedia computer module was developed by the Advanced Veterinary Information System (AVIS) consortium which comprises the FAO, OIE and the Institute for Animal Health, in conjunction with a commercial company, the Telos Group. The module encapsulates the most current information on recognition, epidemiology, diagnosis and control of rinderpest for use as a reference and in training animal health staff.

In an effort to improve understanding of the global rinderpest situation and to ensure the establishment of early warning systems, EMPRES has fielded missions by staff and consultants to every region where rinderpest has been known, as well as to areas of risk or uncertainty. Deficiencies in early warning capacity were clearly evident in many key countries as illustrated by the rinderpest situation in Pakistan, Kenya and Uganda, for example. Although rinderpest was confirmed in Pakistan in 1984 (1), it was not until 1994 that EMPRES was able to convince the authorities of Pakistan to acknowledge officially that rinderpest was clinically and virologically recognisable in the country. The rinderpest outbreak in the Tsavo National Park, Kenya, in 1994, and later in the Nairobi National Park in 1996, apparently unconnected to other rinderpest incidents in the region, further illustrated the importance of early warning. EMPRES investigative missions were able to highlight the suspected cryptic persistence of rinderpest in Somali herds in 1996 and predict possible transboundary spread to Tanzania in 1997.

With the co-operation of the Kenyan authorities and PARC, it was possible to alert the Tanzanian authorities to combat the incursion and focus activities in Kenya. Lack of early warning was also partly responsible for the inability of Uganda to locate the origin of the rinderpest incidences in the country until an EMPRES mission in 1994 identified an endemic focus in east Uganda and rinderpest endemic stability sustained by the Karamajong pastoralists.

An important aspect of early warning has been the use of molecular techniques in the analysis of rinderpest strains from all over the world. EMPRES continued support for this work through the FAO WRL for rinderpest at the Institute for Animal Health, Pirbright Laboratory, which has generated invaluable data, the analysis of which is giving precise direction to surveillance and eradication programmes in the field. As a result of the monitoring of global rinderpest, combined with diagnostic confirmation and virus molecular characterisation, informed statements can now be made concerning the true distribution of rinderpest, areas of endemic persistence can be identified and the risk of epidemic extensions can be assessed (Fig. 1). EMPRES continues to monitor the global rinderpest situation through formal and informal communications which complement the OIE animal health information database.

Establishing the WRL for rinderpest has paid dividends which translate into practical assistance with the management of rinderpest outbreaks. Molecular characterisation of rinderpest viruses has demonstrated clearly the existence of distinct rinderpest virus phylogenetic lineages – African lineages 1 and 2, currently restricted to East Africa, and a more widely distributed Asian lineage extending from South Asia to the Near East and Arabian Peninsula (8) (Fig. 2). Although the 1994 Tsavo National Park outbreak was initially thought to have originated from southern Sudan (the African lineage 1 focus), molecular characterisation of the virus responsible showed that it belonged to the old African lineage 2 which most probably had survived in the region for over thirty years without being detected (11). The fact that the Tsavo outbreak initially was wrongly attributed to virus breakout from southern Sudan, and was finally attributed to a putative cryptic endemic focus, confirmed that early warning based on a sound surveillance system is of paramount importance to GREP.

Rinderpest has not been reported from Central and West Africa since 1988 but at least two long-established endemic foci are known to be present in East Africa, affecting Sudan, Kenya, Uganda, Somalia and Ethiopia, and another covers much of Pakistan, extending into Afghanistan. Rinderpest was last reported from southern Sudan in March 1998 from which African lineage 1 virus was isolated, while in April 1998 there was indirect evidence of suspected rinderpest in southern Somalia.
Rinderpest persistence in southern Pakistan poses a serious threat of re-invasion to countries which have recently eradicated the disease or have been free for many years. That threat was graphically illustrated by the virgin soil epidemic which affected the northern areas in 1995 (15). The threat of further spread prompted the authorities of the People's Republic of China to vaccinate border populations for the first time in many decades. The most obvious focus of rinderpest in Pakistan involves the intensive buffalo and cattle dairy colonies which supply milk to Karachi. However, little is known of the determinants of disease maintenance elsewhere in the country. The relatively recent invasion of rinderpest into Afghanistan from Pakistan seems to be under control but the risk of reintroduction and transmission to central Asia and more distant countries will persist as long as the Pakistan focus is allowed to exist.

The situation in Yemen and Saudi Arabia is uncertain but given the inadequacy of rinderpest surveillance and apparently sporadic case detection in recent years, persisting endemic infection, however localised, is suspected. The continuing uncertainty about the rinderpest status of the 'Kurdish Triangle' involving Iran, Iraq and Turkey is a major constraint to the adoption of the OIE Pathway for many countries in the area. Rinderpest was last reported and confirmed in Iraq in 1994 and Turkey in 1996. Notwithstanding the uncertainty and perceived threat, Iran, Iraq, Syria and Turkey could well be in a position to stop vaccination completely, or in all but limited zones of their countries, and declare provisional freedom from rinderpest.

**Early reaction in support of the Global Rinderpest Eradication Programme**

Staff of EMPRES establish and maintain close contact with national authorities and relevant regional organisations from the earliest stages of rinderpest emergencies to assist in containment and elimination; indeed they may take the initiative to advise countries that action is needed. The first response through EMPRES in rinderpest emergencies usually involves the following:

- the immediate fielding of experts (diagnosticians and surveillance experts) to assist with an analysis of the gravity of the situation and requirements for control and the organisation of the first lines of defence
- developing plans for subsequent action

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Fig. 1
Zones of the world affected by the different lineages of rinderpest virus between 1994 and 1998
EMPRES has the flexibility to react rapidly in a catalytic role but one of the major assets of the FAO, in addition to the close relationship with member countries, is its Technical Co-operation Programme (TCP). In emergencies, the TCP is capable of rapidly mobilising the resources of the FAO or those of donors, with technical guidance from EMPRES, and implementing projects through its Office for Special Relief Operations. This has proved extremely valuable in Pakistan, Afghanistan, Sri Lanka, Turkey, Iran, Iraq, Rwanda, Tanzania, Uganda and Kenya.

EMPRES has played a leading role in the development of national and regional early reaction capacities through workshops on concepts of emergency preparedness and contingency planning in collaboration with the OAU/IBAR, IAEA, OIE and the European Commission for the Control of FMD, as well as through technical/training manuals on rinderpest. The FAO has published the second edition of the Manual on the Diagnosis of Rinderpest (3) and is finalising a Rinderpest Emergency Preparedness Manual for Africa while a generic Animal Disease Emergency Preparedness Plan with a rinderpest-specific module is in the pipeline. It is hoped that individual countries will then be able to prepare their own plans using the guidelines, adapting these as required to reflect their peculiar situations and needs. Another paper in this publication by Mukhopadhyay et al., contains other details of EMPRES early reaction activities in support of GREP (13).

**Fig. 2**

Phylogeny of Asian and African strains of rinderpest virus based on sequence data derived from the fusion protein gene

(Data provided by Dr T. Barrett, Institute for Animal Health, Pirbright Laboratory, United Kingdom)
EMPRES stimulates and supports research into the natural history of rinderpest, improved epidemiological understanding, diagnostics and vaccines.

The Emergency Prevention System and other major transboundary animal diseases

While rinderpest is given prominence by EMPRES, there is a heavy demand for assistance with the control of other major diseases which afflict livestock, and thereby food production, in the developing world.

EMPRES generic emergency preparedness training encompasses a range of diseases and is increasingly supported by publications and electronic communications. A generic Animal Disease Emergency Preparedness Plan is being developed progressively with modules addressing each of the major diseases. This will be produced not only in hard copy but also as a multimedia computer programme through the AVIS consortium, complementing a range of publications – paper, video and computer – which include rinderpest, peste des petits ruminants (PPR), foot and mouth disease (FMD), contagious bovine pleuropneumonia (CBPP) (with the Centre for International Co-operation in Agronomic Research for Development [CIRAD-EMVT] in France), lumpy skin disease, African swine fever (ASF), bovine spongiform encephalopathy and poultry diseases, including Newcastle disease.

The activities of EMPRES in the area of dissemination of information on early warning include development of the concept of global early warning systems through the on-going construction of a Transboundary Animal Diseases Information (TADInfo) system. This is a specialised disease data capture and analysis software with hierarchical modules designed to operate at the national, regional and then global levels in a geographic information system (GIS) environment. A new avenue for the dissemination of early warning information at the local level was established through the introduction of a bi-monthly publication commencing in May 1997, the EMPRES Transboundary Animal Disease Bulletin, which contains up-to-date situation reports on major transboundary diseases, relevant early warning signals to countries at risk, results, appropriate deductions and interpretations from the results which would give added value and effect to early warning efforts.

The FAO has a notable record in successfully intervening against transboundary livestock diseases through the provision of technical expertise and logistical support to countries threatened by, or actively combating, disease emergencies. The EMPRES programme itself has only limited funding to provide assistance in emergencies but these are targeted as described for rinderpest early reaction, primarily for immediate assistance with analysis, planning and resources needed immediately. This initial response is frequently complemented by support from the TCP and, wherever possible, trust fund projects using donor funds. As outlined for rinderpest emergencies, when asked for financial assistance to combat an emergency situation, the response of the FAO is facilitated through its TCP and its Office for Special Relief Operations. The rapid response capability of the TCP mechanism has been invaluable in bridging the gap between initial EMPRES emergency assistance and the generally slower mobilisation of resources by major donors. If these interventions are insufficient, the FAO may launch an appeal for international donor assistance and might be requested to co-ordinate the resultant supporting actions. In the past this has led to the development of a specific FAO unit for an eradication programme, e.g. New World screwworm in North Africa (multi-donor 1990-1992) and FMD in the Philippines (Australia 1996 to date). Trust fund arrangements such as the European Commission for the Control of FMD can also be accommodated.

The scope of EMPRES activities in the developing world can be illustrated by examples of specific diseases.

Contagious bovine pleuropneumonia

The second strategic area of EMPRES activities has been devoted to CBPP in Africa. The disease has been endemic within the pastoral cattle herds of sub-Saharan Africa for many years and control was a key subject of attention for Veterinary Services this century. Recrudescence of CBPP is now being experienced in all regions of sub-Saharan Africa.

East and Central Africa were severely affected during the 1980s and 1990s, decades which have seen the progressive re-invasion, aided by civil strife and the breakdown of veterinary infrastructures, of many areas formerly freed from the disease. In southern Africa, for similar reasons, the endemic area in Angola, extending into northern Namibia, has been the source of spread to neighbouring countries on several occasions. An introduction of CBPP into Botswana in 1994 was successfully eliminated, although at major expense, but endemicity has resulted in many other foci of extension.

Since the inception of internationally co-ordinated rinderpest control programmes in the 1960s, the routine use of bivalent (rinderpest/CBPP) vaccine in mass immunisation campaigns may have suppressed, but not eliminated, the incidence of clinical CBPP even where the disease was not itself a specific target for control by other means. Cessation of this vaccination as countries were cleared of rinderpest may be one of the factors responsible for a dramatic increase in incidence and range of infection which has been a feature of the last decade. This certainly seems to be the case in West Africa where there has been a dramatic upsurge in incidence in many countries.
The insidious nature and chronic course of CBPP make early warning capacity a very important pre-requisite for successful containment and control. The EMPRES contribution to control efforts has included strengthening of national early warning capacity through regional workshops held in Arusha, Tanzania (1996), Bingerville, Côte d'Ivoire and Nouakchott, Mauritania (1998), streamlining of disease reporting systems including data capture, and improvement of laboratory diagnosis and disease surveillance. Direct practical assistance was provided for the control of CBPP emergencies by EMPRES and by regional and national TCP projects to Botswana, Burundi, the Democratic Republic of the Congo (formerly Zaire), Malawi, Mauritania, Rwanda, Tanzania, Uganda and Zambia, for the prevention of transboundary spread. EMPRES contributed to the design of surveillance and control strategy by raising awareness, providing technical expertise, upgrading laboratory diagnostic facilities and organising border harmonisation meetings for the mutual benefit of neighbouring countries.

The FAO has identified the CIRAD-EMVT in Montpellier, France, as the WRL for CBPP, sponsors research into CBPP vaccines and the effectiveness of antibiotic therapy for treatment in control, and is contributing to optimisation of the competitive enzyme-linked immunosorbent assay (ELISA) for CBPP surveillance (with the Joint FAO/IAEA Division). In addition to collaboration with other experts in preparation of the OIE Pathway for verification of CBPP freedom, EMPRES has published the Standard Operating Procedures for CBPP vaccine production and quality control (5), a manual on recognising CBPP, and an AVIS module is in preparation (with the CIRAD-EMVT). The CBPP Expert Panel was reconvened in Rome in October 1998 as a technical forum for discussion.

Foot and mouth disease

Foot and mouth disease exerts its greatest impact on international trade in livestock and animal products and has most dramatic effects on the productivity of the more productive breeds, raised in intensive farming systems. The disease is not generally fatal, yet causes dramatic reductions in milk production and animal growth. In developing countries where draught power is of vital importance for cultivation, FMD has a serious impact on crop production, especially rice, and therefore the impact of the disease on food security extends beyond the direct effect on animal protein supply.

At present, there is no prospect of FMD elimination on a global scale; unfortunately, organised FMD control is still considered to be too expensive for the low income food deficit countries, even though it has been demonstrated for such countries that organised FMD control makes economic sense, resulting in substantial consequential benefits for livestock development and community development in general. Furthermore, it should be stressed that the presence of uncontrolled FMD in such countries will continue to deny them access to the otherwise liberal livestock markets within the context of the World Trade Organization, thus exacerbating the vicious circle of poverty and environment degradation.

EMPRES has collaborated with the Pan American Health Organization (PAHO) and the OIE in evolving global strategies for the control of FMD on a regional basis. There are regional programmes for progressive control with the prospect of eventual elimination. The Americas Hemispheric Plan for FMD eradication from South America by 2009, is progressing on schedule with Chile and Uruguay having attained a status of freedom without vaccination and Argentina, Paraguay and southern Brazil enjoying extended periods without any recorded incidence of the disease. One significant undertaking was the PAHO/OIE/FAO International Conference on the Perspectives of Eradication of Foot and Mouth Disease in the Next Millennium and its Impact on Food Security and Trade: Focus on the Americas, held at ministerial level and convened in Brasilia in July 1996. A nascent programme is gathering momentum in South-East Asia under OIE co-ordination, based in Bangkok with financial support from Thailand, Switzerland, Japan and Australia.

In support partly of these initiatives, with TCP assistance under national and regional projects, EMPRES has fielded technical assessment missions to Bolivia, Cambodia, Laos, Vietnam, the Philippines, Kenya and Uganda, to assist in defining FMD control strategies for these countries. In the Philippines, a trust fund project is being implemented with the financial support of Australia. In partnership with the European Union (EU) and the OIE, EMPRES continues to support the WRL for FMD in Pirbright; this has led to a better understanding of global FMD epidemiology in general and has enabled the monitoring of the evolution and spread of a pig-adapted type O strain in South-East and East Asia, as well as providing early warning of new type A viruses in the Near East and West Africa.

African swine fever and classical swine fever (hog cholera)

The prime focus of ASF distribution is southern and East Africa where the virus is maintained in an endemic cycle involving soft ticks (Ornithodoros moubata) and wild Suidae (warthogs and bushpigs). However, a direct pig-to-pig transmission is also of major importance, even within the traditional endemic area, but perhaps most significantly in areas which lack soft ticks to act as vectors. Events in the last forty years amply demonstrate the propensity of the virus for international and intercontinental spread in meat products. Latin America, the Caribbean and even Europe-hâve suffered serious incursions. However, it is still within Africa that the disease—has the most devastating effects. In addition to exacerbations of endemicity in southern and East Africa, the West African countries, many until recently free, have been
seriously affected by multiple epidemics since 1996 with consequential transboundary spread. The direct effects on production have been devastating but the disease has also compromised swine husbandry development, considered to be essential now and for the future for enhancing food security.

EMPRES and the TCP have responded with assistance to the countries directly affected, specifically in Côte d’Ivoire, Benin, Togo, Nigeria and Cape Verde, within a regional support framework for West Africa, and to Mozambique and Kenya. Two regional workshops on disease recognition, diagnosis, control strategies and concepts of emergency preparedness with respect to ASF were conducted in West Africa.

Limited support has been provided (in collaboration with the FAO Animal Genetic Resources Unit) to an initiative by the Onderstepoort Institute for Exotic Diseases in South Africa to explore the genetic basis of reported ASF resistance in swine. Such resistant swine could potentially make a major impact on village pig rearing in endemic areas.

Classical swine fever is endemic throughout South-East and East Asia causing a constant attrition of swine production. The disease received little attention there or in Latin America and the Caribbean until recently. Outbreaks in Haiti, which soon spread across the border to the Dominican Republic and Costa Rica, with the attendant risk of spread within the Caribbean, Latin America and the United States of America, have served to highlight the importance of this re-emerging disease. EMPRES mounted an immediate mission to Haiti and this was followed-up with TCP assistance.

Rift Valley fever and other vector-borne virus diseases

Rift Valley fever (RVF), a significant zoonosis transmitted by mosquitoes, was recognised first in the Rift Valley of Kenya at the turn of this century and in southern Africa in 1950. Most epidemics have occurred in southern Africa and within the Greater Horn of Africa at prolonged intervals of five to fifteen years or more over at least seventy years. Until 1977, the furthest north that the disease was known to have occurred was the Sudan. During 1977 and 1978, a major epidemic occurred in the Nile delta and valley in Egypt. A severe epidemic affected the Senegal River basin in Mauritania and Senegal in 1987 and again in Egypt in 1993. A most dramatic epidemic occurred recently in the Greater Horn of Africa extending to northern Tanzania. Heavy and unseasonal rainfall at the end of 1997 and in early 1998 in East Africa, attributed to an El Niño event, provided ideal conditions for the breeding of insect vectors of animal and human diseases and, as a result, a disastrous epidemic of RVF and other diseases affected livestock and humans across at least southern Somalia, Kenya and northern Tanzania. The complex of diseases which occurred included other vector-borne diseases, most notably bluetongue in exotic sheep in Kenya and Nairobi sheep disease in northern Tanzania. This was arguably the largest and most extensive epidemic of RVF ever experienced, raising fears that global climatic change could presage an increase in frequency of epidemics and even an extension outside the African continent. Fear of the disease led to a justifiable trade ban imposed by Saudi Arabia on livestock from the affected countries. This had a severe economic impact on economies of countries of the Horn which are heavily dependent on livestock exports.

The fact that epidemics of RVF occur at long, irregular intervals lasting many years and that outbreaks tend to occur simultaneously across an extensive area makes it difficult to advocate, and justify the expense of, repeated prophylactic vaccination of susceptible livestock species during the long inter-epidemic periods. A promising approach to resolving this dilemma is the prediction of RVF epidemics. Monitoring of meteorological and remote sensing data, *inter alia,* Cold Cloud Duration (a measure of rainfall) and Normalised Difference Vegetation Indices (a measure of vegetation density/soil moisture), within a GIS can indicate when conditions suitable for high vector multiplication are developing. In addition, zero-monitoring of livestock can indicate periods of increased viral activity. Prophylactic immunisation of livestock, combined with vector control, could then conceivably be applied in time to avert the most serious consequences.

The response of EMPRES to this most recent epidemic of RVF, assisted by an advance release of TCP funds, was immediate and sustained, working with the World Health Organization (WHO) to analyse the determinants of the disease occurrence and to propose action. The value of remote sensing data, within a GIS environment, in predicting RVF occurrence was amply demonstrated by EMPRES at the time of the epidemic. Action proposed by EMPRES to strengthen emergency preparedness for, and control of, flood-related diseases in the Greater Horn is being implemented through TCP projects in Kenya and Uganda under the umbrella of a regional TCP project. It has been possible to incorporate further field missions to Somalia, Ethiopia and Kenya to undertake a risk assessment for RVF for future trade with the Arabian Peninsula from the affected region. A preliminary assessment indicates that RVF activity in the region has now subsided and that the risk of RVF is no greater now than it was before the epidemic. In West Africa, in addition to TCP support, EMPRES is currently supporting a sub-regional surveillance programme based at the Senegalese Institute for Agricultural Research – National Laboratory for Breeding and Veterinary Research (ISRA-LNERV) in Dakar.

**Peste des petits ruminants**

Only described in West Africa as recently as the 1940s, PPR is now recognised to occur in most of the countries of sub-Saharan Africa from the Atlantic to the Red Sea, as far south as East Africa (where there is serological evidence only)
in the east, and Gabon in the west. Egypt has also reported the presence of PPR which appears to be spreading southwards in Africa. The disease is prevalent in the Near and Middle East, extending to the borders of Europe and as far eastwards as Bangladesh in Asia. It appears that there has been an actual extension of range, as well as increasing aetiological differentiation between PPR and other causes of pneumonic disease in sheep and goats. In India, many cases in sheep formerly ascribed to rinderpest are now known to have been caused by PPR. Figure 3 shows the global distribution of PPR. There are many lacunae in epidemiological understanding of this disease but molecular epidemiological studies have identified three PPR virus lineages in Africa and a fourth in Asia (16). Furthermore, one of the African lineages is in circulation in Asia. Of all diseases of small ruminants, PPR is the one that is extending most alarmingly, perhaps due to the ease with which small ruminants are transported and traded.

EMPRES has promoted enabling research in vaccine development, dissemination of a new homologous vaccine strain and improved diagnostic methods, which have led to an accurate definition of the extent of the disease. These diagnostic techniques have facilitated the distinction of this disease from rinderpest, with which it has been confused for many years.

**Lumpy skin disease**

This vector-borne disease has proved to be of importance in epidemics in East and West Africa, as well as Egypt, and has the potential to extend outside the African continent. In epizootic situations which occur repeatedly at intervals of several years, lumpy skin disease can cause significant mortality, severe damage to hides, suppression of milk yield, particularly in high-production systems, and sickness in draught animals at the time of the year when they are needed for cultivation. The impact of the disease on peri-urban dairies has been most marked in recent years. These features were exhibited in the recent outbreaks in countries of West Africa where EMPRES executed TCP projects involving the upgrading of diagnostic laboratories in Mali, Guinea and Senegal and vaccine production in the Central Veterinary Laboratory in Bamako.

**Conclusion**

EMPRES is in a sense a victim of its own success. Demands on EMPRES resources are growing progressively and meeting them all is extremely difficult. The void which needs to be filled is illustrated by the growing demands for assistance which are stimulated by successful results. Demand far
exceeds the resources available to EMPRES. The classification of transboundary diseases into strategic, tactical and emerging/re-emerging diseases (see above) is, in reality, fluid and there is considerable pressure for diseases of the last two categories to move up into the ranks of those diseases requiring strategic attention. This tends to defeat the objective of classification which sought to focus application of the limited resources by concentrating strategic inputs on those diseases which offer real prospects for progressive control leading to elimination, either globally or on a regional basis and for which the provision of a range of technical inputs would be expected to yield results rapidly. In terms of strategic involvement, in addition to rinderpest, particular attention has been paid to CBPP, a re-emerging disease in Africa targeted for strategic attention, and FMD, for which there are regional initiatives for co-ordinated regional control in Latin America and South-East Asia. However, several other diseases have attained a level of prominence which now demands strategic involvement, most notably PPR, which impinges on GREP as well as being an emerging disease of considerable importance in its own right in Africa and Asia; ASF, in all sub-regions of Africa; classical swine fever, in the Caribbean, Latin America and Asia; and RVF in Africa. This situation has arisen as a result of a succession of transboundary epidemics illustrating the deficiencies in emergency preparedness in national Veterinary Services, together with the results obtained from the provision, primarily by the FAO, of emergency assistance for national and regional control programmes. The list is in fact more extensive than that given above, for other diseases and pests which currently fall outside the strict original definition of EMPRES. Other diseases which invite a similar degree of concerted strategic attention include, for example, Old World screwworm in the Middle East, New World screwworm in Latin America and the Caribbean, brucellosis in North Africa and the Middle East, non-cyclically transmitted trypanosomosis in Latin America, Newcastle disease of village poultry, and classical swine fever in South-East Asia.

Global agriculture and trade are evolving rapidly and, as illustrated by the growing concern with emerging diseases of humans, should the industrialised world neglect the health of livestock in the developing world it will do so at its own peril. The international community faces a considerable challenge in developing national and international systems to enhance the control of transboundary animal diseases throughout the world. The FAO is critically examining its means of response to the problem and has recently commissioned an external review of its EMPRES Livestock Programme to assist in assessing the mismatch between resources and needs. Comparison of the resources available to the WHO – a specialised agency of the United Nations which deals with disease in a single species – with those of the FAO Animal Health Service Infectious Diseases Group/EMPRES – a group of a service, of a division, of a department within a specialised agency of the United Nations dealing largely in agronomy-focused issues – is a salutary exercise suggesting the scope of the challenge. Few, if any, other organisations are as well placed as the FAO to address the issues and EMPRES has started to demonstrate how they could be approached through emergency preparedness at all levels. Rising to the challenge, as global populations expand inexorably (placing ever-increasing pressure on food resources), production systems intensify progressively and the global climate changes, should be viewed by the international community not as an act of benevolence but as informed self-interest.


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Résumé
réduction des pertes dans l’agriculture, grâce à l’amélioration des capacités locales de détection et de réaction rapide en cas de fléaux sanitaires. EMPRES vise en priorité à coordonner le Programme mondial d’éradication de la peste bovine – un programme limité dans le temps – tout en œuvrant à un contrôle progressif des maladies épidémiques les plus graves dans un cadre général de préparation aux urgences. Les auteurs décrivent les activités du programme, notamment dans ses aspects liés à l’alerte rapide, à la réaction immédiate, au développement de la recherche et à la coordination. Outre la peste bovine, le programme a accordé une attention particulière à la péripneumonie contagieuse bovine, une maladie dont la réapparition en Afrique fait l’objet d’une attention stratégique prioritaire, ainsi qu’à la fièvre aphteuse, pour laquelle la prophylaxie a été lancée au niveau régional en Amérique latine et en Asie du Sud-Est. Les auteurs décrivent également les réponses tactiques apportées à d’autres urgences zoosanitaires telles que la peste porcine africaine, la peste porcine classique, la fièvre de la Vallée du Rift, la peste des petits ruminants et la dermatose nodulaire contagieuse.

Mots-clés

Prevención y preparación zoosanitarias: el Sistema de Prevención de Emergencias de la Organización de las Naciones Unidas para la Agricultura y la Alimentación

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Resumen
En 1994, la Organización de las Naciones Unidas para la Agricultura y la Alimentación emprendió la tarea de revitalizar sus actividades de lucha contra la transmisión transfronteriza de enfermedades. Para ello creó un nuevo programa especial conocido como Sistema de Prevención de Emergencias (Emergency Prevention System; EMPRES) contra la transmisión transfronteriza de plagas y enfermedades animales y vegetales. Los aspectos del EMPRES relativos al ganado buscan ante todo adelantarse a los brotes y las subsiguientes pérdidas agropecuarias fortaleciendo la capacidad local para detectar y reaccionar rápidamente a la aparición de plagas. El EMPRES se centra por un lado en la coordinación del Programa mundial de erradicación de la peste bovina – un programa de plazos – mientras que por el otro, y a fin de lograr un progresivo control de las enfermedades epidémicas más graves, prevé un marco general de preparación para emergencias. Los autores examinan las actividades del programa en lo tocante a aspectos como la alerta anticipada, la reacción inmediata, la investigación de apoyo o la coordinación. Además de la peste bovina, han merecido especial atención la peripneumonía contagiosa bovina, enfermedad de importancia estratégica que está reapareciendo en África, y la fiebre aftosa, para cuyo control se han puesto en marcha actuaciones regionales coordinadas tanto en América Latina como en el Sureste asiático. Los autores describen también respuestas de tipo táctico a otras emergencias sanitarias.
como las causadas por la peste porcina africana, la peste porcina clásica, la fiebre del Valle del Rift, la peste de pequeños rumiantes o la dermatosis nodular contagiosa.

**Palabras clave**

**References**