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# Global perspective for foot and mouth disease control

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## Summary

The world distribution of foot and mouth disease (FMD) is almost a mirror image of the global economic structure. In general, industrialised countries are free while the disease is endemic in developing countries. In recent years, several incursions of FMD have been recorded in countries belonging to the Organization for Economic Co-operation and Development (OECD), all of which have been financially and socially costly to eliminate. At the same time, this single disease bars many developing countries from participation in formal trade, both regionally and internationally. However, recent studies have predicted an unprecedented high demand for animal protein, which can only be met through enhanced participation of developing countries in trade in livestock products. Accordingly, globalisation trends will exacerbate the exclusion of poor communities and countries from markets unless a long-term strategy is implemented to progressively build market opportunities for these countries, without placing the livestock of industrialised countries at undue risk from FMD and other major transboundary animal diseases.

The authors submit that there is sufficient knowledge of FMD to make an international initiative for the progressive control of FMD a viable objective. Consequently, a four-stage pathway is proposed for developing a global FMD programme. The proposed strategy involves a build-up of the epidemiology and global status of FMD, including establishing an international early warning system, a risk-reduction phase to lower the incidence of FMD in the primary endemic areas and a control phase leading to the creation of zones of assured FMD-freedom.

The authors also propose that an international FMD programme be co-ordinated, based on the experience of the Global Rinderpest Eradication Programme, the Hemispheric Plan for the eradication of FMD for the Americas, the South-East Asia Foot and Mouth Disease control and eradication campaign and the European Commission for the Control of FMD.

## Keywords

Control – Foot and mouth disease – Globalisation – Trade.

## Context

In July 1996, the Pan American Health Organization (PAHO), the Office International des Epizooties (OIE: World organisation for animal health) and the Food and Agriculture

Organization (FAO) of the United Nations jointly convened in Brasilia an international conference at Ministerial level, entitled: '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'. This Conference gave substantial political backing to the Hemispheric Plan for

the eradication of foot and mouth disease (FMD) from the Americas by 2009. The seventeen ministers from the Americas signed and launched the Declaration of Brasilia on FMD (2). While supporting the Hemispheric Plan as a disease control strategy, the Declaration emphasised the socio-economic benefits of eradicating the disease, particularly for small-scale producers, regional integration and economic development, as well as the link of FMD and other transboundary animal diseases (transboundary animal diseases have been defined by the FAO as 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), to food insecurity. Furthermore the Declaration included an explicit request, as follows:

*'Request FAO, OIE and PAHO to develop technical orientations towards the progress of FMD global eradication as well as the prevention of other important animal diseases in the world.'*

This was the first high-level meeting to call for global action against FMD.

In November 1996, The World Food Summit (WFS) recognised the pivotal, constraining role of animal diseases on food security, sustained animal agriculture and trade. Accordingly, the Heads of State and Governments included a pledge, under Commitment No. 3 of the World Food Summit Plan of Action (10), as follows:

*'Seek to ensure effective prevention and progressive control of plant and animal pests and diseases, including especially those which are of transboundary nature, such as rinderpest, cattle tick, foot and mouth disease, ...'*

In the wake of the FMD outbreaks which occurred in 2001, especially in Europe and South America, the OIE and FAO convened an international conference on FMD. One of the key recommendations of this conference was a call for international action against major animal diseases, especially FMD, rinderpest and classical swine fever. This was further emphasised by the special ministerial meeting on FMD during the 31st Session of the FAO Conference, which urged the FAO, OIE and World Health Organization (WHO) to continue their joint efforts to seek an international solution to the problem of FMD and other transboundary animal diseases.

The international community has clearly and repeatedly expressed a desire for some form of internationally co-ordinated action against FMD. The questions raised are as follows:

– Can the control of FMD be clearly identified as beneficial to the international public?

– Is knowledge about the disease and the epidemiology of the disease sufficient to provide a basis for designing an international strategy against the disease?

– Does the technology exist to develop an international programme for effective prevention and progressive control of FMD?

– Could the national Veterinary Services, farming communities and society at large in FMD-affected and -free areas sustain an international programme against FMD?

– Do developing countries have adequate incentives for a demand-driven approach to comprehensive FMD control?

– Have sufficient resources been mobilised for the task?

## Issues for the global livestock sector

The world population has now reached the 6 billion mark and by 2020 it is expected to be about 8 billion. Estimates show that populations in developed countries will rise by approximately 0.2 billion while those in developing countries will increase by 2 billion during the same period (11). This is a major challenge for world food security. A number of studies have indicated that during the next fifteen to twenty years, the demand for livestock products can be expected to double. A joint study conducted by the International Food Policy, the International Livestock Research Institute (ILRI) and the FAO has predicted that if present consumption trends in developed countries are an indication of patterns in the future, increases in cereal consumption are likely to be much smaller than those observed for meat consumption. Estimates show that by 2015, 60% of meat and 52% of milk will be produced in developing countries, compared to 51% and 36%, respectively at present, and 37% and 26%, respectively, ten years ago (6).

About 75% of the poor live in rural areas in the developing world and 66% of these people keep livestock. In relative terms, livestock and fish are more important to the incomes of the very poor in the world than to the income of any other group. Income from milk, meat, eggs and fish is critical to food security of the poor in most of the world. Therefore, at the global level, the livestock sector is poised to grow with unprecedented rapidity and, at face value, this so-called livestock revolution provides a significant opportunity for livestock farmers in the poorer regions to partake in economic activities and provides a way for them to escape the poverty trap (6, 17).

Unlike fisheries, however, international trade in livestock products continues to be dominated by the industrialised countries, which represent about 80% of world meat export. Among the developing regions, Latin America and the Caribbean are the largest meat exporters, representing about 7% of the world total. An important shift in world meat trade

occurred when the European Union changed from being a net importer of about 1 to 1.5 million metric tonnes (MT) of meat products at the beginning of the 1980s to a net exporter of about 2 million MT in the second part of the 1990s, mostly as a consequence of the Common Agricultural Policy. Nevertheless, livestock production in industrialised countries appears to be rapidly reaching saturation. The soaring demand for food of animal origin will increasingly have to be met by developing countries. Furthermore, market forces and the drive for globalisation of trade are bound to create increasing pressure for exports of livestock products from developing countries much in the same manner as for other agricultural products, such as fish, vegetables, grains and flowers (6).

## Foot and mouth disease control as an international public good

An issue must be demonstrably beneficial to the general public to be regarded as being of public interest, or as a public good. Apart from the impact of FMD on animal health, the disease has been described by Rweyemamu and Leforban as the most important constraint to international trade in animals and animal products, which restricts trade in a south-to-north direction (21). They have shown that the world distribution of this one disease is almost a mirror image of the world-wide global economic structure with the high-income, industrialised countries being generally free from FMD, while the disease is persistently endemic in low-income countries suffering from food deficits. Furthermore, they argued that effective and sustained control of FMD at any geographical level could only be achieved through inclusive area-wide programmes rather than through compartmentalisation.

Foot and mouth disease is now, more than ever, a concern to both poor countries and rich nations, to poor farmers as much as to rich farmers. A recent Department for International Development (DFID)-ILRI study has ranked FMD as the disease that most affects livestock productivity of small-scale farmers, especially in Asia (19) while a consultative document by the FAO has identified FMD as one of the key impediments to the access of poor livestock farmers to formal markets (12).

The recent spread of FMD has demonstrated that a long period of freedom from the disease provides no protection against further outbreaks. The cost of controlling FMD incursions into countries belonging to the Organization for Economic Co-operation and Development (OECD) has been enormous. For example, the direct cost for controlling FMD in Taipei China in 1997-1998 was estimated at approximately US\$400 million, while the indirect cost was about US\$1.6 billion per year (27) and the overall economic impact was estimated to be as high as US\$6.9 billion (26). A relatively limited epidemic (26 outbreaks) in the Netherlands during 2001 is estimated to have cost about US\$250 million, excluding about US\$100 million in lost income for affected

farmers and substantial amounts of lost income for a variety of other companies and sectors, ranging from slaughterhouses to the tourist trade (16). The most dramatic, however, was the recent epidemic of FMD in the United Kingdom (UK) which is estimated to have cost the food and farming industry about US\$7 billion and the leisure and tourism industry another US\$7 to US\$9 billion (25).

With the inevitability of globalisation and in order to safeguard world animal agriculture and trade, it is becoming increasingly imperative that FMD be controlled at the source in developing countries, where the disease is still endemic. Industrialised countries therefore show self-interest when supporting schemes for the control of FMD at source in developing countries. On the other hand, there is need to create conditions that would permit progressive access to formal markets by poor livestock farmers in developing countries. As already remarked, trade in livestock products is currently dominated by industrialised countries. Accordingly, globalisation trends will exacerbate the exclusion of poor communities and countries from markets unless a long-term strategy is implemented to progressively build market opportunities for these countries, without placing the livestock of industrialised countries at undue risk from FMD and other major transboundary animal diseases (12, 14). Therefore, it is important for the international community both to support schemes for the control of FMD and other major epidemic diseases of livestock and to set a pathway approach that would offer countries access to market opportunities progressively, as successive new 'sanitary steps' are attained.

## Factors which favour international control

As demonstrated above, there is already an international consensus for some form of action to ensure effective prevention and progressive control of FMD. Therefore, an international initiative for FMD control would be driven by demand.

As discussed elsewhere, many critical areas still require strategic research (9). Nevertheless, from the perspective of programme management, there is sufficient knowledge on FMD to launch an international initiative for making global FMD control an attainable objective. This knowledge is as follows:

- in general, the disease presents recognisable clinical signs. There are laboratory tests for the specific diagnosis and identification of causal strains (15). In endemic areas and for the purpose of a control programme, specific confirmation of every case is not necessary. Once laboratory confirmation has been obtained, epidemiologically connected outbreaks can be assumed to be due to the same virus strain. Therefore, tactical sampling would be sufficient to monitor disease, at least during the early stages of the control programme

– currently available vaccines, provided they are well handled, are of sufficiently good quality for international campaigns. Thus vaccines of guaranteed safety (innocuity), with a minimum potency of 6 cattle protective dose 50 (PD<sub>50</sub>) can be applied, guaranteeing over 80% protection in vaccinated animals and inducing an immunity of one year or longer in animals vaccinated more than once (5, 7, 8, 13, 22)

– work conducted in South America has increased knowledge of the dynamics of disease in endemic areas; thus, the basic elements for designing a control programme can be defined (3)

– structural reforms in many developing countries mean that it may be possible to organise programmes, which are supervised by the public sector, but which might not necessarily depend on delivery to be conducted everywhere by the State.

## Veterinary Services in developing countries

As stated previously, FMD is endemic in the poorer regions of the world. The sustained control of FMD requires socio-political stability and ability to access all livestock by veterinary personnel. These requirements are in addition to the need for financial, material and human resources to supply and deliver vaccines, maintain effective surveillance systems and implement disease control strategies. The national Veterinary Services in developing countries have to compete for scarce resources but, unfortunately, they are often politically weak and fare badly when the resources are distributed. Furthermore, in several cases, economic structural adjustment programmes tend to weaken the administrative, legal and financial capacity for dealing with major animal disease outbreaks. Consequently, progress in the control of FMD cannot rely on internal resources and management alone.

Since the mid-1980s, structural adjustment programmes in developing countries have led to a demand for the privatisation of veterinary services, thus aiming at drastically diminishing the role of the state in these activities. Animal health was considered a private benefit and Veterinary Services were regarded essentially as providing an animal health care delivery system. Issues such as the sale of veterinary medicines and vaccines, provision of clinical services or undertaking of vaccination therefore obtained priority in the implementation of privatisation programmes. Surveillance, early warning, laboratory diagnostic services, planning, regulation and management of disease control programmes, as well as ensuring the quality and safety of animal products were secondary considerations. The concepts of control of epidemic diseases and international obligation to manage and report on these diseases were overlooked. As a result of restructuring and decentralisation, government veterinary officers were often placed under the control of regional and local authorities within a general agricultural extension system. Thus, the chain of

veterinary command that required notification of disease outbreaks enabling a response to disease emergencies and which also ensured the management of national disease control programmes, was often dismantled.

The combination of reduced financial resources and an improperly organised national Veterinary Service has led to a deterioration in animal health services resulting in epidemic diseases often spreading unchecked. Any international programme for co-ordinated FMD control must therefore also address the structure and efficiency of national Veterinary Services. While many delivery aspects can be implemented by the private sector, national Veterinary Services must not abrogate their responsibilities. Effective control of FMD requires that the government be accountable for the planning, co-ordination and quality assurance of the disease control programme. The national Veterinary Service should also involve the farming and trading communities. Furthermore, in many countries, the authority to manage routine veterinary activities would need to be decentralised. Nevertheless, the national Veterinary Services need to be empowered in such a way to ensure accountability for the nation-wide status of FMD.

## Elements of a strategy for a global programme for foot and mouth disease

Many disease control strategies tend to be based on controlling disease where the disease exists in the epidemic form and is therefore readily visible. It is also easier to secure resources for controlling visible epidemics than for targeting the invisible and insidious disease. Usually, economic benefits can also be readily realised by controlling epidemic disease. To safeguard against FMD and create free zones, countries or regions often interpose a vaccination zone or 'cordon sanitaire' comprising a buffer zone and surveillance zone, as defined in the OIE International Animal Health Code (18). The most well known such zone is the buffer zone in Thrace (Turkey), instituted by the European Commission for the Control of FMD.

Experience in South America shows that sooner or later, the integrity of such buffer zones is breached. Consequently, a scheme was devised which is based on eco-systems and which takes into account the dynamics of FMD, the farming systems and cattle movements to identify primary endemic areas (i.e. virus maintenance areas), secondary endemic areas (i.e. areas of virus propagation) and epidemic areas (i.e. areas of explosive outbreaks) (4). The most cost-effective and sustainable strategy for FMD control was that which targeted first the primary endemic eco-system. If disease is first brought under control in this eco-system, sustained control in the other two zones is relatively easier to achieve. This approach, together with improvements in vaccine quality and the involvement of the

farming and trading communities (the so-called 'social participation'), have been the hallmark of the Hemispheric Plan for controlling FMD in the Americas, especially the Mercosur (3).

The authors therefore advocate that if an international programme for FMD control is devised, the programme should evolve as described below.

### Definition phase

This phase would comprise the following elements:

- enhancing the diagnostic capacity at the national and regional levels, supported by a strengthened OIE/FAO World Reference Laboratory for FMD to ensure a global repository of FMD virus strains and their genetic and biological characterisation
- an epidemiological study to establish an understanding of likely primary endemic areas and the movement of animals from such areas
- setting up an international system for global information and early warning for FMD and other major transboundary animal diseases which would take account of the official reporting system of the OIE as well as disease investigation in the field and epidemiological and laboratory studies to aid prediction modelling and early warning on an international level
- support for strategic research targeted at enhancing FMD control in endemic areas, including robust field or penside diagnostic kits, multi-valency, heat-stable vaccines which induce persistent immunity, epidemiological studies and policies which facilitate animal health delivery (9).

### Risk reduction phase

This phase would involve internationally sponsored FMD control action in primary endemic areas in order to establish, in a relatively short time (about five years), regional (or international) sanitary barriers or buffer zones. The definition of such sanitary barriers would be that they would be infected and deemed, by the evaluation above, to contain regionally important primary endemic areas. These zones would therefore differ from the traditional concept of a buffer zone separating infected and free areas. The strategy for FMD control within each zone would include targeted vaccination of all bovines within epidemiologically defined areas. The inclusion of other species in such a vaccination programme would need to be justified on either local epidemiological grounds or the pathotropism of the FMD virus strain that is endemic in the area. The vaccine of choice would be high potency, oil-adjuvanted, applied at six-monthly intervals in animals under 24 months of age and once a year in older animals. Experience with FMD in South America and with rinderpest control in Africa has shown that the quality of vaccine is best guaranteed through independent quality control testing (1, 20, 24).

Potential regional sanitary barriers could be located in the following areas:

- Indo-China (southern area of the People's Republic of China and neighbouring countries)
- South Asia (Afghanistan, Pakistan, India and Bangladesh)
- Iran and Caucasian Europe
- the Horn of Africa (Sudan, Uganda, Eritrea, Ethiopia, Somalia and Kenya)
- the northern part of Southern African Development Conference (SADC) (Mozambique, Malawi, Tanzania, Zambia and Angola)
- Sahelian West Africa (especially Mali, Niger and Chad)
- the Andean Region of South America, including Amazonian Brazil.

In Africa, FMD control would be complicated by the virus having a permanent carrier, i.e. the African buffalo (*Syncerus caffer*). Nevertheless, experience from Southern Africa has shown that this problem can be contained through practices or structures that minimise contact between livestock and the buffalo population (23).

Such international action may need to be supplemented by targeted vaccination of livestock within national primary endemic zones where these are outside the regional/international sanitary barriers.

### National/regional control programmes phase

This phase would comprise the following:

- maintenance of all the activities initiated during the preceding phases, including the vaccination programme within the regional/international sanitary barriers and the national primary endemic areas
- risk-based FMD surveillance throughout the important ecosystems in order to define where infection might reside beyond the primary endemic areas
- targeted vaccination in the high-risk areas, defined by the above study. The success of the risk reduction phase would also determine the number and size of foci where livestock should be vaccinated.

### Foot and mouth disease-free zones

Following the above measures, many countries would have succeeded in eliminating endemic FMD (except for African buffalo reservoirs, which, as stated above, could be segregated). Accordingly, many developing countries would have access to FMD-free zones, guaranteed by a system of institutionalised surveillance. Such expanding zones would offer the possibility for developing countries to increasingly participate in formal markets for livestock products without undue risk to the health of importing countries.

The four-stage strategy described above is a progressive risk management strategy involving risk-based epidemiological surveillance and targeted vaccination rather than generalised, nation-wide blanket vaccination of all livestock in developing countries.

## International co-ordination

Experience with the Hemispheric Plan for FMD in the Americas, the Global Rinderpest Eradication Programme (GREP), the South-East Asia Foot and Mouth Disease control and eradication campaign and the European Commission for FMD has shown that it is not necessary to run a large, centrally co-ordinated global campaign as was the case for smallpox eradication. An international initiative for FMD control might comprise the following elements:

a) a global secretariat of a small number of staff with several functions, as follows:

- collection and analysis of global FMD data (primarily building on regional databases)
- epidemiological analysis and advice on strategies
- assistance with formulation of regional strategies
- monitoring of progress
- forum for expert meetings and reviews
- publication and dissemination of reports
- links with regional units
- links with relevant international research establishments

b) regional co-ordination units – based on epidemiological clustering of countries or on geo-political entities, as follows:

- same functions as the global secretariat
- more direct involvement in supervising national activities and management of resources.

While it is desirable to co-ordinate funding, financial resources for national, regional and global facilities do not have to originate from the same source. Such funds are also unlikely to be managed centrally.

Mobilising resources is likely to be a far greater hurdle to overcome than the technical constraints for international action against FMD. Nevertheless, such action is urgent and needed both to help poor communities/countries to aspire to gaining access to formal markets for livestock products and to protect the livestock industry of the rich nations. Thus, effective prevention and progressive control of FMD is in the interest of the international community. The issue can be considered as a classical case for the benefit of the international public. Therefore, FMD must be tackled on a regional basis with global co-ordination. The successful eradication of rinderpest and FMD would create a climate which would be conducive for dealing with other transboundary animal diseases. ■

## Perspectives de lutte contre la fièvre aphteuse à l'échelle mondiale

M.M. Rweyemamu & V. Astudillo

### Résumé

La répartition géographique de la fièvre aphteuse dans le monde est le reflet quasi fidèle de la situation économique mondiale. Alors que les pays industrialisés en sont généralement indemnes, la maladie est enzootique dans les pays en développement. Au cours des dernières années, la fièvre aphteuse a fait plusieurs incursions dans les pays membres de l'Organisation de coopération et de développement économiques ; dans tous ces pays, son élimination s'est soldée par un coût financier et social élevé. Parallèlement, cette maladie empêche à elle seule de nombreux pays en développement de participer officiellement aux échanges commerciaux, que ce soit à l'échelle régionale ou internationale. Des études récentes prévoient toutefois une progression sans précédent de la demande de protéines animales qui ne pourra être satisfaite qu'au prix d'une participation accrue des pays en développement au commerce

des produits d'origine animale. La mondialisation va donc aggraver l'exclusion des collectivités et des pays les plus démunis des marchés, à moins qu'une stratégie à long terme ne soit élaborée pour ouvrir graduellement de nouveaux débouchés à leurs produits, sans pour autant exposer les élevages des pays industrialisés aux risques excessifs que représentent la fièvre aphteuse ou d'autres maladies animales transfrontalières graves.

Les auteurs laissent entendre que l'on dispose de connaissances suffisantes sur la fièvre aphteuse pour envisager raisonnablement la mise en œuvre d'une initiative internationale visant à son éradication progressive. Une démarche en quatre étapes est donc proposée en vue de l'élaboration d'un programme mondial contre la fièvre aphteuse. Cette stratégie implique l'intensification des efforts concernant l'épidémiologie et le statut de la fièvre aphteuse dans le monde et comprend, entre autres, l'instauration d'un système international d'alerte précoce, une phase de réduction des risques visant à réduire l'incidence de la fièvre aphteuse dans les zones enzootiques primaires et une phase de prophylaxie destinée à créer des zones confirmées indemnes de fièvre aphteuse. En outre, les auteurs proposent un programme international coordonné contre la fièvre aphteuse, qui s'inspirerait de l'expérience acquise dans le cadre du Programme mondial d'éradication de la peste bovine, du Plan hémisphérique d'éradication de la fièvre aphteuse pour les Amériques, de la Campagne contre la fièvre aphteuse en Asie du Sud-Est et de la Commission européenne de lutte contre la fièvre aphteuse.

#### **Mots-clés**

Échanges internationaux – Fièvre aphteuse – Mondialisation – Prophylaxie.



## **Las perspectivas de lucha contra la fiebre aftosa a escala mundial**

M.M. Rweyemamu & V. Astudillo

#### **Resumen**

La distribución de la fiebre aftosa en el mundo es casi una imagen especular de la estructura económica mundial. En general, los países industrializados están libres de la enfermedad, que en cambio es enzoótica en los países en desarrollo. En los últimos años se han producido varios brotes de fiebre aftosa en países de la Organización de Cooperación y Desarrollo Económicos, todos los cuales han resultado muy onerosos en términos tanto económicos como sociales. Al mismo tiempo, la sola presencia de esta enfermedad impide que muchos países en desarrollo participen en el comercio oficial de ámbito regional o internacional. No obstante, varios estudios recientes permiten augurar que la demanda de proteínas animales alcanzará pronto niveles sin precedentes, que exigirán inapelablemente una mayor participación de los países en desarrollo en el comercio de productos pecuarios. En este sentido, las tendencias propias de la mundialización agudizarán la exclusión de los países y las comunidades pobres de los mercados, a menos que se aplique una estrategia a largo plazo que ofrezca progresivamente oportunidades comerciales a esos países sin que ello entrañe a su vez, para el ganado de países industrializados, un riesgo indebido de contraer la fiebre aftosa u otras enfermedades animales transfronterizas de importancia. Los autores postulan que los conocimientos actuales sobre la fiebre aftosa son lo bastante amplios como para que resulte viable una iniciativa internacional para



controlar progresivamente la enfermedad. Proponen, en este sentido, un proceso en cuatro etapas para llevar a cabo un programa mundial sobre la fiebre aftosa. La estrategia que proponen pasa por un conocimiento más exhaustivo de la epidemiología y la situación mundial de la fiebre aftosa (incluida la creación de un sistema internacional de alerta precoz), una etapa de reducción del riesgo para aminorar la incidencia de la enfermedad en las zonas enzoóticas primarias y una etapa de control que culmine con la creación de zonas garantizadas libres de fiebre aftosa.

Los autores proponen asimismo que se coordine un programa internacional de lucha contra la fiebre aftosa, basado en la experiencia de otros dispositivos como el Programa Mundial de Erradicación de la Peste Bovina, el Plan Hemisférico de Erradicación de la Fiebre Aftosa en las Américas, la Campaña contra la Fiebre Aftosa en Asia Sudoriental o la Comisión Europea para la Lucha contra la Fiebre Aftosa.

#### Palabras clave

Control – Fiebre aftosa – Intercambios internacionales – Mundialización.



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