

Regional status and approaches to control and eradication of foot and mouth disease in the Middle East and North Africa

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Summary

The Middle East is regarded as the region of the world most heavily affected by foot and mouth disease (FMD). The situation in the Middle East and North Africa constitutes a threat to other regions of the world, especially Europe. Risk management differs between North Africa and the Middle East due to different epidemiological situations. In the Middle East, the national cattle population is the principal target of preventive vaccination. Vaccination is used as a tool for preventing economic losses due to the disease, rather than as a means to prevent the spread of the infection. In North Africa, as FMD occurs almost cyclically, management is more focused on emergency preparedness and limitation of the spread of the disease upon diagnosis, as well as on effective control measures based on quarantine and mass vaccination. To reduce future outbreaks of FMD in the countries of the two regions, a common strategic programme should be adopted, based on effective regional co-operation at many levels. This should be complemented by efforts to restructure and consolidate the national Veterinary Services.

Keywords

Animal health – Control – Epidemiology – Eradication – Foot and mouth disease – Middle East – North Africa – Regional status.

Animal health challenges in the Middle East and North Africa

Despite the close geographic proximity of Middle Eastern countries, the term 'Middle East' is more political and economic in essence and cannot be considered to identify an ecological region in the epidemiological sense. Conversely, the countries of North Africa constitute more of an ecological region that could be considered as similar for epidemiological reasons. The animal health authorities of North Africa and the Middle East are confronted by many challenges, including the following:

- the location of the Middle East and North Africa at the crossroads of international transportation, especially between the continents of the Old World
- the unstable political situation, reflected in inadequate regional co-operation and lack of exchange of epidemiological information
- the need for restructuring and consolidating the national Veterinary Services in the region
- differing climatic and ecological sub-regions in the Middle East and North Africa
- many of the countries of the two regions are permanent importers of livestock and animal products
- the diversity of livestock production systems and different approaches to animal health management
- the different market trends in animals and animal products that may affect decision-making and could also result in the introduction of exotic animal diseases
- demographic changes characterised by a growing human population, accompanied by desertification and increasingly limited water resources
- obvious variation in economic well-being between countries of the Middle East, which influences decision-making on matters related to animal health.

Historical epidemiology in the Middle East and North Africa

Only one country in the Middle East (Cyprus) is presently included in the Office International des Epizooties (OIE: World organisation for animal health) list of foot and mouth disease (FMD)-free countries. The problems encountered in the animal health status of countries in the Middle East have been demonstrated repeatedly by the presence of FMD, and the region is regarded as that most affected by FMD in the world (2).

Foot and mouth disease has been recorded in all countries of the Middle East on numerous occasions between 1960 and 2000 (Table I), with serotype O being the most prevalent. In the past, exotic FMD viruses were the cause of panzootics which spread to many areas of the region, even extending to the frontier of Europe. A remarkable example was the rapid dissemination of serotype South African Territories (SAT) 1 virus which occurred initially in Bahrain (probably through

imported sheep from Africa) in December 1961. The virus spread north-westwards to reach Iraq, Jordan, Israel and Syria by April 1962, continuing into Iran and Turkey. In September 1962, this serotype crossed the Bosphorus to enter Europe for the first time and, in November, caused an outbreak further west, near the border between Turkey and Greece.

Historically, epidemics mainly affected cattle and spread from east to the west in the Middle East (5). The slow spread of FMD from Tunisia in 1989 to Morocco in 1991 exemplifies the difficulty of controlling the disease since unregulated movements of herds of small ruminants may play an important role in spreading the infection.

The situation in the Middle East and North Africa constitutes a threat to other regions of the world, especially Europe. During the past few years, FMD spread several times from the eastern part of the Middle East to Europe, infecting Turkey (Thrace), Greece, Bulgaria and Italy.

Table I
Serotypes of foot and mouth disease virus recorded in the Middle East and North Africa between 1961 and 2000 (year of the last reported occurrence)

Country	O	A	Serotypes				Ref.	
			C	Asia 1	SAT 1	SAT 2		SAT 3
Algeria	1999	–	–	–	–	–	–	5
Bahrain	2000	1965	...	...	1962	...	...	2
Cyprus	1964	1964	0000	0000	0000	0000	0000	2
Egypt	2000	1972	–	–	–	(1950)	–	2
Iran	2000	2000	0000	2000	1964	0000	0000	2
Iraq	2000	2000	...	1975	1962	...	...	2
Israel	1999	1981	0000	1989	1962	0000	0000	2
Jordan	1999	1978	1969	1961	1962	0000	0000	2
Kuwait	2000	1977	0000	1981	1970	2000	...	2
Lebanon	2000	1992	1992	1984	1962	...	...	2
Libya	1994	1979	...	...	...	...	...	2
Morocco	1999	1977 (A ₇₇) 1983 (A ₃)	–	–	–	–	–	5
Oman	2000	...	...	1982	...	...	...	2
Qatar	2000	...	...	...	...	...	...	2
Saudi Arabia	2000	1994	1987	1994	1970	2000	–	2
Syria	1999	1988	1969	1988	1962	0000	0000	2
Tunisia	1999	1982 (A ₃)	–	–	–	–	–	5
Turkey	2000	2000	0000	2000	1965	0000	0000	2
United Arab Emirates	2000	1990	...	...	...	...	...	2
Yemen	1995	1998	–	1980	...	1990	...	2

Source: Data compiled in 2000, based on country reports to the Food and Agriculture Organization and Office International des Epizooties and on annual reports of the World Veterinary Laboratory for foot and mouth disease, Pirbright

... : no information available

– : not reported

0000 : never reported

Risk management in the Middle East and North Africa

Risk management differs between North Africa and the Middle East because of differences in the epidemiological situations of those two regions, due to diverse factors such as varying geographical and ecological conditions and trade practices. In the Middle East, the cattle population is the main target of preventive vaccination. Vaccination is used as a tool for preventing economic losses caused by the disease rather than as a means of preventing the spread of infection. In Iran, for example, dairy cattle are vaccinated preventively and sheep and goats are only vaccinated when outbreaks occur. Conversely, in Algeria, when an outbreak occurs (such as that of 1999), control measures include slaughter and destruction of affected animals, slaughter of in-contact animals (cattle and small ruminants) and ring vaccination. Vaccination campaigns are applied to the entire national herd when threatened, including small ruminants along the frontier in the east of the country (3). As the diagnostic capacity of the Middle East and North Africa is limited and as only a few samples are sent to the Food and Agriculture Organization (FAO)/OIE World Reference Laboratory (WRL) at Pirbright, United Kingdom (UK), the selection of vaccines to match the circulating strains of FMD is not always suitable. Some countries, such as Turkey and Iran, also vaccinate small ruminants in specific areas to prevent introduction of the disease from neighbouring countries (5).

In North Africa, FMD has occurred cyclically in the past. Recently, the management of outbreaks has focused on emergency preparedness and limitation of the spread of the disease once diagnosed. Effective control measures based on quarantine and mass vaccination are used.

Foot and mouth disease hazards identified in the Middle East and North Africa

Other surrounding areas affected by FMD, such as the Caucasian countries, East, Central and West Africa and South Asia, constitute sources of infection for the Middle East and North Africa. Exotic FMD strains were introduced to these areas as follows:

- SAT 2 strain, originating in East Africa, infected Kuwait in 2000
- the O pan-Asian strain spread over many countries of the Middle East in the late 1990s
- Asia 1 strain was recorded in Turkey in 1996 and Iran in 1998
- an O strain originating in West Africa infected North Africa in 1999 (Fig. 1).

The major reason for these developments is that some countries of the Middle East or North Africa are important livestock importers. However, effective pre-import and quarantine measures have not always been implemented. A second reason for the spread of FMD is the uncontrolled movement of animals across country borders.

Examples of control approaches in the Middle East and North Africa

The regional FMD Control Project in the Middle East includes Egypt, Israel, Jordan and the Palestinian Territories, and FMD control by the four parties relies heavily on compulsory vaccination (1). Animal movement in Israel is permitted only under license and cattle are individually identified. Small ruminants will also be included in this project soon.

Ring vaccination is used by all four parties to prevent the spread of infection following outbreaks of FMD.

Foot and mouth disease control in countries of the Middle East and North Africa

Iran

Foot and mouth disease types A and O occur regularly in Iran. A new variant of type A (Iran 96 topotype) was identified in 1996. The WRL indicated that the type A₂₂ vaccine offered no cross-protection against this new variant. Iran started to produce vaccine against the new variant in 1997. In 1998, similar type A strains were identified in Turkey and in Armenia. A total of 369 outbreaks were reported in unvaccinated herds in Iran in 1997, including 297 in cattle and 72 in sheep and goats from various parts of the country. Dairy cattle are vaccinated preventively and sheep and goats are vaccinated when outbreaks occur. The quantity of vaccine produced does not meet the requirements of the country. In 1997, about 4.6 million cattle and 11.2 million small ruminants of a total 8,047,420 cattle and about 55,000,000 small ruminants (4) were vaccinated with locally produced bivalent vaccine.

Saudi Arabia

Saudi Arabia imports approximately 6.5 million live animals (mainly sheep and goats) annually from many countries, including countries in Africa and Asia, that are not free of FMD. These animals may be affected with FMD viruses that then spread to local herds and flocks. Saudi Arabia possesses a highly sophisticated dairy industry with imported high-productivity dairy cows. Despite regular vaccination, sometimes every ten weeks with up to seven viral strains incorporated into the vaccine, the herds are periodically severely affected by FMD. The country has adopted a policy

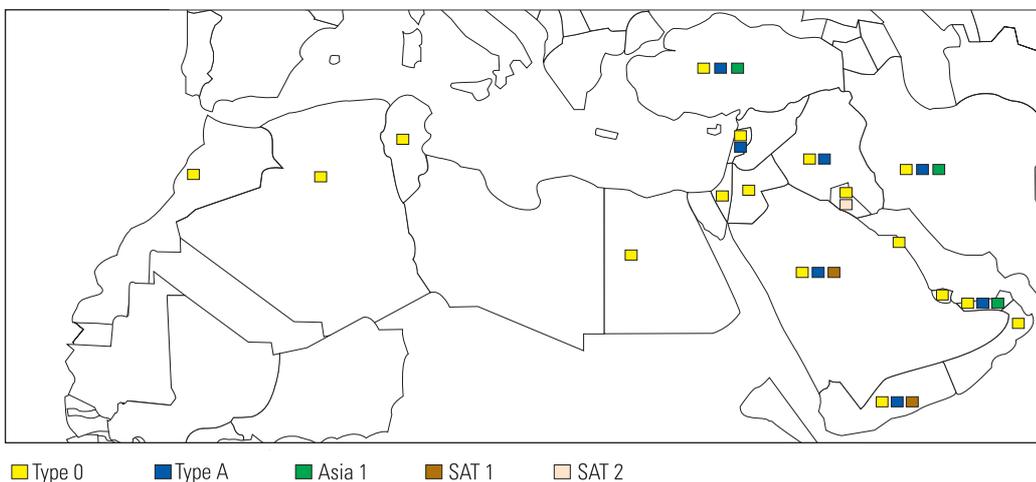


Fig. 1
Foot and mouth disease in the Middle East and North Africa, 1997-1999

that prevents entry of the virus to farms by applying strict security measures. Vaccination is used as a second line of defence.

Kuwait, Qatar and Yemen

Foot and mouth disease continues to be endemic in Kuwait. In 1997, 21 outbreaks caused by type O were reported in cattle. An outbreak of type O was reported in May 1998 in a dairy herd, as well as in sheep, despite recent vaccination. In July 1998, FMD was reported to have moved from Iraq to Kuwait (and to Saudi Arabia, as there is extensive nomadic movement across the border between Saudi Arabia and Kuwait). In the majority of FMD outbreaks, clinical disease was preceded by movement of sheep onto the affected farm. Seven outbreaks of FMD were reported in Qatar in 1998. Foot and mouth disease occurs relatively infrequently in Yemen and serotype O is the virus usually isolated, although serotype A was identified in 1998 and SAT 1 was isolated from animals in quarantine in 1984. In Bahrain in December 1998, 170 cases of FMD were diagnosed clinically in cattle and sheep in three separate outbreaks.

Turkey

The law in Turkey requires that FMD be reported immediately to the Veterinary Authorities who are responsible for the application of appropriate measures, such as investigations into the outbreak and taking of specimens for typing at the FMD Institute (Sap Enstitüsü in Ankara). The Veterinary Authorities are also responsible for ordering movement restrictions to prevent further spread of the disease, quarantine, cordoning, disinfecting, compensation (when destruction and stamping-out are applied), ring vaccination, and informing neighbouring districts and provinces immediately.

According to the FMD Programme instituted in 1999, all ruminants would be vaccinated twice a year with a bivalent vaccine O₁ Manisa and A₂₂ Mahmat 11 or A Ankara in the Thrace region. In Anatolia, all large ruminants are vaccinated twice a year with a monovalent vaccine (O₁ Manisa) and small ruminants are vaccinated in accordance with requests from farmers. The Sap Enstitüsü in Ankara, a Government laboratory for vaccine production and FMD diagnosis, was the only vaccine manufacturer in the country until 1998. That year, the authorities of Turkey authorised a private company, VETAL in Adiyaman, to produce FMD vaccine and the company received virus strains from Pirbright and commenced operation. The Ministry of Agriculture and Rural Affairs (MARA) continues to support the production of vaccine by private companies. There are also legal regulations for the importation of FMD vaccines. The authorities in Turkey conduct complimentary epidemiological studies on FMD in the country. Annual production of vaccine is about 30 million bivalent cattle doses. Vaccine production in the Sap Enstitüsü in 1998 was 11 million doses of type A₂₂ Mahmat 11 and

10 million doses of type O₁ Manisa. The Institute adapted two field strains of the new A Iran type, namely: A Ankara and A Aydin, for vaccine production. According to the General Directorate of Protection and Control (GDPC) in 1998, the large and small ruminant populations of Turkey totalled 11 million and 39 million, respectively.

Iraq

The last available figures (10 January 1999) indicate that 50,678 cattle and 982,309 small ruminants had been infected with the FMD virus (mainly with serotypes O and A) in 13 Governorates with a mortality of 3,832 (7.5%) and 48,089 (4.9%), respectively. There was a high risk of spread to other Governorates and neighbouring countries. Iraq contacted the FAO in December 1998 and reported that FMD had occurred since the beginning of November 1998, and that vaccination was urgently required to control the disease. Due to the political ban imposed by the United Nations, provision of FMD vaccine to Iraq was authorised only after acceptance by the sanctions committee that the measure was necessary.

Lebanon

A significant number of live animals (up to 300,000 head of cattle and one million head of small ruminants) are imported every year for slaughter from different countries that are not all free of FMD, and the disease is therefore continuously reintroduced. Foot and mouth disease predominantly affects imported livestock of different origin that are kept together before slaughter. The population of local livestock is estimated to be 45,000 cattle – mainly dairy – and 750,000 small ruminants. This population is partially vaccinated and rarely infected. Dairy cattle are vaccinated twice a year (18,000 cattle and 31,000 small ruminants were vaccinated in 1997 using a trivalent O, Asia 1, A₂₂ vaccine).

Israel

The present policy of the Veterinary Services of Israel is to vaccinate all cattle above the age of three months annually between October and December with a trivalent vaccine (O₁, A₂₂ and Asia 1). Booster vaccination is performed in cattle younger than 18 months, eight to twelve weeks after the initial vaccination. Calves born after the general vaccination period are vaccinated at the age of three months, within a secondary scheme. The entire sheep and goat population of Israel is also vaccinated with a monovalent (O) vaccine, without a booster. Based on antigenic analyses of past isolates, the O component of the vaccine used includes the O₁ Manisa and O Geshur strains. Since 1998, strain A Iran 1996 has also been incorporated into the vaccine, together with A₂₂.

The efficacy of the vaccine used is evaluated by the results of an ongoing monitoring programme which has been operational since 1992. The programme involves six dairy farms distributed throughout the country. On each farm, 30 animals

in three age groups are sampled twice a year for evaluation of their serum/virus neutralisation antibody levels against current Middle Eastern strains of A₂₂, O and Asia 1. In 1997, sheep were included in the monitoring programme which is implemented three months after vaccination of sheep flocks located in four districts. Ten sheep from each flock are tested serologically against the current regional FMD O strain. This monitoring programme is scheduled to continue. Vaccination is compulsory and liable to State fees paid by the owners. In 1997, 400,823 doses of trivalent vaccine were used for cattle as well as 398,717 doses of monovalent (O) vaccine for small ruminants.

Jordan

Foot and mouth disease has been endemic in cattle and small ruminants in Jordan for many years. Cattle are vaccinated two to three times annually. About 51,000 cattle and 200,000 sheep and goats were vaccinated in 1997. No outbreaks were reported in 1997.

The first suspect cases of FMD for 1998 and 1999 were reported on 23 November 1998 in the Irbid Governorate situated close to the borders with Syria and Israel. Since then, more than twenty outbreaks have been reported by State Veterinarians.

Egypt

All major animal diseases have been notifiable in Egypt since 1906. This is facilitated by 1,400 Veterinary Services Units distributed country-wide. Type O was the only virus isolated in five Governorates in 1997. Egypt applies a policy of vaccination of dairy animals every four months and of fattening steers every six months, using locally prepared type O vaccine. In 1997, about 5 million large ruminants, 5.5 million small ruminants and 200,000 camels were vaccinated against FMD. Antibody levels are monitored to assess the immune status after vaccination campaigns. The main problem used to be the quantity of the vaccine available, but recently production has been sufficient.

Furthermore, a new quality control laboratory has been built in Abbasia with the support of the European Union at a cost of US\$2.2 million. The laboratory employs modern technology, including molecular techniques (polymerase chain reaction [PCR], nucleic acid probes).

Control measures applied in Egypt prohibit importation of live cattle, sheep and goats, deboned meat or other animal products except from countries that have been free from FMD for at least six months before importation. This measure aims at preventing the introduction of viruses other than strain O₁ into the country. Animals imported into Egypt are kept in quarantine for 33 days on arrival and vaccinated against FMD with serotype O₁ vaccine.

The disease surveillance system in operation is conducted by veterinarians throughout the country, working as field officers in abattoirs, during vaccination campaigns and in quarantine stations.

Notification of disease by owners or any member of the public is also encouraged. The Chief Veterinary Officer immediately directs a diagnostic team to investigate and provide expert opinion, with appropriate samples being examined in 26 specialised governmental diagnostic laboratories.

Infected farms are placed under quarantine for 21 days after recovery or death of the last affected animal. In-contact animals and animals in the surrounding area (4-8 km radius) are vaccinated.

Vaccination of all cattle, buffalo, sheep, goats and camels in the country is conducted every six months and every four months for dairy cows using a vaccine produced from a local isolate. The target of the vaccination campaigns is to vaccinate all animals and the logistic support in Egypt (considered the greatest in the two regions) enables them to vaccinate the entire population. Calves are vaccinated at six weeks of age or more to overcome the differences in maternal immunity due to differences of breeds and quality of colostrum.

In Egypt, vaccination against most infectious and contagious diseases is obligatory and free of charge. Serological monitoring is conducted to assess the immune status of the animals after vaccination campaigns. Sera collected during 1998 showed satisfactory responses to FMD vaccination.

Libya

Two type O outbreaks were reported in 1994. Small ruminants were affected by the disease in January of the same year, resulting in high mortality in new-born lambs aged two to four weeks in the Eastern part of Libya (Ejdabia area). Preventive vaccination of bovine herds has been practised twice a year since 1996 with 70,000 head of a total of 150,000 cattle, being vaccinated in 1997.

Algeria

Preventive vaccination continues to be conducted along the eastern border areas considered to be at risk. In 1997, 8,931 cattle and 110,000 small ruminants were vaccinated.

Morocco

About 1,270,000 cattle (51% of the total population) were vaccinated in 1997 with a monovalent type O vaccine.

Tunisia

Foot and mouth disease has not been reported in Tunisia since August 1999. Susceptible animals are vaccinated yearly, small ruminants receiving monovalent type O vaccine, and large

ruminants, trivalent vaccine against types O, A and C. About 300,000 cattle, 3.4 million small ruminants and 8,000 camels were vaccinated in 1997.

The foot and mouth disease epidemic in North Africa in 1999

An FMD outbreak caused by type O occurred in North Africa in February 1999. The disease was first reported in Algeria where it spread rapidly from the east to the west of the country. Isolated outbreaks of the disease also occurred in Tunisia and Morocco. The disease mainly affected cattle (more particularly beef cattle) and vaccination campaigns organised within the three countries prevented further spread. Genetic characterisation carried out by the FAO/OIE WRL for FMD at Pirbright showed a close relationship between the strain isolated during this outbreak and strains previously isolated in the Côte d'Ivoire and Ghana, indicating that the virus was most likely of West African origin (3).

Future perspectives for controlling and eradicating foot and mouth disease in countries of the Middle East and North Africa

To reduce future outbreaks of FMD in countries of the Middle East and North Africa, a common strategic programme should be adopted. The programme should include the following:

- detailed risk evaluation and institution of appropriate strategies for control in each country
- establishment of a surveillance network capable of providing early warning and implementing immediate control measures.

Collection and exchange of information on the epidemiological situation in the Middle East and North Africa

Epidemiological studies on FMD must be conducted throughout the region, especially in endemic areas.

Targeted disease control strategies must be implemented at the regional level.

Emergency plans, enabling rapid national and regional reaction, must be co-ordinated.

The national Veterinary Services must be restructured, including revision of the national legislation.

More effective control measures, that hopefully could lead to co-ordinated regional eradication of FMD from the Middle East and North Africa, must be applied at the national level. This would also provide protection for nearby FMD-free regions such as Europe (2).

This goal will only be achieved if and when regional co-operation is implemented. Co-ordinated epidemiological studies leading to a common control policy should be implemented and supported by the international community.

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Statut régional de la fièvre aphteuse et mesures de prophylaxie et d'éradication de la maladie au Moyen-Orient et en Afrique du Nord

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Résumé

Le Moyen-Orient est considéré comme la région du monde la plus gravement touchée par la fièvre aphteuse. La situation qui prévaut au Moyen-Orient et en Afrique du Nord représente une menace pour les autres régions du monde, et notamment pour l'Europe. Confrontés à une situation épidémiologique différente, l'Afrique du Nord et le Moyen-Orient ont fait le choix d'une gestion spécifique du risque. Au Moyen-Orient, la vaccination préventive vise principalement le cheptel bovin national. Elle y est davantage utilisée pour limiter les pertes économiques causées par la maladie que pour empêcher la propagation de l'infection. En raison du caractère cyclique de la maladie, la gestion du risque en Afrique du Nord s'articule plutôt autour de plans d'urgence et de moyens permettant d'endiguer sa progression dès le diagnostic. Cette gestion passe également par l'adoption de mesures prophylactiques efficaces fondées sur la mise en quarantaine et une vaccination généralisée. Pour juguler l'apparition de nouveaux foyers de fièvre aphteuse dans les pays des deux régions, il conviendrait de mettre en œuvre un programme stratégique commun, axé sur une coopération régionale efficace à de nombreux niveaux. Une telle initiative devrait s'accompagner d'efforts de restructuration et de renforcement des Services vétérinaires nationaux.

Mots-clés

Afrique du Nord – Épidémiologie – Éradication – Fièvre aphteuse – Moyen-Orient – Prophylaxie – Santé animale – Statut régional.



Situación de la fiebre aftosa y métodos para su control y erradicación en la región de Oriente Medio y el Norte de África

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Resumen

En general se considera que Oriente Medio es la región del mundo más afectada por la fiebre aftosa. La situación en esa zona y en el Norte de África constituye una amenaza para otras regiones del planeta, en especial para Europa. Las características epidemiológicas de la enfermedad son distintas en esas dos zonas, razón por la cual también difieren los métodos de gestión de riesgos que se aplican en cada una de ellas. En Oriente Medio, las cabañas bovinas nacionales son las destinatarias básicas de campañas de vacunación preventiva encaminadas no tanto a prevenir la propagación de la enfermedad como a reducir las pérdidas económicas que se derivan de ella. En el Norte de África, dado el carácter casi cíclico de la fiebre aftosa, las medidas de gestión apuntan sobre todo a preparar las estructuras para este tipo de emergencias, contener la propagación de la infección en cuanto se haya diagnosticado su presencia y

adoptar en ese momento una serie de medidas de control eficaces, basadas en la cuarentena y en vacunaciones masivas. De cara al futuro, y con el objetivo de reducir el número de brotes de fiebre aftosa en los países de las dos regiones, convendría que éstos adoptaran un programa estratégico común basado en una colaboración eficaz en diversos frentes, acompañándolo de un esfuerzo por reestructurar y consolidar los Servicios Veterinarios nacionales.

Palabras clave

África del Norte – Control – Epidemiología – Erradicación – Estatus regional – Fiebre aftosa – Oriente Medio – Sanidad animal.



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