

GF-TADs

GLOBAL FRAMEWORK FOR THE
PROGRESSIVE CONTROL OF
TRANSBOUNDARY ANIMAL DISEASES



REPORT

INTER-REGIONAL CONFERENCE
MIDDLE EAST & HORN OF AFRICA

*“RVF : challenges, prevention and
control”*

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Mombasa ▼ Kenya

OIE Sub-Regional Representation for Eastern Africa

Nairobi ▲ Kenya

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ACRONYMS

AGID	Agar-Gel Immuno-Diffusion (test)
APHIS	Animal and Plant Health Inspection Service [USDA]
ARIS	Animal Resource Information System [AU-IBAR]
ASAL	Arid and Semi-Arid Lands (Kenya)
AU	African Union
AVHRR	Advanced Very High Resolution Radiometer
BHK	Baby hamster kidney (cell culture)
BSL	Bio-Safety Level
CAC/AP	<i>Cash against Commodity / Advanced Payment</i>
CBPP	Contagious Bovine Pleuro-Pneumonia
CCPP	Contagious Caprine Pleuro-Pneumonia
CDC	Centres for Disease Control and Prevention (US)
CEO	Chief Executive Officer
CFT	Complement Fixation Test
CIRAD	<i>Centre de Coopération Internationale en Recherche Agronomique pour le Développement</i> [France]
CMC-AH	Crisis Management Centre for Animal Health [FAO & OIE]
CVO	Chief Veterinary Officer
DALY	Disability Adjusted Life Year(s)
DNA	Deoxyribo-Nucleic Acid
DVS	Department of Veterinary Services
EA	East(ern) Africa
EAC	East African Community
EC	European Commission
ECTAD	Emergency Centre for Trans-boundary Animal Diseases [FAO]
ELISA	Enzyme Linked Immuno-Sorbent Assay
EMPRES	Emergency Prevention System for animal and plant pests and diseases [FAO]
ENSO	El Niño Southern Oscillation
EU	European Union
EWS	Early Warning System
FAO	Food and Agriculture Organisation [UN]
FMD	Foot and Mouth Disease
GALVMed	Global Alliance for Livestock Veterinary Medicines
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GF-TAD	Global Framework for the progressive control of Trans-boundary Animal Disease
GLEWS	Global Early Warning System
GMP	Good Manufacturing Practices
HA	Haemagglutination
HAI	Haemagglutination Inhibition
HoA	Horn of Africa
IAEA	International Atomic Energy Agency [UN]
IBAR	Interafrican Bureau for Animal Resources [AU]
IBD	Infectious bursal disease
ICM	Integrated Committee of Ministers
ICPALD	IGAD Centre for Pastoral Areas and Livestock Development
IEP	Inter-epidemic period
IF	Immuno-fluorescence
IFAH	International Federation for Animal Health
IGAD	Inter-Governmental Authority for Development
IHC	immunohistochemistry
ILRI	International Livestock Research Institute [Kenya]
IRCM	Integrated Regional Coordination Mechanism
ISO	International Organisation for Standardisation
IZS	<i>Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale" de Teramo</i> (Italy)
KEMRI	Kenya Medical Research Institute
KEVEVAPI	Kenya Veterinary Vaccine Producing Institute
KSA	Kingdom of Saudi Arabia
LEISOM	Livestock Emergency Intervention to Mitigate Food Crisis in Somalia [AU-IBAR]
LSD	Lumpy Skin Disease

LSDV	LSD Virus
MDBK	Madin-Darby Bovine Kidney (cell culture)
MoA	Ministry of Agriculture
MoH	Ministry of Health
MSD	Merck, Sharp & Dohme
MVA	Modified Vaccinia Ankara
n/a	not applicable
NAHDIC	National Animal Health Diagnostic and Investigation Centre
NAMRU	Naval Medical Research Unit [US]
NASA	National Aeronautics and Space Administration [USA]
ND	Newcastle Diseases
NDV	ND Virus
NDVI	Normalized Difference Vegetation Index
NGO	Non-Governmental Organisation
NOAA	National Oceanic and Atmospheric Administration
NVA	Non-vaccinated animals
OBP	Onderstepoort Biological products [South Africa]
OIE	World Organisation for Animal Health
PACE	Pan-African Control of Epizootics programme
PAFLEC	Pan-African Platform of Livestock Trading Countries [AU-IBAR]
PAN-SPSO	Participation of African Nations in SPS Standards-setting Organisations [AU-IBAR]
PANVAC	Pan-African Veterinary Vaccine Centre [AU]
PARC	Pan-African Rinderpest Campaign
PCR	Polymerase Chain Reaction
PDL	Process Development Laboratory (Ethiopia)
PMO	Prime Minister's Office
PPP	Purchase Power Parity
PPR	<i>Peste de petits ruminants</i>
PVS	Performance of Veterinary Services [OIE]
REC	Regional Economic Community
RNA	Ribo-Nucleic Acid
RT-PCR	Reverse Transcriptase PCR
RVF	RVF
RVFV	RVF Virus
SADC	Southern African Development Community
SAHSP	Somali Animal Health Services Project [Somalia]
SGP	sheep and goat pox
SMP-AH	Standard Methods and Procedures in Animal Health [AU-IBAR]
SOI	Southern Oscillation Index
SOLICEP	Somali Livestock Certification Project
SPOT	<i>Système Pour l'Observation de la Terre</i>
SPS	[Agreement on the application of] Sanitary and Phytosanitary Standards [WTO]
SRR	Sub-Regional Representation [OIE]
TAD	Trans-boundary Animal Disease(s)
TC	Tissue culture
UAE	United Arab Emirates
UK	United Kingdom
UN	United Nations
US	United States
USAID	United States Agency for International Development
USD	United States Dollar
USDA	United States Department of Agriculture [USA]
VACNADA	Vaccines for the Control of Neglected Animal Diseases in Africa [AU-IBAR]
VETGOV	Veterinary Governance in Africa [AU-IBAR]
VI	Virus Isolation (test)
VN	Virus Neutralisation (test)
VSF	<i>Vétérinaires Sans Frontières</i>
VSVRI	Veterinary serum and vaccine research centre (Egypt)
WAHID	World Animal Health Information Database [OIE]
WAHIS	World Animal Health Information System [OIE]
WHO	World Health Organisation [UN]
WTO	World Trade Organisation
ZDU	Zoonosis Disease Unit (Kenya)

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PREFACE

Under the auspices of the FAO & OIE *Global Framework for the progressive control of Trans-boundary Animal Diseases (GF-TADs)*, some 70 veterinary professionals and scientists met in Mombasa, Kenya, from November 13 – 15th to reassess the situation of *RVF* in the area around the Red Sea and the Indian Ocean : it's challenges and options for prevention and control.

The seminar was attended by representatives from 18 countries including Bahrain, Djibouti, Egypt, Ethiopia, Iraq, Jordan, Kenya, Kuwait, Lebanon, Madagascar, Qatar, Saudi Arabia, Somalia (FAO), South Sudan, Sudan, Tanzania, Uganda and Yemen.



The conference was officially opened by the Kenyan Minister of Livestock Development, Hon. Dr. Mohamed Abdi Kuti.

Participants discussed the current state of RVF in the Middle East and the Horn of Africa, its impact on trade between the two regions and reviewed recommendations from previous seminars and conferences.

The focus of the conference was to debate the use of new prevention and control tools, presented by technical experts from both the public and private institutions. New vaccines, diagnostic tools and early warning and rapid response models were discussed.

Inputs into the meeting were provided by regional organisations such as AU-IBAR, AU-PANVAC and the Inter-Governmental Authority on Development (IGAD), along with speakers from international organisations such as FAO, OIE and ILRI, and private and public stakeholders in research and trade, such as CDC (US), CIRAD (France), the University of Liège (Belgium), IZS (Italy), GALVmed (United Kingdom), MSD Animal Health (Netherlands), MERIAL (France), OBP (South Africa), KEVEVAPI (Kenya), USDA-APHIS, USAID, NASA (US), IFAH (Belgium), etc

More information : <http://www.rr-africa.oie.int/en/news/20121127.html>

TABLE OF CONTENTS

Preface	page 7
Opening ceremony	9
Welcoming address by the OIE Deputy Regional Representative for Africa	9
Opening address by the Representative of FAO – EMPRES	11
Opening address by the Representative of AU – IBAR	12
Opening address by the Representative of IGAD	14
Opening address by the Minister of Livestock Development of Kenya	15
Objectives of the Conference, presented by the OIE Sub-Reg. Representative for Eastern Africa	17
Session 1 : The disease and how it is controlled	19
Session 2 : Current situation of RVF in Eastern Africa and the Middle-East	29
Session 3 : Impact of RVF on trade	43
Session 4 : Challenges to disease control	55
Session 5 : Prevention and early warning	71
Session 6 : Towards regional prevention and control strategies	85
Conclusions (recommendations)	91
Annexes	95
Seminar programme	97
List of participants	100
Useful websites	108
Relevant chapters of the OIE Terrestrial Code	109

WELCOMING ADDRESS BY THE OIE REGIONAL REPRESENTATIVE FOR AFRICA

Florência Massango - Cipriano

Deputy-Representative
Regional Representation for Africa
OIE
Bamako, Mali

Honourable Minister of Livestock Development,
Distinguished guests from regional and international Organisations
Invited Speakers,
Dear Participants,
Ladies and Gentlemen,

It is my great pleasure and honour to be here on behalf of the OIE Regional Representation for Africa, welcoming you to Mombasa, in Kenya. I believe you arrived safely and are well accommodated.

I also would like, through you Honourable Minister, on behalf of the OIE Director General and all African OIE Members, to very sincerely thank the Government and the people of Kenya for agreeing to host this important Inter-regional Conference on *RVF for East Africa (EA), the Horn of Africa (HoA) and the Middle East*, and to you in particular for availing yourself for honouring with your presence this event.

Additionally, I would like to thank each and every one present for finding time despite your very busy agendas and attending the present Conference which theme is *RVF : Challenges, Prevention and Control*.

Especially I would like to extend my thanks to each one of the organizers of this Inter-regional Conference, the OIE Sub-Regional Representation for East Africa and the Horn of Africa as well as the Regional Representation for the Middle East for all the work well done.

Honourable Minister,

Ladies and Gentlemen,

One of the lessons learned from the last global GF-TADs Steering Committee meeting in Paris (16th and 17th of October, 2012) is that RVF is one of the best candidate diseases to be addressed in the framework of the *One Health* approach. The OIE Representations for Eastern Africa and for the Middle East included RVF in their action plans in contribution to the GF-TADs agenda, according to the GF-TADs for Africa five year action plan which is to be finalized by end 2012. A harmonized approach in tackling the disease is also important as the two regions have considerable inter-regional trade of small ruminants.

RVF is clearly one of the most challenging diseases for OIE member countries as it appears to change its patterns in relation to environmental and climate change. In fact the occurrence of the disease has been widely correlated to extreme climate conditions like drought and floods. This has been witnessed in the occurrence of the disease during the last years in the affected regions in Africa and the Middle East.



Honourable Minister,

Ladies and Gentlemen,

The present Conference is organized under the auspices of the *Global Framework for the progressive control of Transboundary Animal Diseases* (GF-TADs), which is a mechanism for policy definition, coordination and harmonisation for programmes/projects and not an implementation tool of programmes/projects, through which the United Nation's *Food and Agriculture Organisation* (FAO), the *World Organisation for Animal Health* (OIE), the *Interafrican Bureau for Animal Resources* (IBAR) and African *Regional Economic Communities* endeavour to strengthen collaboration on tackling *transboundary animal diseases* (TADs) including zoonoses.

In the light of the GF-TADs framework, tackling diseases such as RVF at the animal source remains the most efficient and cost-effective way of dealing with zoonotic threats and high impact diseases for animal and human health and trade. RVF qualifies for the described approach as its prevention and control requires appropriate collaboration at all levels between the Animal and Human Health authorities and where appropriate the Environmental Health authorities.

The present Conference follows recommendations from previous meetings on the subject, namely from Cairo (2007), Bloemfontein (2009) and Rome (2011) and will amongst others highlight recent progress on disease control and discuss relevant aspects on diagnosis and vaccines.

From this Conference it is expected that Veterinary Services of participating countries will be better capacitated with necessary information, updates and skills for RVF prevention and control, including compliance with their obligations of prompt notification of animal health events and especially of RVF through the *World Animal Health Information System* (WAHIS).

I thank you for your kind attention.

WELCOMING ADDRESS BY THE FAO EMPRES REPRESENTATIVE

Vincent Martin

Acting Head
EMPRES
FAO
Rome, Italy

Honourable Minister, Regional representatives, distinguished delegates, ladies and gentlemen,

It's a great pleasure for me to be here in Mombasa and participate in this important meeting on RVF, organized under the aegis of the *Global Framework for the progressive control of Transboundary Animal Diseases* (GF-TADs).

After five years based in China, I am back in FAO Headquarters in Rome and glad to visit Africa again and witness the huge progress made in the prevention and control of RVF. During the past months, I was particularly impressed by the increased level of awareness and preparedness of countries regarding the potential risk of observing RVF epidemics during the 2012 winter season. Early warning messages originating from Veterinary Services or meteorological departments were shared by several countries which concomitantly enhanced their field surveillance activities in high risk areas.



Indeed, from late July to August 2012, above normal precipitation was recorded in the sub-Saharan belt including south-eastern Mauritania and adjacent areas in Mali, the middle and lower Niger River basin in Mali, the Lake Chad basin in Niger, Chad, Nigeria and Cameroon. Flash- and river floods, due to excessive precipitation at and upstream of many locations of the Lake Chad and River Niger basin, were reported. RVF cases we also confirmed in Mauritania showing that the threat was real.

We can see that early warning and emergency preparedness are definitely in motion in Africa and not an abstract concept anymore.

However, while major progress have been made, including in vaccine development, surveillance and cross-sector collaboration, major challenges are still ahead of us to efficiently address the risks associated with RVF epidemics and its impact on people's livelihood. Global RVF *Early Warning Systems* services such as the one provided by NASA in the past have been disrupted for lack of funding and some countries regularly affected by the disease cannot sustain their sentinel herd monitoring systems. Control strategies and response to RVF events also remain weak and ill-articulated with existing early warning and surveillance activities.

This meeting is therefore timely and will provide the necessary platform for exchanging experiences and good emergency practices related to RVF epidemic management. As far as FAO is concerned, the EMPRES Animal Health programme has been engaged for decades in field activities for the monitoring and control of RVF, and is committed to continue its efforts and translate research into long term policy and strategies.

Let us not forget that RVF is first and foremost a disease affecting the livelihood of the poor living in vulnerable areas already suffering from extreme weather events, droughts, civil unrest and food shortages. Simple solutions including proper vaccines, communication on basic hygiene measures and cost-effective control interventions are still needed to reduce the public health and socio-economic impact of the disease as well as the burden it imposes on farmers. I would like to wish you, us, an excellent meeting and look forward to hearing the results of your deliberations.

OPENING ADDRESS BY THE REPRESENTATIVE OF THE AFRICAN UNION

James Wabacha

Coordinator SMP-AH Project
Inter-african Bureau for Animal Resources
AU
Nairobi, Kenya

Hon. Minister for Livestock Development,
OIE Regional Representatives for the Middle East and Eastern and the Horn of Africa,
Representatives of International Organisations present, FAO, USAID, WHO,
Representatives of EAC and IGAD,
CVOs from Middle East and the Horn of Africa,
Distinguished participants,
Colleagues,
Ladies and Gentlemen,

On behalf of the Director, African Union *Interafrican Bureau for Animal Resources* (AU-IBAR), Prof Ahmed El-Sawalhy, I take this opportunity to thank OIE for organizing this seminar and for inviting AU-IBAR.



Hon Minister, AU-IBAR, in line with its mandate, with support from development and technical partners, has over the years supported livestock development in Africa. The support has significantly enhanced livestock health, contributed to enhanced livelihoods, household food security, poverty reduction, enhanced public health and greater access to livestock markets.

However, despite the efforts, livestock development in Africa is still faced with many challenges, especially *transboundary animal diseases* (TADs). Therefore, as institutional environment evolves, new challenges arise and new knowledge and tools become available. There is a need for us to continuously review our approaches and interventions to mitigate the effects of TADs. This seminar on RVF is therefore timely.

To address evolving institutional environment and other challenges associated with TADs prevention and control, AU-IBAR together with technical partners and with financial support of key partners is currently implementing a number of interventions in the region.

These include a project to enhance veterinary governance which is being implemented by AU-IBAR, OIE and FAO. Another initiative is facilitating effective participation of African Countries in activities of OIE, IPPC, Codex Alimentarius, and WTO-SPS committee, during the formulation of international standards through the Project for enhancing *Participation of African Nations in Sanitary and Phytosanitary Standards-setting Organisations* (PAN-SPSO).

To enhance regional coordination and harmonisation of TADs prevention and control AU-IBAR in partnership with IGAD and with financial support from *United States Agency for International Development* (USAID) has developed a regional project, the *Standard Methods and Procedures in Animal Health* (SMP-AH). It is being implemented in the nine countries in Eastern and HoA. It is focusing on 9 regional priority diseases including RVF.

The project will build capacity for regional prevention and control for these diseases and for each diseases, there is a “*Standard Methods and Procedures*” that specifies how the disease is to be controlled and/or eradicated in line with OIE standards. The SMP-AH takes an umbrella design, to provide regional uniformity, with the goal of supporting stable and safe intra and regional trade in livestock and livestock products.

Ladies and Gentlemen it is my sincere hope that this meeting will provide a platform upon which we will jointly explore what needs to be done in the management of RVF in order to facilitate safe trade in animals and their products, between the two regions in compliance with OIE standards and guidelines.

On behalf of the Director of AU-IBAR, Prof Ahmed El-Sawalhy, I wish you successful deliberations.

OPENING ADDRESS BY THE REPRESENTATIVE OF THE INTER-GOVERNMENTAL AUTHORITY
FOR AGRICULTURAL DEVELOPMENT

Ameha Sebsibe

Livestock Expert
Centre for Pastoral Area and Livestock Development
IGAD
Nairobi, Kenya

Your Excellency, Minister of Livestock, Kenya

Dear Representatives of OIE, AU-IBAR, FAO and WHO

Dear Participants,

On behalf of IGAD's *Centre for Pastoral Areas and Livestock Development (ICPALD)*, I welcome all of you to Mombasa, IGAD region.



As you well know, the IGAD region covers 8 countries and is rich in livestock resources, with about 336 million ruminants. The demand for livestock and livestock products within the continent and the Middle East is high. However, the region is only able to supply on average 40% of the live animal and 6% of the meat annual demand of the Middle East. Among the major bottlenecks affecting livestock trade, limited capacity to control and prevent TADs and limited coordination are some issues that need attention

We remember the negative impact of the trade bans when RVF occurred in the region. Somalia alone had an economic loss of about USD 435 million during the two bans. The bans affected all countries in the region. We thank OIE for organizing this inter-regional conference on RVF and bringing together important stakeholders to update us on the current status and recent progress made in the control and prevention of the RVF.

ICPALD is a new centre established by the IGAD Secretariat with the approval of Member States to serve as technical arm. The centre confirms its commitment to jointly work with OIE, AU-IBAR, FAO, Member States, importing countries and other partners to strengthen and enhance the control and prevention efforts on RVF. We believe such joint efforts improve livestock trade and protect the health of the people of both regions and beyond.

I look forward to productive meeting that yield practical recommendations

Thank you

OPENING ADDRESS BY THE MINISTER OF LIVESTOCK DEVELOPMENT OF KENYA

Hon. Mohamed Abdi Kuti

Minister
Ministry of Livestock Development
Nairobi, Kenya

Dr. Masiga Walter, OIE Sub-Regional Representative for Eastern and Horn of Africa,
Dr. Ghazi Yehia, OIE Sub-Regional Representative for the Middle East,
OIE Delegates from Eastern African and the Middle East,
Distinguished guests,
Ladies and Gentlemen

It gives me great pleasure to be with you at this OIE Inter-Regional Conference on RVF that brings together renowned experts and delegates from the Middle East and Eastern African regions. I am informed that this meeting in Mombasa is a follow up on similar meetings in Rome 2011, Bloemfontein 2009 and Cairo 2007 that were held to review prevention, control and diagnostic standards for RVF. It is therefore my earnest hope that this conference will draw on the experiences of these past forums to draw recommendations to guide RVF control efforts into the future.



Secondly, may I also express my satisfaction with the theme of this conference which not only seeks to address an extremely important disease but also brings together the Eastern Africa and Arabian subcontinent, two regions of the world that have much in common shared historical, cultural and trade ties and are in a sense “joined at the hip”.

Like most of Eastern Africa, Kenya’s economy is predominantly agricultural with the livestock sector contributing 12% to the national GDP and 40% to the agricultural GDP. Livestock keeping is an important economic activity that also promotes social equity and contributes to rural livelihoods and household incomes especially in the *Arid and Semi-Arid Lands* (ASAL) where people are entirely dependent on livestock. Kenya also has a robust domestic demand for meat and also meets export demand for chilled and frozen beef, mutton and hogget in different regional and Middle East destinations.

Ladies and Gentlemen,

Kenya has not experienced any RVF related events since the last case was reported in the March 2007 outbreak that was finally resolved in June 2007, and contingency plans have been developed and continue to be refined to address the risk of its future occurrence. RVF, typical of other rare viral haemorrhagic fevers like yellow fever, Marburg and Ebola, is still not very well understood. On-going work on RVF reported in conferences such as this is therefore important and contributes to the growing body of scientific knowledge that will eventually lead to its full control and eradication.

The Government of Kenya recognizes the need to put in place programmes for diseases of economic and public health importance. In this regard, the Ministry for Livestock Development in partnership with the Ministry of Public Health and Sanitation formally inaugurated a *Zoonosis Disease Unit* (ZDU), a “one health” platform on 3rd October 2012. Since its inception in 2011, the unit has already carried out monumental work on animal and human trypanosomosis and brucellosis. RVF no doubt also represents an important test case for this unit which has the onus to sustain and build on multispectral collaborations on RVF and other zoonotic diseases.

My Ministry remains supportive of the development of mitigation measures, infrastructure, legislation and the multi-lateral framework necessary to prevent the spread of the disease through trade.

RVF causes considerable economic losses occasioned by depressed domestic demand for meat, international trade bans, cost of control measures and animal deaths and morbidity. The loss of human life that accompanies RVF outbreaks is regrettable and painful. The disease's impact would obviously be much higher if the *Disability Adjusted Life Years* (DALYs) from human morbidity and mortality were incorporated in the impact assessment studies and this necessitates the formulation of measures to achieve effective public awareness and education to address public and market anxiety and limit the impacts of disease.

Ladies and Gentlemen,

May I at this junction proceed to welcome all participants from the Middle East, Europe and Eastern Africa to Kenya's members of the OIE family of nations. Kenya also hosts the OIE Sub Regional office in Nairobi through which several regional and international conferences have been hosted including this conference for which we are justifiably proud.

Finally,

Ladies and Gentlemen,

May I take this opportunity to welcome you all to the Kenyan Coastal city of Mombasa and request you to take time off your busy schedule to enjoy its scenic attractions, serene beaches and cultural life.

I now declare this conference officially open.

OBJECTIVES OF THE CONFERENCE

Walter Masiga

Representative
Sub-Regional Representation for Eastern Africa
OIE
Nairobi, Kenya

RVF is a devastating, vector borne, zoonotic disease, first described in the Rift Valley in Kenya in 1931. Most of Africa is endemic for *RVF* which is characterised by long inter-epidemic intervals. The historical prevalence of the disease both in Eastern Africa and the Arabian Peninsula indicates that these regions are always at risk.

The cross border risks associated with *RVF* have made the disease one of the priorities of the *Global Framework for the progressive control of Trans-boundary Animal Diseases (GF-TADs)*. In order to contribute to the GF-TADs agenda, the OIE Regional and Sub-Representations for the Middle East and East Africa have included *RVF* in their action plans.

In this regard, the objective of this conference is to review the main challenges of *RVF* in relation to safe trade in animals between the HoA and the Middle East.

To this end, the recent progress made in describing, detecting, diagnosing and preventing the disease will be highlighted.

In addition, specific issues related to surveillance, diagnosis, vaccine production and development, vaccination strategies including vaccine distribution, risk analysis, regional disease behaviour and movement of animals will be addressed. Translation of these subjects into action for our two regions will be discussed first in workshop sessions.

In conclusion, the conference will deliberate and make recommendations on diagnostic tests, availability of vaccines and general research and development in line with OIE Terrestrial Manual Chapter on *RVF*.

Recommendations of previous meetings on *RVF* e.g. Rome 2011, Bloemfontein 2009 and Cairo 2007 will also be taken into account.



Session 1

The disease and
how it is controlled

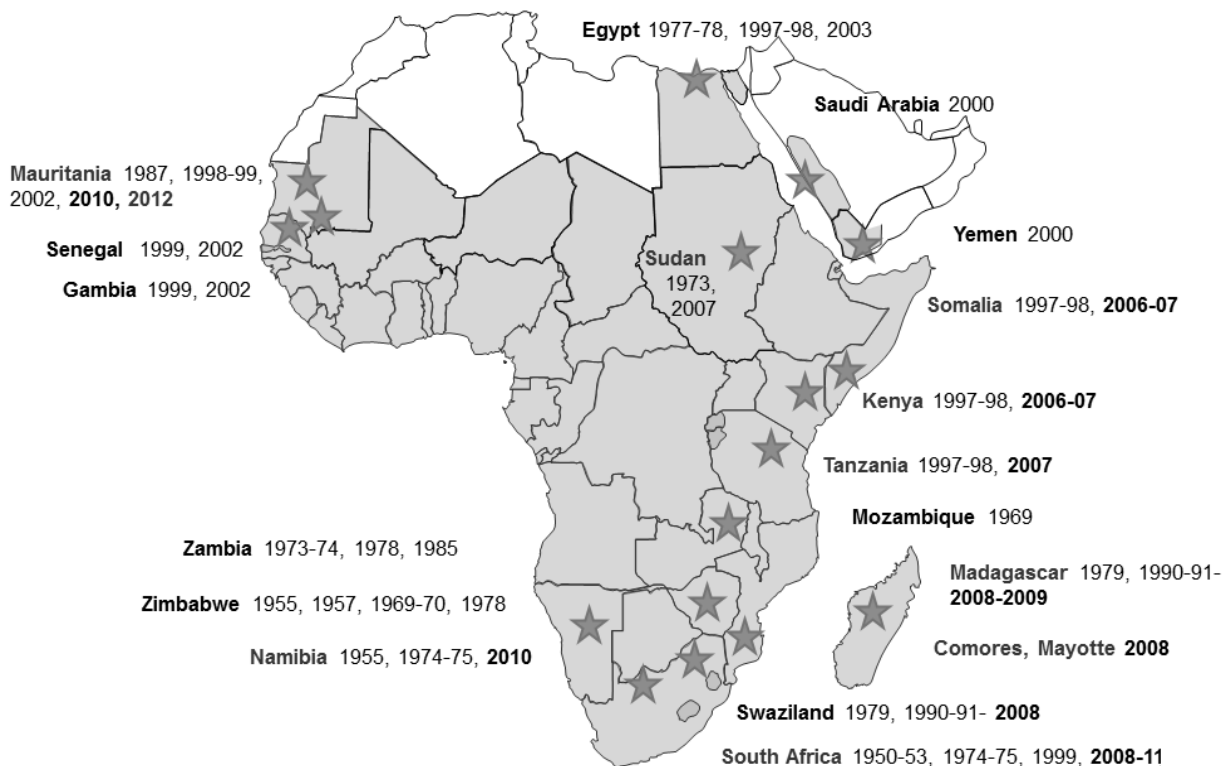
THE DISEASE EPIDEMIOLOGY IN ANIMALS AND OVERVIEW OF ITS GLOBAL SPREAD

Susanne Münstermann *, Stéphane Delarocque & Pierre Formenty

(*) Programme Officer
Scientific and Technical Department
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Paris, France

RVF is a peracute or acute disease of domestic ruminants and human, caused by a *Phlebovirus* (*Bunyaviridae*) and transmitted by vectors or direct contact with organs or fluids of infected animals. Domestic and wild ruminants are the usual hosts of the virus and the disease can produce up to 100% mortality in new-born animals, 10 to 20% among adult ruminant and abortion in pregnant animals. In human, the disease mainly develops as an influenza-like illness, but can develop as meningo-encephalitis or haemorrhagic fever.

The virus has historically been responsible for widespread and devastating outbreaks of severe disease throughout the African continent, and also extended to the Arabian Peninsula and Madagascar. RVFV was first isolated in the Great Rift Valley in Kenya in 1931, following the sudden death of thousands of small ruminants along the shores of Lake Naivasha. The disease was then reported in 1950-51 in South Africa during a large epidemic when it was estimated that 100 000 sheep died and 500 000 aborted. It was also at this occasion that the zoonotic nature of the disease was recognised; In the last decades, major outbreaks in sheep and cattle were reported in the eastern and southern part of Africa, several of them following exceptionally heavy rains: Kenya (1968, 1978-79, 1997-98, 2006), Sudan (1973, 1976, 2007), Somalia (1997-98, 2006), Tanzania (1977, 1987, 1997, 2007), Zambia (1973-74, 1978, 1985), Zimbabwe (1955, 1957, 1969-70, 1978), Mozambique (1969), South Africa (1974-76, 1981, 1996, 2009-11), Namibia, (1955)).



In most of these countries, epidemics have usually been associated with above average rainfalls at irregular intervals of 5-15 years, but minor outbreaks were also reported during the intervening years and serological evidences of the occurrence of RVF or sporadic isolation of the virus were confirming a low level circulation of the virus and the endemicity of the disease.

In contrast, in West Africa, the severe epidemic of RVF in 1987 in the Senegal river basin, extending to Northern Senegal and Southern Mauritania was not related to unusual rains, but rather to the abundance of vectors as a consequence of the newly constructed dams on the Senegal River. South of Mauritania experienced additional outbreaks of significance in 1993, 1998, 2012, while northern territories were affected in 2010. In Madagascar RVFV was first isolated from mosquitoes in a relic of primary forest in 1979 and a large outbreak occurred in 1991 and 2008. The most northerly report of RVF is Egypt where in 1977-78 a major epidemic occurred along the Nile valley and in the delta, causing an unprecedented number of 200,000 human infections and at least 594 deaths. Further substantial outbreaks were observed in the southern provinces in 1993 and 1997-98. Movement of livestock was also incriminated in the dissemination of the RVFV in the Arabian peninsula. In 2000, south-west Saudi Arabia and adjoining Yemen were affected by the disease and RVFV strains were proved to be genetically similar to those isolated from the 1997-98 outbreak in the HoA.

In addition to countries affected by these substantial outbreaks of RVF, minor outbreaks and periodic virus isolation or serological evidences of RVF occurrence have been recorded in (non comprehensive list) Angola, Botswana, Burkina Faso, Cameroun, Central Africa Republic, Chad, Djibouti, Ethiopia, Gabon, Guinea, Ivory coast, Malawi, Mali, Nigeria, Niger, Uganda, Dem. Rep. of Congo.

From the end of 2006 until now, a wave of major RVF outbreak has been reported in, chronologically Kenya and Somalia, Tanzania, Sudan, Comoros and Madagascar, Swaziland, South Africa, Namibia, Botswana, Mauretania. According to WHO, for Kenya, Somalia and Tanzania only, while officially 923 cases including 234 deaths were reported, a total of 100,000 human cases have been affected.

Ecology and epidemiology of RVF

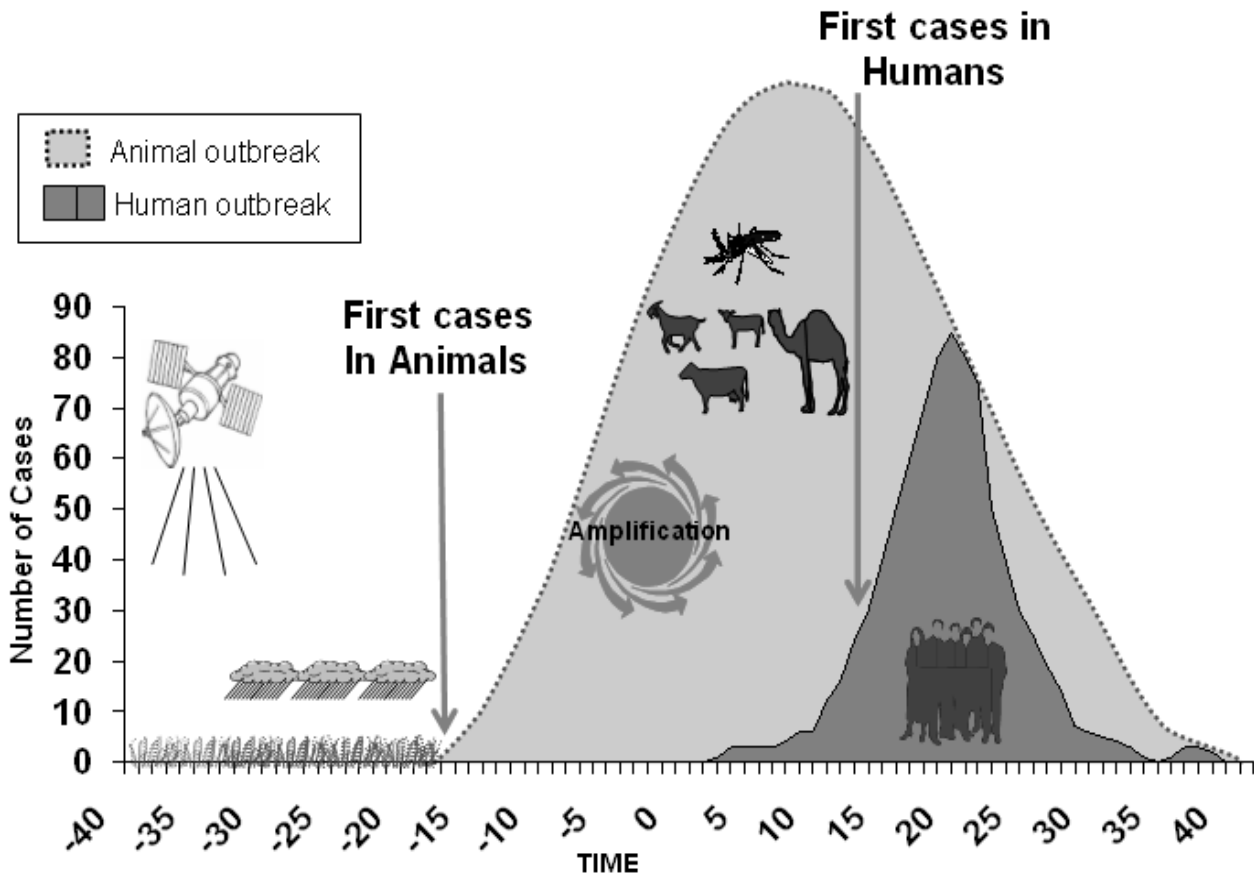
A significant number of arthropods have been listed as possible or confirmed vectors. , Not less than thirty-eight species of mosquito have been found infected in nature, of which at least thirty-five have proven their vector competence in controlled conditions. For mosquitoes only, six genera are represented namely *Mansonia*, *Anopheles*, *Coquillettidia*, *Eretmapodites*, *Culex*, *Aedes inc. Ochlerotatus*. Some species of the last two genera are considered to be major vectors. In addition, mechanical transmission has been demonstrated with other hematophagous insects, including *Stomoxes*, phlebotomies, tabanids, tsetse flies or *Culicoides* midges. The wide diversity of arthropods from which the virus has been isolated signifies different eco-epidemiological patterns and disease transmission processes in the epidemic/endemic RVF distribution area.

For decades, it has been accepted that the virus was endemic in indigenous forest, from where it was thought to spread to livestock when heavy rains favoured the breeding of vectors. The possibility that wildlife could play the role of reservoir has been further investigated. Prevalence of antibodies have been found in a few ruminant species including antelopes and African buffaloes (*Syncaerus caffer*) in East Africa and Zimbabwe, with some clinical signs In buffaloes.

Many rodents have been shown to be susceptible to RVF virus in the laboratory but do not seem to play a role in the epidemiology of RVF outbreaks. Today, the conclusion is still that wild ruminants can play a role during outbreaks, but the existence of a wild reservoir still needs to be demonstrated.

Endemic versus epidemic

RVF virus is known to be circulating in a variety of bioclimatic conditions, with different epidemiological patterns. Suitable ecotypes include wet and tropical areas (e.g. Ivory Coast and Congo), hot and arid areas (e.g. Mauritania or Chad) and irrigated regions (e.g. the Senegal River valley and the Nile Delta). In most of these areas, RVF virus activity is cryptic and at a low level. As a result, many countries are not really aware of its circulation in animals in the absence of specific surveillance activities. However, during active surveillance investigations, many African countries have been able to detect significant sero-prevalence in sheep, goats and cattle for the RVF virus without clinical signs being reported in humans or in animals.



Dynamic of a RVF outbreak. Pierre Formenty (WHO)

How the virus is able to survive the inter-epizootic period is not always clear. In wet or irrigated areas, low level virus circulation may persist all year round as a result of permanent vector populations. In more arid areas, there are different hypotheses regarding the maintenance of RVF, including (i) low level of circulation in livestock without notable clinical signs ; (ii) persistence of the virus in mosquitoes eggs. From studies on mosquito ecology in areas known as hot spots for RVF in Kenya, it has been shown that female mosquitoes of *Ae. mcintoshi* transmit the virus to their descendants by vertical transmission. The eggs are laid in the wet soil of temporary ponds where they are capable of surviving for several years once the soil dries. Subsequent flooding of these areas results in a mass hatching of mosquito eggs, some of which are infective; this then leads to a new outbreak of disease. Once infection has been amplified in naïve livestock, secondary epidemic vector mosquitoes that breed in semi-permanent pools of water and get infected by biting infected vertebrates can become involved in transmission and some, like *Culex* sp., serve as excellent secondary vectors if immature mosquito habitats remain flooded for long enough.

It is anticipated that other species from the *Aedes* genus may have the same capacity to act as reservoir for the virus. It is also interesting to note that not all but about 60% of the *Aedes* eggs hatch when flooded, the other ones remaining available for hatching during the next immersion in water. Studies conducted in the sahelian Ferlo region of Senegal demonstrated that several generations of *Aedes vexans* can emerge during the same rainy season, depending on the succession of rains and dry periods and consecutive changes in the water levels of temporary ponds. This mechanism is thought to maintain low but regular circulation of RVF virus, reflected by very low incidence rate of RVF infection in livestock every rainy season. Results of long-term active surveillance systems, using sentinels herds, confirm the circulation of the virus every year.

In conclusion, the natural history of RVF is not fully understood and several transmission modes exist or co-exist. The cycle includes several actors, i.e. livestock, wild animals, humans, vectors, and is modulated by environmental factors. All these make the prevention, prediction and control of the disease challenging, as the amplification of the virus is very rapidly out of control and then difficult to stop.

Q & A

The Representative of Egypt, Dr Atef Elgorbagy, provides some more detail on the RVF situation in his country. The first outbreak occurred in 1977 and the source of the outbreak was human infection. No animal source was ever identified. Furthermore, he argues that the construction and subsequent flooding of the Assouan Dam was unrelated to these outbreaks.

The Representative of Sudan, Dr Khidir El Faki, points out that the line-Ministry mentioned in the presentation is now called *Ministry of Livestock and Fisheries*.

Dr Chip Stem (Livestock Trade Services, Ltd) wonders whether the massive epidemic RVF outbreaks in western Africa were imported from other regions or whether the virus had already be silently circulating ?

In her reply, Dr Susanne Münstermann confirms that she did not suggest that the virus moved from southern to western Africa.

KEY RECOMMENDATIONS FROM PREVIOUS IMPORTANT RVF MEETINGS

Susanne Münstermann & Vincent Martin*

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RVF has been the subject of several previous conferences and meetings, which underlines its importance as one of the priority diseases with enormous economic impact for Africa and the Middle East. The disease has been identified by the *Global Framework for the progressive control of Transboundary Animal Diseases* (GF-TADs) as a priority diseases and has therefore been inserted into the five Year Action Plans for the two regions concerned.

A summary of the recommendations of some of these events and the GF-TADs Action Plan were presented and participants were encouraged to come up during their discussion at this Conference with new recommendations that address the identified problems with suitable proposals.

Cairo, Egypt, 2007: <http://www.oie.int/doc/ged/D4246.PDF>

Participants in the Conference came from North and East Africa and the Middle East and the Agenda was similar to the Mombasa meeting.

Recommendations related to:

- Develop Surveillance Guidelines for vector borne diseases
- Provide training and technical assistance to affected countries
- Promote Good Veterinary governance
- Develop diagnostic tests and vaccines
- Develop regional control strategies under GF-TADs
- Develop prediction models at sub-regional level
- Improve communication between OIE, FAO, WHO and national MoH and MoA (*One Health* concept)
- Import/export to be governed by standards in the OIE Terrestrial Code
- Promote the use of the intra-regional trade health certificate as developed in Cairo 2004

Bloemfontein, South Africa, 2009 : http://www.rr-africa.oie.int/en/en_index_annex19.html

Participants in this Conference came from East and Southern Africa and the Agenda was similar to the Mombasa meeting.

Recommendations related to:

- Promotion of Good Veterinary Governance
- Ecological sub-regions with similar risk characteristics to define harmonized preventive measures
- OIE & FAO to support research and development of diagnostics and vaccines
- Research on epidemiology and the role of wildlife in Southern Africa
- Socio-economic impact of disease outbreaks to be studied and communication strategy to be developed

- Strengthen inter-sectoral collaboration (One Health concept)
- Southern African countries to prepare emergency preparedness plans
- Countries to comply with reporting obligations to WAHIS
- OIE to update Manual and Code chapter
- Strengthen laboratory capacity in national laboratories
- OIE to support twinning on RVF to have a 2nd Reference Laboratory in the Region
- SADC countries to develop forecast capacity
- SADC to develop Regional RVF control strategy
- OIE to consult with WHO to promote research for human vaccine development



Participants at the 2009 Bloemfontein seminar (South Africa).

FAO-WHO expert consultation on RVF outbreak forecasting models, Rome, Italy, 2008 :

http://www.who.int/csr/resources/publications/WHO_HSE_GAR_BDP_2009_2c.pdf

A group of experts came together to share experiences, identify gaps and explore potential improvements in RVF outbreak models. The objectives of the workshop were to review the natural history of RVF, review the forecasting models and risk distribution maps available and being developed, and propose how these tools might be improved.

Recommendations related to:

- The accuracy of RVF potential major outbreak area maps should be increased in order to improve forecasting models
- The specificity of RVF forecasting models should be increased

- Models should be improved in space and time; an alert signal should be sent six months before the start of an animal outbreak
- RVF forecasting models should be used in combination with livestock trade/movement data
- The participation of Ministries of Meteorology, Ministries of Health should be encouraged

GF-TADs meeting on RVF vaccine development, Rome, Italy, 2011 :

<http://www.fao.org/docrep/014/i2310e/i2310e00.pdf>

The aim of this meeting was to discuss how the most promising RVFV vaccines can be selected and commercialized. Desired characteristics with respect to safety and efficacy were established, and the advantage of using DIVA vaccines was discussed. The conclusions that emanated from the discussions were used to formulate recommendations to the scientific community, policy-makers and industry, which aim to facilitate global preparedness for future RVFV incursions.

Recommendations related to:

- The relative risks and benefits of RVF vaccination in the face of an outbreak should be evaluated to inform FAO and OIE, and allow them to make the most appropriate recommendations for the integrated control of RVF
- Encourage the development of a strategy for a global vaccine stockpile for use in RVF-endemic areas and emergency vaccination campaigns
- Evaluate the benefits of multivalent vaccines to increase uptake of RVF vaccines in specific at-risk populations
- Second generation of live-attenuated vaccines holds great promise, e.g. Clone 13 in South Africa
- Use of viral vectors for the control of RVF is a promising approach
- DNA vaccines in combination with MVA (*Modified Vaccinia Ankara*) vectors
- Explore potential of next generation vaccines to be used as DIVA vaccines

GF-TADs Five Year Action Plan for Middle East and Africa, 2012.

RVF is mentioned in both regional actions plans as priority disease:

- Middle East: FMD, Brucellosis, RVF
- Africa: PPR, FMD, CBPP, RVF, Rabies

Expected Results:

- Further spread of RVF in the region is prevented
- RVF is progressively controlled in countries where the situation is endemic
- RVF is actively monitored and controlled in countries where cases

Session 2

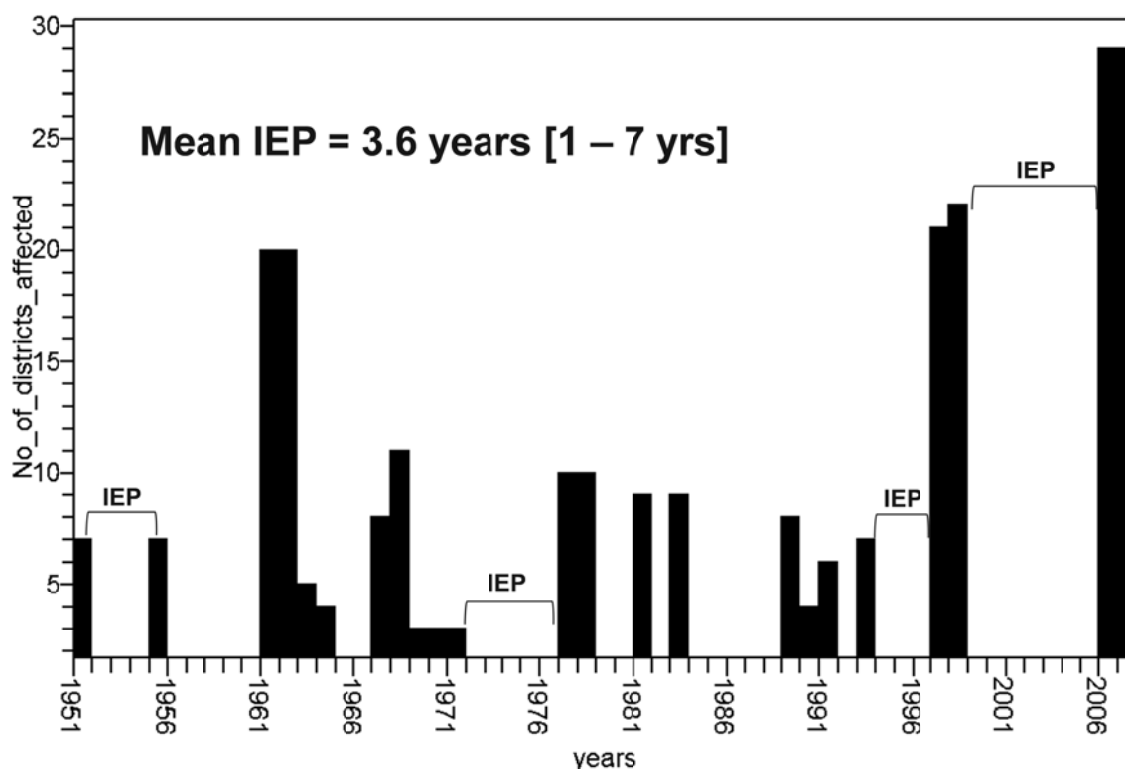
Current situation of RVF in Eastern Africa and the Middle-East

RVF IN EAST AFRICA – AN OVERVIEW

Kariuki Njenga

Virologist
Head, One Health Programme
Centers for Disease Control and Prevention
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Atlanta, Georgia and Nairobi, Kenya

RVF-like disease in livestock was first reported in Kenya in 1912 and RVF virus isolated from sick animals in the same country in 1931. Subsequently, the disease spread to many countries in all regions of the African continent, and for the first time outside Africa to the Arabian Peninsula (Saudi Arabia, Yemen) in 2000. Severe epidemics resulting in high fatalities in humans have been reported in Egypt, Eastern Africa (Kenya, Somalia, and Tanzania), Mauritania, Sudan, republic of South Africa, Madagascar, Saudi Arabia, and Yemen. In Kenya, a total of 38 of the 69 (55%) administrative districts located in 6 of the 8 provinces had reported RVF epizootics by end of 2007. The Western and Nyanza provinces, located on the South western region of the country had never reported RVF infections by 2007. Between 1951 and 2007, Kenya reported 11 national RVF epizootics (defined as outbreak in ≥ 3 administrative districts) with an average inter-epizootic period of 3.6 years [range = 1 -7 years]; in addition, all epizootics occurred in years when the average annual rainfall increased by more than 50% in the affected districts. The probability of a district being involved in a national epizootic was 5-fold higher if the district had previously reported disease when compared to a district that had no prior disease activity. Severe RVF epidemics in Eastern Africa occurred 1997-1998, and again in 2006-2007 that affected Kenya, Somalia and Tanzania, which were characterized by an outbreak that started in the Northeastern province of Kenya in November and ended with the last cases reported from the North central region of Tanzania in June of the following year.



History of RVF Epidemics in Kenya : 1952-2007.

Reproduced from : Murithi et al, Epidemiol Infect, May 2010

In Kenya, severe human disease was reported in 3 foci, Garissa/Ijara Districts in Northeastern province, Kilifi and Malindi districts in Coast Province, and Baringo District in Rift Valley Province. In Somalia, disease was reported in two foci in the South-western region of the country, in the Middle and Lower Juba regions, and Gedo region. In Tanzania, severe human disease was reported in the two North-central regions of the country, Arusha region and Dodoma region.

A study in Kenyan wildlife reported high prevalence of RVF virus neutralizing antibodies in sera collected from 16 ruminant wildlife species, including African buffalo, black rhino, lesser kudu, impala, African elephant, *kongoni*, and waterbuck. In contrast, sera from lions, giraffes, plains zebras, and warthogs were negative. These data provided evidence that wild ruminants may get infected by RVF virus but further studies are required to determine whether these animals play a role in either the virus maintenance between outbreaks and virus amplification prior to a noticeable outbreak. Studies conducted during interepizootic periods show that up to 18% of sheep and 3% of goats born during the 1999-2006 interepizootic period become seropositive for IgG against RVF virus before the next epidemic. Taken together, these results suggest that in addition to maintenance in the eggs of *Aedes* mosquito species, the RVF virus may also be maintained through a sylvatic cycle involving vertebrates during interepizootic periods.

Genetic characterisation of RVF viruses isolated during the 2006-2007 epidemic in Eastern Africa confirmed previous findings that the RVF virus is highly conserved with less than 5% differences in nucleotide sequence homology, suggesting that a safe and efficacious monovalent RVF virus vaccine is likely to be effective in all regions of the world. In addition, the data revealed three distinct lineages of the viruses, Kenya 1a, Kenya 1b, and Tanzania 1 virus lineages, within and across distant geographic outbreak foci. Detailed analysis of amino acid sequences of key viral proteins revealed unique patterns of substitution among the isolates from each outbreak foci. These findings suggest that during RVF epidemics, the virus is independently activated or introduced in each outbreak foci. Therefore, banning livestock movement in one region of a country experiencing an RVF outbreak, while important, may not prevent outbreaks in other permissive foci in the country.

Q & A

The representative from PANVAC, Dr. Karim Tounkara asks whether any attempts were made at isolating virus from the vectors.

Dr. Njenga replies that KEMRI did some work during non-epidemic periods and concluded that it was close to impossible to isolate viruses from the vectors. This being said, it may in future serve as an early warning indicator of extension, once the outbreak has started.

RVF IN KENYA – A COUNTRY PRESENTATION

Peter Maina Ithondeka

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Kabete, Kenya

RVF is caused by a virus in the genus *Phlebovirus* of the *Bunyaviridae* family. The principal disease hosts for *RVF* in Kenya are exotic breeds of sheep and cattle and their crosses (Scott, Weddel, and Reid, 1995; Davies, 1975). The virus replicates in mosquitoes and in vertebrates. Genetic characterisation suggests that all strains are closely related.

A disease fitting *RVF* description was first described in Kenya in 1910 by Montgomery. It is believed that the disease might have occurred in 1913 because an outbreak fitting the description of *RVF* was associated with heavy mortalities of sheep in the Rift Valley (Bres, 1981). The *RVF* virus was first isolated and characterised in 1931 close to Lake Naivasha in the Kenyan Rift Valley where about 4700 ewes were infected (Daubney, Hudson and Garnham, 1931). In an outbreak that followed the El Niño rains of 1997, 27,500 people contracted the disease in Garissa District (Wood, Peters, Spertzel and Patrick, 2002).

During a recent *RVF* outbreak in Kenya that was first recognized in December 2006 and apparently ended in March 2007, *RVF* was detected in 36 out of the 70 Kenyan districts. The outbreak resulted in 684 reported human cases and 162 deaths.

Socio-Economic Impacts of RVF

During outbreaks of *RVF*, livestock and meat exports are immediately banned, causing massive losses to the livestock industry. Other financial losses arose from livestock deaths, abortions, slaughter restrictions, decreased demand for meat, depressed prices and disease control costs. Total costs inclusive of control were estimated at USD 54 million.

Diagnostic tests for RVF

- *RVF* inhibition ELISA
- Capture enzyme-linked immunoassay for the detection of *RVF* IgM
- Antigen detection (AGID, IF)
- RT-PCR detection of viral RNA
- Virus isolation (Mouse Inoculation, TC)
- Antibody tests (HAI, VN, ELISA IgM, IgG)
- Histopathology, immuno-histochemistry



Vaccination against RVF in Kenya

Critical Decision Making Points in RVF Outbreak Cycle

The average duration between critical events that should serve as decision points for disease prevention and control actions are as follows:

- Onset of heavy rains and mosquito swarm: 33.1 days,
- Mosquito swarm and first animal case: 19.2 days,
- First animal case and first human case: 21 days
- First human case and medical service intervention: 35.6 days
- First medical service intervention and first veterinary intervention: 12.3 days
- First animal case and veterinary service intervention: 68.9 days

The decision-making process in RVF cycles involves balancing the lack of perfect information with the need to take a decision to avert losses due to failure to take action during RVF interventions. If the decision is taken too early with scant information available, the likelihood of taking a wrong decision is increased and costs will result from inappropriate or unnecessary activities. On the other hand, if a decision is taken too late, the opportunity to intervene effectively may be lost, leading to unmitigated impacts. Thus, the decision-maker has to balance the risks of over-reacting against those of under-reacting (ILRI, DVS, 2007).

Kenya has adopted vaccinations in the high risk RVF areas whenever flooding is predicted. In case of an outbreak, vaccination is immediately extended to medium risk area. Vaccination is not recommended in low risk areas that are free of the disease due to the risk of reversion to virulence of the live attenuated vaccine. The hot spots vaccinations based on the 2010 FAO forecast on RVF prevented disease outbreak in Kenya as evidenced by the high IgG antibodies demonstrated.

RVF Serology Results from past outbreaks in Kenya

A seroprevalence survey involving 571 camel sera was conducted after the 1979 RVF outbreak in the northern and coastal areas of Kenya. Only 22 (3.9%) seroreactors from Galana in the coast were detected (Davies et al; 1984). Scott et al; (1963) had earlier reported the presence of neutralizing antibodies to RVF in camels from Garissa and Marsabit districts of Northern Kenya.

In the 2006-2007 RVF outbreak that occurred in the drier semi desert parts of Kenya, serological tests showed that camels, sheep, goats and cattle were sub clinically infected (ILRI DVS, 2007). A total of 100 donkeys were sampled in Marigat and Ijara Districts of Kenya 2011 and 3 were positive for RVF in the Marigat cohort.

Specimens from 7 wildlife species had detectable neutralizing antibodies against RVFV i.e. African buffalo, black rhino, lesser kudu, impala, African elephant, *kongoni* and waterbuck. 249 sera samples collected and tested during the 2006/2007 RVF outbreak. 84% of the ruminant specimen had RVFV neutralizing titres of $\geq 1:80$.

Studies were carried out in 1979 using 171 bird sera (Davies, 1979) to check if RVF produced viraemia or neutralizing antibodies in birds. Only 3 of Ploceus weavers tested contained specific antibodies to RVF.



Ploceus weaver (Black-necked Weaver or *Ploceus nigricollis*)
Picture © www.joniecnaturalnie.com

Challenges in RVF Control

RVF typically has a long (10-15 year) inter-epidemic cycles. This leads to loss of disease recognition institutional memory as personnel involved in control of an ongoing outbreak are likely to have left service by the time of the next outbreak which hampers early disease recognition and extends lead time to necessary intervention. RVF vaccine has a shelf life of 4 years which necessitates the destruction of huge volumes of strategic stocks during inter-epidemic periods occasioning financial losses and audit queries. There is also low commercial incentive to produce by vaccine institutes and acquiring sufficient volumes in a short time is not assured especially when there are simultaneous threats across many countries.

RVF IN SOMALIA – A COUNTRY PRESENTATION

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(*) Project Manager
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Somalia is largely dominated by arid and semiarid rangelands for which pastoralism is the most appropriate form of land use. The livestock sector accounts for over 40% of the GDP and provides the main source of Somali livelihoods. Export of livestock and their products account for 80% of the exports in normal years. The Somali livestock export trade has thrived for hundreds of years with minimal interruptions. However, in the recent past, livestock exports have been periodically interrupted by bans imposed by importers citing presence of RVF in Somalia and the neighbouring countries.

RVF, first identified in the 1930's in sheep and cattle farms in the Rift Valley in Kenya, is a zoonotic disease caused by a vector-borne virus that belongs to the genus *Phlebovirus* in the family *Bunyaviridae*. The virus is thought to persist in the environment through vertical transmission in certain floodwater *Aedes* mosquito species. RVF outbreaks where there is enzootic virus activity and susceptible hosts are strongly linked to excessive rainfall and flooding that drives vector amplification.

RVF virus has gradually expanded its geographical range and the 1997/98 El Nino associated epizootic of RVF in Northeastern Kenya also occurred in Somalia. This epizootic represents the first official record of RVF in Somalia and was confirmed in humans in the flooded areas delimited by

the towns of Belet Weyne and Jowhar along the Shabelle River. In 2006/2007 the RVF epizootic in Kenya and was also confirmed in humans and livestock in many regions of Somalia including Gedo, Lower Juba, Middle Juba, Lower Shabelle, Middle Shabelle and Hiran. The 1997/98 and 2006/07 are the two most recent outbreaks of RVF in Somalia. Clinical disease in sheep, goats and cattle has been confined to epizootics and the first year following an epizootic. Serological evidence indicates that RVF virus circulates in sheep and goats in varying extent in the pastoralist areas and in the Juba and Shabelle river basins in central and southern Somalia. Ongoing sentinel surveillance for RVF virus activity in sheep in Middle Shabelle and Nugal valley provides more evidence for virus circulation in domestic ruminants during inter-epizootic period. Preliminary results show sero-prevalence of 2.6% in Middle Shabelle sentinel sites and 3.4% in Nugal valley indicating low RVF virus circulation. Monitoring of the sentinel flocks has been enhanced in the period preceding the forecasted El Nino 2012.



Quarantine facility in Berbera.

Though livestock trade between Somalia and the Arabian Peninsula has been going on for hundreds of years the RVF epizootic of 1997/98 in the HoA heralded a wave of livestock import bans initially imposed by Saudi Arabia and later by other importers in the Arabian Peninsula. In September 2000 an outbreak of RVF was confirmed in the Kingdom of Saudi Arabia and Yemen, two major importers of livestock from Somalia. RVF infection and disease in humans and ruminants has subsequently been recorded in Saudi Arabia on several occasions. The livestock export ban imposed in 2000 remained in force even during prolonged RVF inter-epizootic periods in Somalia until November 2009 when Saudi Arabia lifted it. The livestock import bans severely eroded the livelihoods of Somali people. Consequently, RVF remains one of the most dreaded animal disease in Somalia.

Prevention and control of RVF in endemic areas remains a huge challenge in many countries including Somalia. The Somali veterinary authorities in collaboration with animal health service providers in the private sector undertake general surveillance for all animal diseases including OIE listed diseases and submit 6-monthly reports to the OIE. No clinical RVF has been reported during the inter-epizootic periods. Due to concerns raised by livestock importing countries RVF vaccination was not carried out either before or after the epizootics of 1997/98 and 2006/07. Enforcing livestock movement controls in the pastoralist areas of Somalia is almost impossible. Non-governmental organisations (NGOs) including the Somali Animal Health Services Project (SAHSP) working in the outbreak areas in Somalia played an important role in raising public awareness on how to minimize risk of virus transmission to humans and livestock. In addition, SAHSP supported development of RVF contingency plans for Somaliland, Puntland and for central and southern Somalia. However, due to the prevailing political, financial and technical constraints implementation of RVF emergency preparedness plans in Somalia remains a daunting task.

Q & A

Dr. Cyprien Biaoua from FAO - Somalia thanks the speakers. He informs the audience that this year there have been some floods in Somalia along the *Shabele* river, with no confirmation from *Juba* river. This, he argues, seems like a high risk situation. Is there any action that SAHSP has anticipated to take ? Dr Rwambo responds that he is waiting for sample analysis but that *a priori*, it is indeed a high risk situation.

RVF IN THE MIDDLE EAST – AN OVERVIEW

Ghazi Yehia

Representative
Regional Representation for the Middle East
OIE
Beirut, Lebanon

RVF, a disease known to have occurred in the Sub-Saharan countries of Africa, was introduced to the Arabian peninsula (Saudi Arabia and Yemen) for the first time in 2000. It was of particular concern because of its impact on public health, causing human suffering and mortalities; and on trade because of import bans targeting livestock from countries of the HoA, imposed by the Gulf countries of the Middle-East.

Based on the ecological conditions enhancing RVFV activity, other areas in the Middle East could be at potential risk.

Controlling and minimising the threat should be based on compliance with OIE standards of good governance of the veterinary services (legislation, policies and resources) and on a surveillance mechanism, including a contingency plan, an early warning system, depending some time on climate change parameters, are to be established.

Also surveillance strategy should be targeting all susceptible species and include vector control.

RVF outbreaks have a major impact on trade. Proper measures need to be put in place to mitigate the risk, on the basis of measures described in the OIE Terrestrial Animal Health Code in order to avoid excessive disruption of trade.

Specific health certificates were proposed as a specimen, to regulate and safeguard trade of livestock and animal products between the two trading regional partners.

RVF IN YEMEN – A COUNTRY PRESENTATION

Shaif Abdo Salem Abdullah, Mansour Al-Qadasi, Khalid Saeed*

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RVF is an arboviral disease caused by *Bunyavirus* of the genus *Phlebovirus*. Several species of *Aedes* and *Culex* mosquitoes are the vectors of this virus that affects sheep, goat, buffalo, cattle, camels but also humans. Until 2000 the disease was only described in Africa; then outbreaks were declared for the first time outside of Africa, in the Kingdom of Saudi Arabia and Yemen (2000-2001); animal and human cases were recorded.

The outbreak started on the coast of Tihama (Az-Zuhrah district, Al-Hodeidah governorate) and led to about 21,862 abortions in animals cases and 6,653 animal deaths between September 2000 and February 2001¹. On the human side, this outbreak led to about 1,080 human cases including 141 fatal cases. It started with an abortion storm: up to 90% of pregnant animals were affected. Neither the veterinarians nor human health care have had experience with RVF control as it emerged for the first time in Yemen.

Table 1. Estimated economic impact of RVF outbreak in Yemen in 2000-2001

Sector	Losses (in million USD)	% annual GDP (PPP) <i>Purchasing power parity per cap.</i>
Trading	50.0	0.400
Livestock industry	15.0	0.100
Vector Control	0.3	0.002
Public health (death only)	12.0	0.100
Tourism	30.0	0.200
Total	107.3	0.800

Source : Handlos M. Assessment of the estimated costs of past disease outbreaks in Yemen. Sana'a, Yemen, 2009. ICON-INSTITUT Public Sector GmbH and Jules van Lancker Consulting publication no IDA CR. No. 4220 YEM

RVF was first confused with malaria and dengue fever for which Tihama is an endemic zone². Despite the quick reaction of government and international organisations, such as the FAO, the OIE, the *International Atomic Energy Agency* (IAEA), the *World Health Organisation* (WHO) and the U.S *Naval Medical Research Unit 3* (NAMRU-3), the socio-economic impact of the RVF outbreak in Yemen was dramatic³. Impacts were felt by traders, importers, middle men and small retail distributors. It affected all sectors of society.

¹ Alqadasi, M. *Rift Valley Fever outbreak in Yemen, Sept3ember 2000 to February 2001*. In *27th World Veterinary Congress*. 2002, Tunisia, Tunis.

² Davies, G.f. *RVF in Yemen*. 2000, FAO, Rome, p.8

³ Handlos, M. *Summary assessment of the estimated costs of past disease outbreaks in the country*. 2009. ICON & JVL Consulting. Sana'a & Vientiane. P. 34

It took time to regain the confidence of consumers in animal products. Yemen is one of the main importers of livestock from the HoA. Twenty-five to 40% of total meat consumed annually is imported⁴. In addition Yemen has a unique geographical position in the Arabian Peninsula as it is situated only a short distance from the HoA; it has a long history of animal trade and human movement with the HoA as well as a crossroad for animal trade for the Arabian Peninsula and Gulf countries.

Nevertheless, even if animal trade over the red Sea has a long history, such an epizootic of abortions and deaths in animal had never been reported in Yemen before 2000. Indeed, a retrospective study conducted on 264 serums samples from the serum bank of 1996/97 from outbreak area of Tihama Waides revealed that all samples were negative⁵

Table 2. RVF (active) surveillance and laboratory testing results for 2010 – 2011.

Governorates	Surveillance results 2010				Surveillance results 2011			
	Inhibition ELISA		IgM ELISA		Inhibition ELISA		IgM ELISA	
	Tested	Pos	Tested	Pos	Tested	Pos	Tested	Pos
Al-Hodaidah	93	-	19	-	59		1	
Hajjah	8	7	7	6	-	-	-	-
Hadramout-Q'tine	59	-	-	-	30	-	-	-
Taiz – Quarantine	302	11	157	2	460	13	22	10
Total	462	18	183	8	549	13	23	10

Yemeni Veterinary Services did not declare any RVF outbreak since 2000⁶. Yemen is not using vaccination to control RVF but it applies active surveillance in targeted risk areas using few sentinel herds as indicators for the circulation of the virus.

Q & A

The Representative from Yemen, Dr Mansoor Al Qadasi provides some additional information on the outbreaks on the Arabian peninsula (between 2000 – 2001). Lots of studies were conducted (serum bank) since 1997 and all were negative for RVFV. There is therefore no historical evidence of RVF in Yemen. The East Africa outbreaks between 1997 – 1998 are widely believed to have brought the disease to the Peninsula through trade. Since 2000 there have been no clinical cases, despite active clinical surveillance. In between 2006 – 2007 some positive cases were found in quarantine. Again, the detection of positive cases or samples was linked to outbreaks in East Africa. Studies between 2005 and 2009 have again demonstrated that there is no endemicity of RVF in Yemen, though these results still need to be statistically validated.

⁴ ARD, *Livestock movement and trade study for the Yemen agricultural support program*, 2006, ARD, Inc. Burlington 2006. P. 51.

⁵ Alqadasi.M. *RVF outbreak in Yemen Sep 2000/March 2001 and surveillance follow up. In An integrated approach to controlling RVF in Africa and Middle East.*. 2009. Cairo, Egypt.USAID.

⁶ Abdo-Salem, S. et al., *Risk assessment of the introduction of RVF from the Horn of Africa to Yemen via legal trade of small ruminants*. Trop Anim Health Prod., 2010.

RVF IN SAUDI ARABIA – A COUNTRY PRESENTATION

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In September 2000, an epizootic of RVF was identified in southwest Saudi Arabia following the confirmation of cases in humans. These were accompanied by abortions in livestock in the affected area. A staggering 683 human patients were hospitalized, of whom 95 deceased (13.9%). Approximately 76% of the human patients had close contact with animals. The 2000 outbreak was the first to be recorded outside the African Continent.

After virus isolation and sequencing, epidemiological data obtained from the CDC revealed that the KSA virus had close antigenic relation with the 1998 virus in Kenya and the HoA. Since there were numerous activities related to the importation of live animals from the countries of the HoA, it was suggested that the virus was introduced to KSA via these animals.

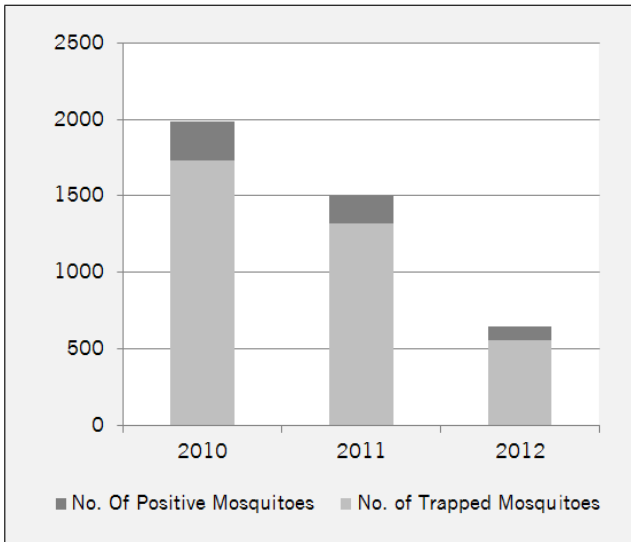


In response to the RVF outbreak, restrictions on animal importations from the African countries, recognized as endemic for RVF, was implemented. In Saudi Arabia itself, restriction of animal movement was implemented in the affected areas which included Gazan, Aseer & Tohamet Mekkah as well as the surveillance zone in Najran and Albaha Provinces. This was combined with massive vaccination of all livestock in the infected areas, as well as the implementation of intensive screening and stamping out procedures.

Ground spraying using foggers. Picture © Ministry of Agriculture, Kingdom of Saudi Arabia

Meanwhile, a massive campaign of vector control had been started immediately using airplanes, fog and sprinkle sprayers in the rural farms, cities and villages in the infected areas. Moreover, activities of draining and filling of water swamps were initiated. The outbreak which started in September 2000 in Gazan Region ended with the last reported positive case in April 2001 in the same region. The total number of animal positive cases was 398, 174 and 41 in Gazan, Aseer and Tohamet Mekkah regions respectively. By the end of the outbreak, there had been cases diagnosed in 154 sheep, 188 goats, 12 bovines and 3 camelids in Gazan region alone. It is worth mentioning that goats had the highest infection rate in all regions.

In the years that followed (2002 - 2004) monitoring and active surveillance activities included vaccination of newborn animals under 6 months, active disease surveillance in local herds, clinical and serological examination of clandestine imports at *Al-Twal* quarantine station at the border with the Republic of Yemen, regular examination and serological testing of sentinel herds distributed in different localities of the infection zone, random collection of serum samples from susceptible animals, RVF virus detection in periodically collected mosquitoes using molecular techniques, and sero-monitoring of vaccinated animals. Vector control included various types of aerial and ground spraying, as well as the use of traps and larvicidals.



Results of vector monitoring (numbers and infection rates) between 2010 and 2012.

All these measures resulted in drastically decreased numbers of IgM and IgG positive reactors. Active surveillance in “loophole” animals, conducted in 2010 revealed that there were still positive cases (both IgG and IgM were detected). “Loophole animals” are animals illegally introduced from the HoA and the Republic of Yemen. Active surveillance in sentinel herds demonstrated that there was still active circulation of virus in the endemic area (both IgG and IgM were detected).

By 2012, only IgG’s were detected in loophole animals, whilst sentinel herds continued to pick up virus in the area (IgM was detected). No clinical cases were observed in any of the IgM positive reactors. The vector monitoring programme revealed that there is a decrease in the numbers of trapped mosquitoes over the last three years. Moreover, there is a decrease in PCR positive mosquitoes.



*Mosquito traps, used for vector control and monitoring
Picture © Ministry of Agriculture, Kingdom of Saudi Arabia*

In conclusion, screening of sentinel herds reveals that there is still active virus in the area but the situation is under control due to the control activities applied (vector control and vaccination). The vaccination of young animals (less than 6 months) must continue because of apparent virus – circulation in the area. Also, clinical examination at livestock markets and farms is to be continued and intensified in case of positive reactor animals in sentinel herds or loophole animals. Loophole animals continue to present a major hazard for the control programme as 70% of the positive reactors identified over the last 3 years were loophole animals. In spite of the environmental impact of the insecticides, the vector control programmes must be pursued in case of increase in rainfall, but alternative control activities are under study.

Session 3

Impact of RVF on trade

RVF TRADE REGULATIONS IN THE OIE TERRESTRIAL CODE

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As one of the main objectives of the OIE is to safeguard international trade and prevention of global disease threats, standards have been set by the General Assembly of OIE Delegates, based on the need to enable developing/in transition countries to apply the standards for disease control, disease risk mitigation and improvement of capability to control trade in animals and animal products.

One of the constraints for trade in livestock between Middle Eastern countries and the Horn of Africa is the periodical occurrence of RVF outbreaks.

The presentation summarizes the relevant OIE standards to be used as guidance for trade between the two regions.

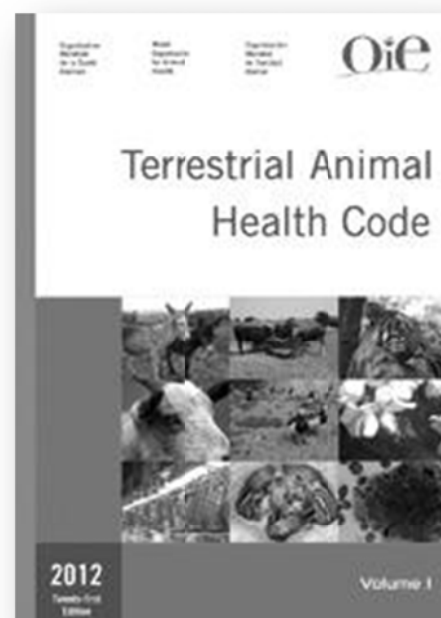
These standards (OIE *Terrestrial Animal Health Code*, 8.11 and OIE *Manual of Diagnostic Tests and Vaccines*, 2.2.14) describe:

1. How to define RVF infection and to what species it is applicable;
2. How to declare a country or zone as disease free and how to regain the free status after a RVF outbreak;
3. Standards for the diagnostic tests and vaccines;
4. Standards for virus inactivation;
5. Guidelines for surveillance and how to mitigate risk for trade;
6. Guidelines for slaughter of animals and disposal of carcasses.

The presentation addresses also complementary standards on the evaluation of the capability of the veterinary services to control the disease (PVS tool), to report and notify in case of occurrence of the disease, risk management and export certification.

The factors of emergence and re- emergence to be considered when developing and implementing a disease control policy for RVF, such as climate and weather conditions, international commerce and travel, globalization of agriculture and trade and changing host susceptibility are also discussed.

The Code Chapter 8.11 on RVF is presented in detail, with a RVF disease status decision tree for life animals and animal products as the summary.



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More than just moving animals...

Livestock export from the HoA to the Arabian Peninsula is a trade deeply rooted in tradition and culture. This trade has flourished for many hundreds of years, perhaps thousands, following the seasonal winds and historical trade routes of the Middle East – HoA region. Livestock, in particular camels, sheep, and goats play important roles culturally among the Muslim communities of each side of the Red Sea and thus are far more important than their inherent value as a food source.

The Red Sea forms the dividing line between these two closely knit regions that historically were joined giving its shores similar soil types, climates, and agroecological zones. This enables the same diseases of livestock and humans to gain a foot hold on each side, creating outbreaks and epidemics and often leading to diseases becoming endemic on both sides of the Red Sea.

This trade can be slowed, but it cannot be stopped.

Trade in the 20th century

Beginning in the 20th Century as populations grew and incomes increased due to oil revenues and development in the Arabian Peninsula, the demand for livestock imports grew exponentially and was nicely paired with a large supply of suitable livestock nearby in the HoA. Livestock export thus became an important part of many economies of the HoA countries. The Somali economy became highly dependent on this trade accounting for anywhere between 75 – 90% of export earnings.

Can a trade ban increase the risk of disease spread?

Trade continued to grow with record numbers of livestock exported annually until 1983 when a ban on import of livestock from the HoA was placed by Saudi Arabia and other countries of the region due to the fear of the introduction of Rinderpest to the newly established dairy herds of the region. This forced the closure of the Somali quarantines and greatly reduced organized export trade.

This didn't stop the trade but only took it underground.

This had an immediate and dramatic effect on the economies, livelihoods, peace, and stability of the HoA region. Though effects were most dramatic in Somalia, they were regional, affecting the pastoral regions of Ethiopia, Kenya, and Eritrea. Initially trade plummeted, but it recovered surprisingly quickly through the development of a costly and unregulated informal or black market trade. Since livestock couldn't enter Saudi Arabia directly, Yemen became a key transit point for livestock to enter the Arabian Peninsula. Data from the port authorities of Berbera and Bosasso indicate that though numbers of livestock exported were considerably less than the pre-ban period, within 2 years after the ban was imposed, more than 1million head were exported to the Arabian Peninsula. Export trade gradually increased until it reached levels of between 2 and 3 million head a year approaching pre-ban levels.

At first, this black market trade was uncontrolled and unregulated. Animals were quickly loaded at the ports without quarantine or inspection. Later, Somali authorities with the help of international NGOs and donor funding, introduced brucella testing and visual inspection of livestock by veterinarians leaving for the GCC region. Also, trade to the UAE and occasionally other GCC countries was intermittently permitted and became important from a disease control perspective since on paper, veterinary examination and testing was required.



Sea-transport of sheep at night. Picture © Chip Stem.

A notable result of the trade ban was that without strictly regulated trade, animals were often held in makeshift quarantines for only a few days, and in fact were often seen to be walking directly on ships at the Somali port of Berbera without any testing and anything more than a cursory inspection.

Thus, it might be said that with the import ban in place, the risk of spread of disease was greater than it ever was prior to the placement of the ban.

Yemen Import Quarantine

In 2002, the Yemen Livestock Service responded by taking the unprecedented, but pragmatic position of opening up a quarantine at their livestock center in Al Mukalla requiring a 2 week quarantine period before livestock were permitted to leave. This at least brought the livestock under the watchful eyes of veterinarians and permitted them to screen incoming livestock in an organized way.

Djibouti Quarantine

In 1999 and 2000, livestock traders from the HoA region approached major international livestock organisations including FAO, OIE, and AU-IBAR to see if there was a solution to the black market trade. Their perspective was one of reduced profits due to the high costs of the black market and the knowledge that the risks of disease spread were great meaning that without intervention, the chances for a return to open, legal, regulated and more profitable trade were not good. In response, the Red Sea Livestock Trade Commission was formed under AU/IBAR which raised awareness of the situation and the risks of the black market trade and proposed the solution of modern quarantine to ensure the disease-free status of livestock being exported from the HoA. With donor funding, a quarantine was designed and built in Djibouti and opened in 2006, which led to the return of organized and regulated trade.

Somalia Quarantines

Subsequent to the success of the Djibouti quarantine, quarantines in Berbera, Bosasso, and Mogadishu, Somalia were built and the export trade from the region has mushroomed to more than 4 million head a year, with more livestock being shipped than ever before.

Present Status and Risks

Though RVF is possibly endemic in southwestern Saudi Arabia and western Yemen, this poses less threat to human health during the Hajj and Ramadan than the livestock trade from the HoA where the disease is also endemic and many more livestock originate making vigilance prior to export from the HoA particularly important.

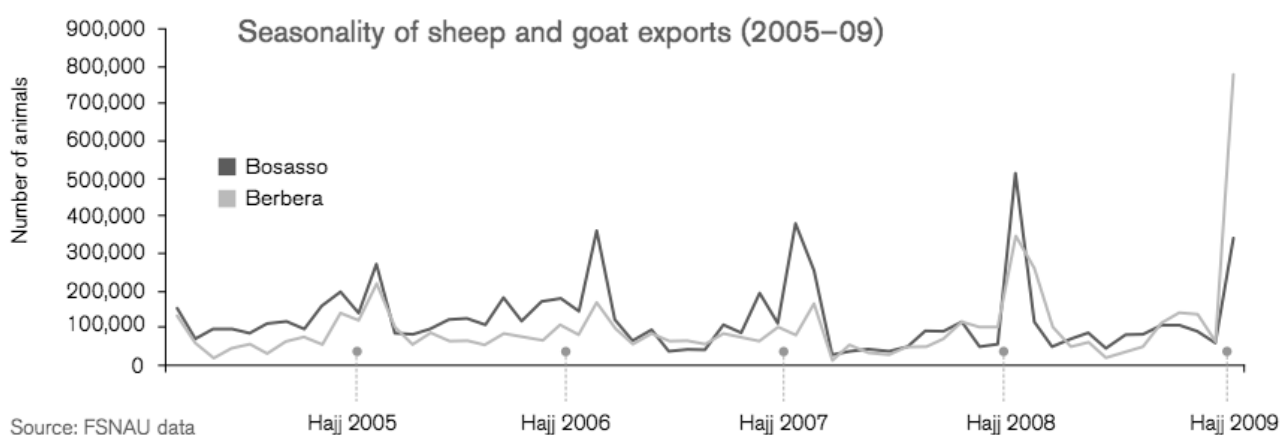
While it is clear that the present state of the export trade between the HoA and the GCC states carries much less risk than the black market trade during periods of the ban, risks are still present which could foreseeably result in the transmission of additional cases to RVF to the Arabian Peninsula, especially during the periods of Hajj and Ramadan. These include abbreviated quarantine periods of 7 – 10 days, occasional mixing of newly arriving animals with those already in the quarantine, lack of an independent and resourced entity to undertake pre-export certification inspection, lack of livestock identification and traceability and occasionally, direct shipment of livestock.

ECONOMIC IMPACT OF RVF OUTBREAKS ON TRADE WITHIN AND BETWEEN EAST AFRICA AND THE MIDDLE EAST

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Apart from the direct losses due to ruminant abortions and flock mortality, the greater economic impact of RVF is systemic and ensues from the trade restrictions aimed at its containment. Indeed, past outbreaks of RVF in East Africa and Middle East came as disturbing events in a commercial context of high specialisation in trade of small ruminants and interdependence between East-African exporters and the Middle-Eastern importing countries. The two successive bans imposed by Middle-Eastern countries on livestock products coming from the HoA in 1998-1999 and 2000-2002 highlighted this interdependence. Both bans caused an abrupt stop in exportations from IGAD countries. Nevertheless, the impact of the outbreaks motivating these bans differed due to their unique timing with regard to the Muslim celebrations that trigger the main flow of livestock from the HoA to Mecca. Hence, in 2000, the worst impact was observed on pastoralist households because the ban was imposed in September, prior to the Haj festival, when the main seasonal export flow had not been realized yet. Regarding the 1997 outbreak, the ban was implemented only in February 1998, after the main trade flow had occurred.



Seasonality of sheep and goat exports. From Majid, 2010. Chatham House Briefing paper

The impacts of the bans on Somalia were particularly severe, due to the high specialisation of the concerned region in an export-oriented livestock sector, benefitting from a niche market organized around the above-mentioned religious festivals and Arab consumers preferences. The country was all the more affected, as they own two main ports involved in this trade, i.e. Berbera (Somaliland) and Bossaso (Puntland). Prior to the bans, the size of the export market from Somalia to Saudi Arabia and the United Arab Emirates was estimated around USD 600 million, with Saudi Arabia representing 66% of the total. The bans led the Somali livestock market to collapse. Losses for the livestock industry were estimated at USD 109 million and USD 326 million, for the first and second ban respectively.

The government also directly incurred an important loss around USD 45 million from foregone export taxes and docking fees. In the same time, livestock exporters lost a net cumulative profit of USD 330 million, whereas producers estimated their annual losses at over USD 8 million. Hence, the successive RVF-related trade bans impacted the employment rate, the public treasury, the exchange rate of national currency and thus, the price of imported goods, inducing a general inflationary pressure and important socio-economic upheavals.

More generally, the livestock market in the whole East Africa was affected, due to the fall in prices caused by the loss of outlets for livestock. Using market equilibrium models taking these shocks into account, this impact of the trade bans has been estimated for the particular case of the Somali region of Ethiopia and was estimated at a 36% fall of the GDP. Other impacts originated in the closure of markets inside East Africa, being part of national control strategies. In Kenya, e.g., the closure of the Garissa Market, which is a major outlet for Somali and Ethiopian livestock, resulted in a more than 25% decrease in the price of cattle, inducing a total loss of USD 10 million for the value chain. The emergency destocking response of distressed households also participated to the fall in prices and worsening of terms of trade. Together with flock mortality and abortion, destocking moreover affects the herds' dynamics on the long run and the commercial potential of households. These mechanisms show greater impact on smallholders, due to threshold effects in livestock capitalisation and the loss in risk management ability in such variable environmental conditions. In the Middle East too, the bans showed drastic economic impacts. In Yemen, e.g., the bans caused a loss of USD 15 million from foregone custom taxes and USD 27 million profit losses for traders.

The two bans, combined with the prolonged ban maintained till 2009 by Saudi Arabia on Somalia, contributed to a restructuration of trade within and between the two regions. Indeed, trade actors soon reorganized their activity, as highlighted through official figures, notwithstanding the importance of informal trade. Hence, Yemen and the United Arab Emirates appeared as major alternative entry points on Arab Peninsula for Somali livestock. The latter could also transit through Djibouti or Sudan to reach Saudi Arabia. Benefitting from the prolonged bans on Somalia, the port of Djibouti emerged as a major player in the region between 2006 and 2009, thanks to massive investment in port infrastructures and agreements with Saudi importers. Therefore the private sector played a considerable role in adapting to new risks. The Djibouti port diverted much of the livestock trade previously handled at the Berbera and Bossaso ports. On this occasion, as it has been the case in Somalia after ban lifting in 2009, the Middle East has been a source of investment for the HoA for biosecurity infrastructure. Finally, the second ban led to the emergence of Australia as a major livestock supplier for Saudi Arabia from 2000 till now, and to a certain point Australia has been a country of major Saudi investments which is seen as another way of adapting for some major value chain agents.

In the two last decades, the intraregional livestock trade grew rapidly in East Africa, spurred by the urban demand. Most of this trade is informal, thus lacking official figures. It nevertheless shows a great importance regarding poverty alleviation aspects, the small to medium actors being the main operators of this trade. In recent years, a considerable growth in recorded intraregional trade is noticed, mainly due to a growth of recorded exports from Ethiopia to neighboring countries, as a result of a policy aiming at the facilitation of registration procedures for small and medium traders through the CAC/AP-system (*Cash against Commodity/Advanced Payment*).

As a conclusion, livestock export to Middle East and the growing intraregional East-African livestock trade are both threatened by RVF-linked bans due to loss of outlets and price volatility. Thus, stability of the livestock sector being crucial to human and economic development in the region, a high priority must be given to RVF prevention and control, as supported by figures of impact of past outbreaks..

Dr. Cyprien Biaoua from FAO - Somalia thanks the speakers. He confirms that the lifting of the trade ban has really boosted the trade from Somalia and confirms the data presented by Drs Stem and Antoine – Moussiaux. The prices too have greatly increased (especially before the Hajj) to around 90 dollar per sheep. This has without doubt benefited producers and their households.

INFRASTRUCTURE, SYSTEMS AND LEGISLATION NECESSARY TO PREVENT THE SPREAD OF THE DISEASE THROUGH TRADE

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Unregulated trade in live animals and animal products can be a source of spread of diseases such as RVF. Therefore infrastructure, systems and legislation required to prevent the spread of RVF have to be in place in exporting and/or importing countries, for live animals as well as for animal products. Surveillance in the exporting country is of paramount importance to prevent disease spread. Sero-surveillance is usually risk based, if not based on sentinel animals (in animals where RVF has occurred in the past) and complemented by clinical surveillance to the extent that this is possible in populations or consignments that are intended for export / slaughter. Early detection of RVF may be facilitated by regular consultation with public health care services.

The exporting country will have legislation in place that lists RVF as a notifiable disease, appropriate animal welfare standards, international zoo-sanitary certification procedures and –where applicable- legislation enabling the use of certain (live) vaccines. Legislation compliant with international standards, provides for adequate definitions of susceptible animals, vectors and in particular ‘ruminants’ and ‘wild ruminants’. The same applies, as is the case in the HoA, to transit countries or to countries which serve as feedlot-service providers for the purpose of export (in the latter case, animals do not “transit” in terms of Cap. 5.5 of the OIE Terrestrial Animal Health Code., but are imported and re-exported).

Certification relies on compliance with the terms of any bilateral agreement, whether based on OIE standards or risk analysis by the importing country, and usually requires minimal but reliable diagnostic services, recognized by both parties. For RVF, there is usually little ground for divergence on diagnostic assays in terms of possible equivalence agreements. The *Advisory Committee on Dangerous Pathogens* classifies RVF as a group 3 pathogen, requiring strict containment; hence, it is advisable that the laboratory be situated in an isolated location; access should be limited to appropriately trained staff. Emergency protocols should be posted within the laboratory to advise personnel of procedures to follow in case of a pathogen spill or the need to evacuate the laboratory in the event of a fire. The OIE containment level for Group 3 pathogens surpasses biosafety level-3 (BSL-3) guidelines (Cap 5.8.5) although overall the system itself is progressively being phased out and replaced by a risk based approach (OIE *ad hoc* group on biosafety and biosecurity in veterinary laboratories). Besides these precautionary infrastructures and systems in laboratories dealing with organ samples from suspected cases, biosecurity should be observed throughout the sampling and transport of samples, the latter requiring UN 6.2 category containers.

There is (currently) no OIE certified pathway. Countries declare themselves free of the disease/infection. In doing so, providing a documented history of reporting to the OIE in general, and of RVF in particular, is deemed highly relevant. A country such as the Republic of South Africa reported no less than 663 outbreaks and submitted 40 follow-up reports between 2009 and 2011. Neither emergency notifications, nor specific trade concerns with regard to RVF have been raised with the SPS Committee of the WTO so far, which is to be expected given the unambiguous OIE standards that exist with regard to RVF (precautionary principle is usually not justified).

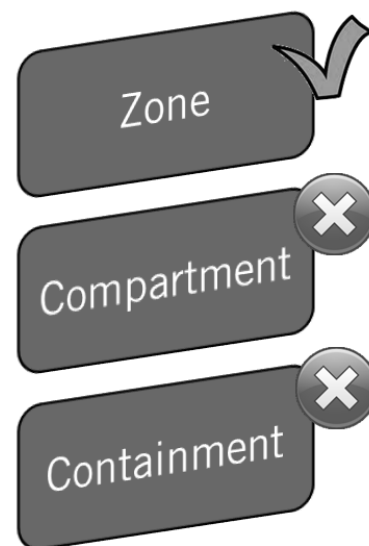
Conditions imposed by the prospective importing country on the exporting country may vary widely based on whether one is dealing with live animals or animal commodities such as meat, milk, semen, embryos, wool and fibres, and hides and skins. According to the *Terrestrial Animal Health Code* (Cap. 8.11, ed. 2012) the latter two categories are considered safe commodities, irrespective of the exporting country's disease / infection status with regard to RVF.

The precautionary principle is applied to milk. Until such time as scientific evidence clearly demonstrates that milk too is a safe commodity, pasteurisation or equivalent inactivation techniques (Codex) limits the trade of fresh milk products. With regard to meat and meat products, the Code stipulates that these may safely be imported from RVF infected countries or zones if –amongst other conditions- the carcasses from which the products were derived were submitted to maturation at a temperature above +2°C for a minimum period of 24 hours following slaughter.

For live animals (ruminants), the trade-facilitating provisions in the Code include foremost the issue of vaccination, the matter of which (live) vaccine to be used being referred to in the Terrestrial Manual (Cap. 2.1.14.) but providing little grounds for equivalence agreements under the SPS Agreement. Whilst zoning is recognised in the Terrestrial Code, compartmentalisation – given the vector-borne nature of the disease – is not and neither is the concept of containment zoning (restricted to FMD at this stage)

In both importing and/or exporting country, quarantine may be required in terms of the Terrestrial Code, or at least highly recommended as an alternative to e.g. vector control, vector-proof housing/isolation or vaccination. In any case, identification and registration systems, on a herd basis, but preferably on an individual basis, may be required; they are not imposed by the terms of the Terrestrial Code, but may become unavoidable in light of activities such as vaccination, zoning, animal movement controls, inspection, and certain types of certification (Cap. 4.1.1.).

On the importing country's side, irrespective of which certification-system is applied, fraud, smuggling and other "collateral" trade routes will keep VS on alert at all times. Defining what is a legal entry and what not is greatly facilitated by communicating a list of border posts, quarantine stations, approved abattoirs and storage depots which are approved for international trade (Cap. 5.6). The adoption of generic or specific emergency preparedness plans, including proven communication strategies, are key, and so are the provision *ex-ante* of emergency funding (mechanisms), including limited resources for compensation where applicable.



Session 4

Challenges to disease control

DIAGNOSTIC TESTS FOR RVF

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Researcher

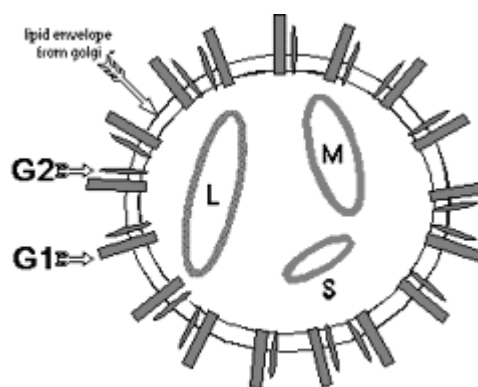
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Rift Valley fever (RVF) is a peracute or acute zoonotic disease of domestic ruminants in Africa. It is caused by a single serotype of a mosquito-borne *Bunyavirus* of the genus *Phlebovirus*. RVF virus (RVFV) is an enveloped, spherical virus from 80 to 120 nm of diameter with short glycoprotein spikes. The single stranded RNA genome is divided in 3 segments named according to their size: large (L), medium (M) and small (S). Each segment is contained in a separate nucleocapsid in the virion.

Tentative diagnosis of RVF is based on epidemiological, clinical and pathological features. The observation of sudden onset of abortions at all stages of pregnancy, sudden death of young animals following an acute febrile disease and liver involvement, eventually coincident with the occurrence of heavy rains and the report of influenza-like illness in human beings, raises the suspicion of RVF.

Suspicion of RVF requires laboratory confirmation. Samples to be collected include blood, plasma or serum, tissue samples, including liver, spleen, kidney, lymph nodes and heart. Samples from aborted fetuses should include brain.



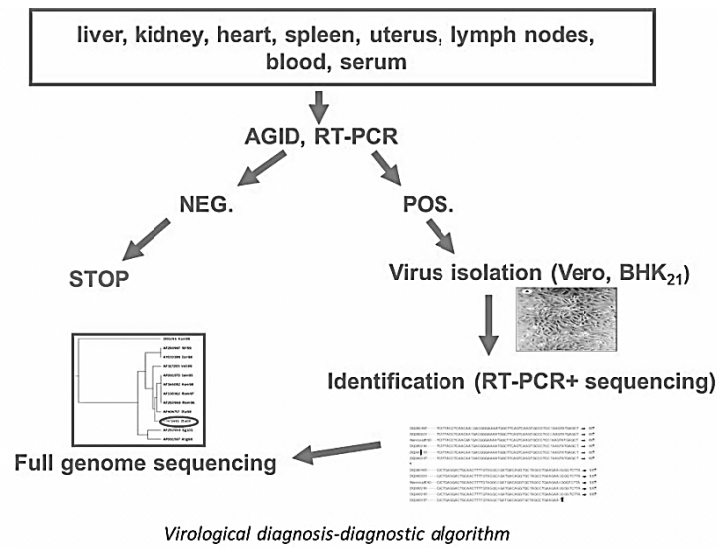
Structure of the RVFV. University of Queensland, Australia (www.uq.edu.au)

Diagnostic specimens should be securely packed, labelled to specify the dangerous nature of the contents and shipped on ice at 4°C to the reference laboratory. Guidelines for collection and shipment of the diagnostic specimens are provided in the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (Terrestrial Manual, Chapter 1.1.1). Veterinary laboratories handling the RVF samples, should be appropriately equipped to minimise the risk to the health of staff (biosafety) and environment (bio-containment) (Terrestrial Manual, Chapter 1.1.2). A Biosafety level 3 (BSL 3) laboratory or cabinet is required for the isolation of RVFV on cell culture, neutralisation test, direct ELISA or RNA extraction from field strains.

Laboratory tests allowing virological diagnosis of RVF include (Terrestrial Manual, Chapter 2.1.14):

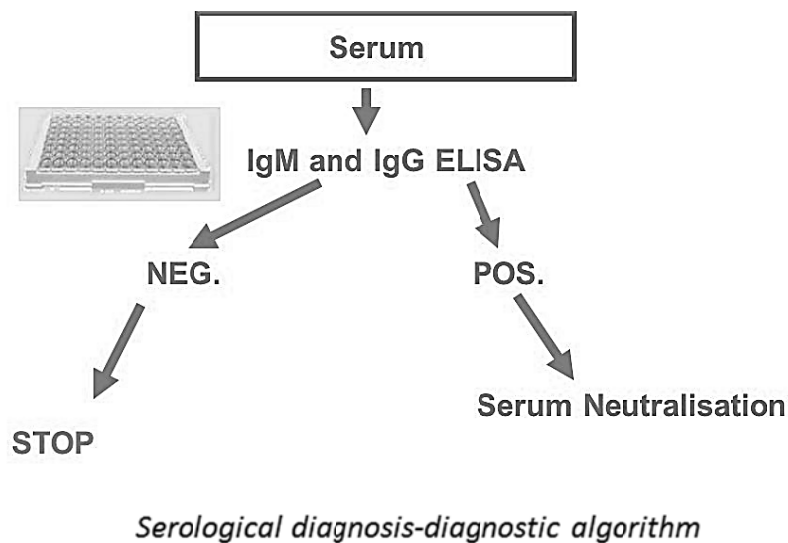
- Virus isolation on tissue culture (VI): it is very sensitive and specific to confirm the presence of the infection. Nevertheless the success in the isolation is strongly influenced by the quality of the collected samples and requires trained personnel and appropriate facilities.
- Agar gel immuno diffusion (AGID): it is easy to perform and requires few reagents and equipment. It is less sensitive if compared with VI and RT-PCR.
- Histopathology and Immunohistochemistry (IHC): tissue samples are placed in formol saline, it facilitates handling and transport in areas remote from the laboratory and inactivates virus infectivity. Specialized personnel and expensive laboratory equipment are required to carry out histopathology and immunohistochemistry examination.
- RT-PCR: several RT-PCR assays are available targeting different segments of the RVFV genome. RT-PCR is highly sensitive, specific and fast, providing results in less than 4 hours. The viral genome can be detected in specimens collected during the acute phase of RVF. This technique, however, requires expertise in molecular biology and expensive laboratory equipment.

Genetic characterization and phylogenetic analysis should be based on the entire genome sequence analysis because of the remarkable genetic stability of RVFV.



Several tests are available for serological diagnosis: (Terrestrial Manual, Chapter 21.14)

- Virus neutralization: it is highly specific test and can be used to test serum from any species in order to diagnose RVF. It is the prescribed test for international trade. Virus neutralization is laborious, expensive, and requires several days for results. Using live virus is not recommended in laboratories without appropriate biosecurity facilities.
- ELISA (Enzyme-linked immunosorbent assay): it is the most widely used serological test. it employs an inactivated antigen. IgM-capture ELISA allow diagnosis of recent infection. IgG-(indirect, sandwich or inhibition) ELISA is used to determine the rise in antibody response. The ELISA is very specific and sensitive, is cheap, rapid and well suited to the needs of large scale testing. Commercial kits developed for domestic ruminants could be less efficient when used to test different species of susceptible hosts (e.g. camels).
- Hemagglutination Inhibition: it is an appropriate screening test for surveys although it is not specific. Marked cross-reactions do occur between other phleboviruses.



REVISION OF THE RVF CHAPTER IN THE OIE TERRESTRIAL MANUAL

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A meeting of the OIE *ad hoc* group on RVF took place in Paris, in October 2012. The chapter 2.1.14 on RVF of the *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* was reviewed and updated taking into account recent scientific advances and the latest available technologies in vaccine developments and diagnostic tests. During the review and in the light of harmonisation of the chapters of the Manual, instructions for authors of the chapters of the Terrestrial Manual adopted by the *Biological Standards Commission* in 2012 were considered. Detailed protocols for the different test methods were included in the section on diagnostic techniques and it was felt that these protocols should preferably describe the use of diagnostic tests that are validated by the OIE reference laboratories for RVF. The Group also pointed out that the diagnostic test methods recommended in the chapter should be validated in each laboratory implementing these techniques in collaboration with the OIE Reference Laboratories for RVF. The Group agreed for this reason to include a statement in the introduction of the Section B to reflect this point: *“All the test methods described below have to be validated in each laboratory using them”*. In addition a reference was made to Chapter 1.1.5. of the Terrestrial Manual.

Table 3. Test methods available and their purpose

Method	Purpose			
	Surveillance	Laboratory confirmation of clinical cases	Humoral immune status in individual animals or populations post-vaccination	Population free from infection
Isolation in cell cultures	+	+++	na	–
Isolation in suckling mice	+	+	na	–
Polymerase chain reaction	+	+++	na	–
Antigen detection	+	++	na	–
Histopathology	–	++	na	–
ELISA	+++	++	+++	+++ nva
Virus neutralisation	++	++	+++	+++ nva

(NVA) in non vaccinated animals

The section C ‘requirements for vaccines’ was updated based on the latest scientific advances and special attention was paid to the harmonisation of tests required for licensure. Detailed protocols were proposed on safety and efficacy testing and as much as possible alignment with current *Pharmacopeia* and or international licensing standards were followed.

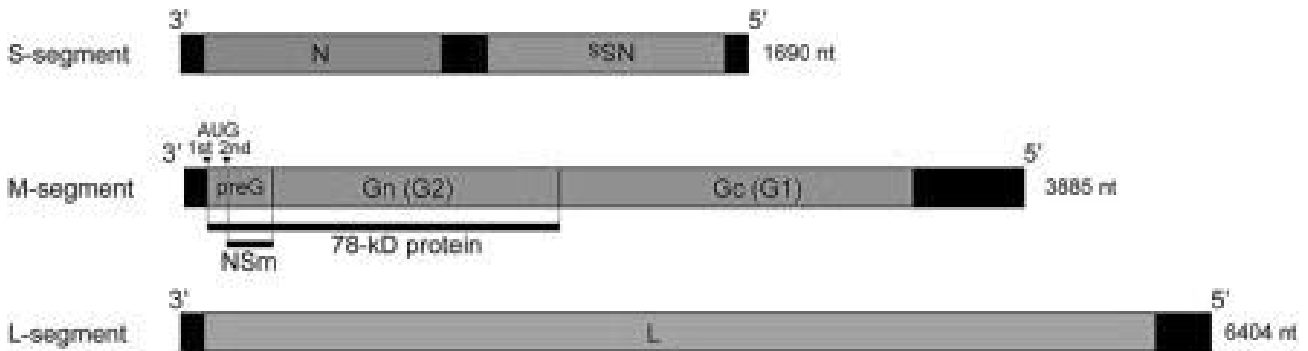
Q & A

Dr Karim Tounkara, Director of AU-PANVAC asks the speaker whether the AGID test will be removed from the new OIE Manual chapter on RVF, to which Dr Goovaerts replies that the chapter will remain unchanged.

Daniel (Danny) Goovaerts

Representative
 IFAH / MSD AGVET (INTERVET)
 Boxmeer, Netherlands

For RVF some inactivated as well as live attenuated vaccines are available and used in the field. However there still is a gap between safety and efficacy of these vaccines and a need for improved RVF vaccines for livestock but also for human use does exist.



The RVF RNA genome. Reproduced from Tetsuro Ikegami (2012) Molecular biology and genetic diversity of RVF virus. In : Antiviral Research Volume 95, Issue 3 2012. p. 293 – 310.

Several improved live attenuated vaccines are currently under development and the possibility of using reverse genetics tools to better design custom tailored vaccines largely increased the number and potential candidates for RVF vaccines. A wide range of recombinant deletion mutants, vector vaccines based on poxviruses, NDV, DNA vaccines and replicon based approaches have been generated and respectively tested in animal models or target animals. Several of these show promising characteristics for further development. Depending on the desired vaccine product profile in an endemic or epidemic situation for livestock or human vaccine target, several approaches can be considered.

Vaccine Research candidates

Live attenuated

- MP-12
- R566
- Δ NSs/Δ NSm
- MP-12 Δ NSm, MP-12 Δ NSm

Vector vaccine strains

- rLSD RV (Gn, Gc)
- rKS-1/RVfV (Gn, Gc)
- rKS-1/RVf (NSm, Gn)
- NDV RVF (Gn) and NDV RVF (Gn, GC)

Subunit vaccine

- Based on GN ectodomain

DNA vaccine

- plasmid DNA (Gn and Gc) or (N)
- plasmid DNA (Gn and C3D complement)
- plasmid DNA combination with MVA vector
- combination with alpha virus replicon vector

Virus like particles (VLP)

- Based on Gn and GC, with or without N
- Chimeric VLP with gag of Moloney Murine leukemia virus
- Mammalian and insect cell production systems
- Transcriptionally active VLP's

Dr. Karim Tounkara, Director of AU-PANVAC seeks clarification from one of the statements in the presentation regarding the screening tests. Are both AGID and RT-PCR considered as screening tests ? Dr. Goovaerts admits that this is a difficult question to answer and suggests that they are both screening tests but that their application depends on the type of laboratory or on the circumstances, including the number of samples to be processed.

Dr. Kariuki Njenga from CDC would like to hear some more about the use of combination vaccines. Dr. Goovaerts answers by listing some pros & cons. The advantage is that one can control two diseases at a time, e.g. RVF + LSD, but the disadvantage may be that existing host immunity against the carrier, e.g. LSD, could render the vaccine useless for RVF as well. It is possible to circumvent this problem by having two types of freeze dried antigens or live viruses in the same vial.

The representative from Tanzania, Dr. John Omolo, asks whether the current Smithburn vaccine is active against the different lineages of the RVF virus ? Dr. Goovaerts states that the existence of genetic lineages does not mean that lineages respond differently in terms of immune response or protection by antibodies; there are currently no indications for this type of restricted response.

The representative from the Kingdom of Saudi Arabia, Dr. Faisal Bayoumi asks whether any of these vaccine candidates look promising as a candidate for a human vaccine. Dr. Goovaerts answers that indeed, some of the candidates have a profile that would fit with a good human vaccine, but doubts that any pharmaceutical company will pick up the challenge of developing it at high cost, given the limited market prospects. The experimental vaccine referred to in the presentation is not available anymore. There is therefore currently no human vaccine on the market.

Dr. Faisal Bayoumi argues that the notion of cost is relative, given the losses incurred by affected countries in the last 20 years. Dr Kariuki Njenga agrees and argues that the development of a human vaccine would put a stop to the often irrational, and costly, decision making we experience now.

Dr John Ogoto Kanisio Okeleng Lefuk, Director General of Veterinary Services from South Sudan recalls that there is no official pathway for RVF, no way to control the vector, and that we face a cyclical return of the disease, so what is the way forward, he wonders ? Dr. Münstermann suggests to refer the question to the working group session.

Dr Khidir El Faki, Director General of Animal Health & Epizootic Disease Control from the Sudan requests some clarification on the use of paired diagnostic tests for confirmation purposes. Dr. Goovaerts replies that various combinations are possible : (a) an IgG and an IgM test, or (b) two consecutive antibody tests or (c) one antibody and one virus isolation or (d) two virus isolations.

*Jeannette Heath * and Theresa Smit*

Acting Chief Scientific Officer
Onderstepoort Biological Products, SOC., Ltd.
Pretoria, South Africa

RVF outbreaks can have an enormous negative impact on the livestock industry and more often than not, spill over into the human population. The only way to control this vector-borne viral disease is to ensure that susceptible livestock populations have adequate herd immunity which is achieved through consistent annual vaccination programmes. Ensuring herd immunity during inter-epizootic periods prevents sudden epidemics and/or eliminates endemic RVF virus infections. The explosive nature of the RVF outbreaks requires that vaccines provide swift and thorough protection after vaccination. Currently, 3 different RVF vaccines are commercially available :

- Inactivated whole RVF virus vaccine which requires a booster vaccination and annual re-vaccination; currently produced in South Africa and Egypt
- Live-attenuated Smithburn vaccine. This vaccine can provide lifelong immunity and is, therefore, a less expensive and more effective alternative to the inactivated vaccine. However, due to residual virulence, the Smithburn virus has a potential risk to cause teratogenicity when administered to gestating adults. The Smithburn vaccine is currently produced in South Africa and in Kenya
- RVF Clone 13 is a live attenuated vaccine derived from Clone 13 virus, isolated from a benign human case in the Central African Republic. Clone 13 contains a large deletion in the NSs gene which renders the virus a-virulent in mice, hamsters and livestock animals. The RVF Clone 13 vaccine is currently only produced by OBP in South Africa. The RVF Clone 13 vaccine is safe for use in sheep and cattle irrespective of the pregnancy status, protects against virulent RVF challenge and has proven effective during a RVF outbreak in South Africa during 2009-2011. Annual vaccination with RVF Clone 13 is recommended especially in endemic areas such as South Africa, where outbreaks occur at regular intervals

"...I think the large scale use of Clone 13 after the subsidence of the outbreak / mosquito activity in the 2nd half of 2010 represents a significant break with history (...) Vaccination on that scale during a relatively quiescent period during a time of RVF activity is a breakthrough and I think we were all surprised at how relatively little virus activity occurred in 2011 (despite good rains) in the areas most severely affected in 2010 and where presumably most vaccinating was done (...) I think this is more of a triumph for timely and significant scale usage of vaccine possibly for the first time ever..."

Prof. Robert(Bob)Swanepoel, South Africa.

Several candidate vaccines are being worked on by different groups around the world and the published results of some of these look very promising. However, although there is no shortage of promising candidate or experimental vaccines, there is currently limited follow through from research and development to production.

Q & A

Dr Danny Goovaerts (IFAH) asks whether there exist any field data on maternal immunity when using clone 13 to which Dr Heath replies that limited data are available from lambs (2 months) which tend to show that no interference was observed.

Dr. Kariuki Njenga adds that field trials conducted in cattle, sheep and goats in Kenya, Clone 13 looks promising, both in terms of potency and safety.

THE GLOBAL OFFER OF RVF VACCINES

Daniel (Danny) Goovaerts

Representative
IFAH / MSD AGVET (INTERVET)
Boxmeer, Netherlands

Since long some inactivated as well as live attenuated vaccines are available for RVF and are used successfully in the field. However there is a gap between safety and efficacy of these vaccines and a need for improved RVF vaccines for livestock but also for human use does exist. Several improved live attenuated, vector, DNA, subunit or replicon vaccine candidates are under development and for some promising results or proof of concepts have been demonstrated with respect to safety and efficacy of these vaccine candidates.

The biggest challenge however will be the task of further commercialisation of these vaccine candidates and bringing these candidates to the market. RVF despite being a serious economical and enzootic endemic disease in a large part of Africa as well as in some countries of the Middle East is from a commercial vaccine market aspect a rather low or moderately attractive disease. Besides being endemic, the disease also has a characteristic epidemic outbreak cycle depending on climate, rainfall and flooding. When these inter-epidemic periods are long, it is difficult to economically justify vaccination campaigns to control the disease. As a result the motivation for the broad consistent use of RVF vaccines and consequently the incentive for commercial companies to seriously invest in RVF vaccine development is rather limited. Also for human vaccine development, although it is clear that a serious need exists for a human RVF vaccine to protect specific groups at risk like livestock keepers, veterinarians, laboratory personnel working with RVF virus, the balance between costs to develop and license an efficacious and safe RVF vaccine for human use and the potential commercial rewards is rather negative.

Nevertheless certain RVF vaccines are currently under development for veterinary use. Important aspects to provide incentives for commercial companies to invest in RVF vaccines or certain vaccines for the developing world in general can be; an equal level playing field, harmonized or limited regulatory requirements or restriction to basic claims, external research or providing of development funding, vaccine banks or market support and corporate social responsibility aspects.

Q & A

The representative of USDA-APHIS Egypt, Dr. Dr Mahmoud Orabi, thanks the speakers and states that he now understands that vaccines are available and registered for endemic situations, but what are the rules in case of a emergency outbreak ? Dr. Heath replies that ring vaccination should be implemented as soon possible, with a one-dose vaccine, therefore a live attenuated and safe vaccine. Dr. Kariuki Njenga from CDC also suggests to vaccinate in farms in which there is no active outbreak.

Dr. John Lefuk from South Sudan asks what the recommended pre-shipment delay for vaccination is. Dr. Jeannette Heath replies that, for trade purposes, it is 21 days.

INDEPENDENT RVF VACCINE QUALITY CONTROL

*Karim Tounkara *, Nick Nwankpa & Sanne-Charles Bodjo*

(*) Director
Pan-African Veterinary Vaccine Centre (PANVAC)
AU
Debre-Zeit, Ethiopia

The control of RVF, a peracute or acute zoonotic disease of domestic ruminants, requires among others the use of good quality vaccine. The experience gained from rinderpest eradication dictates the necessity to establish a system ensuring the independent quality control of all RVF vaccine batches to be used in vaccination campaigns. In Africa the *Pan African Veterinary Vaccine Centre* of the African Union (AU-PANVAC) was founded in 1993 in support of the *Pan African Rinderpest Campaign* (PARC) and the *Pan African programme for the Control of Epizootics* (PACE) and has been mandated by African Union Member States to, among other things, provide *international independent quality control of veterinary vaccines* produced in Africa and imported into the continent. This service was regarded as pivotal in the eradication of rinderpest from Africa and is now extended to all veterinary vaccines including RVF vaccines.

AU-PANVAC, as an independent entity directly linked to the *Department of Rural Economy and Agriculture* of the African Union Commission, is currently involved in certifying the quality of the following veterinary vaccines: *Peste des petits ruminants* (PPR), *Contagious bovine pleuropneumonia* (CBPP), *Contagious caprine pleuropneumonia* (CCPP), *Rift Valley fever* (RVF), *Sheep and goat pox* (SGP), *Lumpy skin disease* (LSD), *Newcastle disease* (ND), *Infectious bursal disease* (IBD), *Blackleg* and *Hemorrhagic septicemia*.



AU-PANVAC has a repository of veterinary vaccine seeds including RVF vaccine and established cell lines (Vero, MDBK, BHK), which are at the disposal of AU Member States vaccine producing laboratories (on request).

The main RVF vaccine producing laboratories in Africa are *Onderstepoort Biological Products Limited* (OBP), *Kenya Veterinary Vaccine Producing Institute* (KEVEVAPI) and Egypt's *Veterinary Serum and Vaccine Research Institute* (VSVRI).

The quality control of RVF vaccines is carried out at the AU-PANVAC Bio-Safety Level 3 (BSL 3) Laboratory.

Two types of RVF vaccines are submitted to AU-PANVAC : attenuated RVF vaccine prepared from Smithburn's attenuated strain (for use in non pregnant cattle and sheep) and inactivated vaccines prepared from virulent field strains (for use on pregnant animals).



*The BSL 3 facilities of PANVAC in Debre-Zeit, Ethiopia.
Top picture © AU-PANVAC (2011).*

The quality control service for veterinary vaccines is provided to African Union Member States free of charge while a minimal fee is applied for non-African Union Member States. The tests undertaken by AU-PANVAC to certify the quality of RVF vaccine batches are those described in the OIE *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals*.

For the quality control of live RVF vaccine batches, the tests applied are:

- Freedom from bacterial, fungal and viral contamination.
- Safety on susceptible animals and laboratory animals.
- Identity test using *Reverse Transcriptase-Polymerase Chain Reaction*.
- Potency using intra-cerebrally inoculation of vaccine in infant mice or Vero Cells and assessment of immune response on vaccinated sheep.
- Stability test using assessment of potency after incubation of the RVF vaccine at 37°C for one week.
- Residual Moisture content using the gravimetric method.

The quality control of inactivated RVF vaccine batches is performed using the following tests:

- Freedom from bacterial, fungal and viral contamination.
- Safety on susceptible animals and laboratory animals.
- Identity test using *Reverse Transcriptase-Polymerase Chain Reaction*.
- Potency using assessment of immune response on vaccinated sheep.
- Completion of inactivation using inoculation of vaccine into susceptible cell culture.
- Residual Inactivant content using colorimetric method.

The *Pan African Veterinary Vaccine Centre* of the African Union is committed to the continued provision of quality service thus ensuring the independent quality control of RVF vaccine in Africa.

Q & A

Dr Alehegne Yirsaw, Deputy Quality Manager and Microbiology Laboratory Coordinator of Ethiopia's *National Animal Health Diagnostic and Investigation Center* (NAHDIC) asks what the status of PANVAC is in terms of certification ? Dr Karim Tounkara answers that PANVAC applied for certification of the tests it is conducting, and also applied for recognition as a FAO Reference Laboratory and as an OIE Collaborating Centre. South Africa's SANAS will be the first certification authority they will work with towards 17025 ISO certification.

OIE PRINCIPLES FOR VACCINE BANKS

Susanne Münstermann

Programme Officer
Scientific and Technical Department
OIE
Paris, France

The OIE has set international standards in Chapter 1.1.10 of the Terrestrial Animal Health Code that describe general principles for vaccine banks and the Manual on Diagnostic Tests and Vaccines contains specific sections on Vaccines in the disease chapters.

The Code chapter outlines the different application purposes for vaccines, namely as preventive, routine vaccination or as emergency vaccination. The OIE promotes vaccine banks for both situations because of the assurance of having high quality vaccine in stock that was manufactured in compliance with OIE standards. Reasons for setting up vaccine banks are manifold, most importantly for countries to protect themselves against disease incursions in case they are free from a given disease or to carry out ring vaccinations in case of an outbreak that requires stamping out, or to support regular vaccinations. The advantages of vaccine banks are that the vaccine is rapidly accessible, available in sufficient quantity, quality and at a feasible price. Furthermore, the vaccine virus or antigen has been tested to match the field virus and is available in the required type of formulation and is of acceptable safety and potency.

The chapter explains the modalities of setting up vaccine banks. Regarding the formulation, there are pros and cons for storing the final product versus the antigen, however, antigen banks are currently favored, as they avoid replacing expired products, provided that the vaccine production process is rapid. The geographical location of the vaccine bank is discussed and it is pointed out that international and regional banks can be preferred to national banks, as they allow for a greater variability of viruses to be stored, for more flexibility in the use of the vaccine bank and for possible economies of scale (initial fixed cost and unit cost of vaccines). The question of physical location (on a national territory or with the manufacturer) is discussed and the option to store the vaccine with the manufacturer is preferred. Lastly the question of specifications of the seed virus to be stored is addressed. The selection should go hand in hand with monitoring the global disease situation and in consultation with the respective Reference Laboratories. Quantities of vaccine to be stored need to consider the area, the livestock population, the disease risk and the costs. Vaccines should only be released from the bank when they are licensed and if their quality, safety, efficacy is guaranteed; hence stocks need to be tested regularly.

The OIE in its approach to setting up vaccine banks follows some basic principles. The most important principle is that only high quality vaccines produced on the basis of international OIE standards, GMP, ISO or other equivalent official certification is purchased. The use of vaccine purchased by OIE and put at the disposal of countries is flexible and can be requested based on a list of criteria for emergency vaccinations, specific disease control programmes, or in support of a global/regional or national vaccination campaign, by an official country request. The setting-up of the vaccine bank is done through an international tender process, and the OIE purchases the vaccine on the basis of economies of scale regarding price, volume, reduced fixed costs, reduced administrative burden. The tender dossier provides the applicants with detailed specifications and conditions. Funding for the OIE vaccine banks is based on public-private partnerships involving different donors and countries in view of sustainability and continuity of replenishment.

Most OIE vaccine banks are “virtual” vaccine banks, where the manufacturer does not store large quantities but rather produces required volumes on request, allowing also for flexibility in terms of size of vials, volumes, speed of delivery and ready-made vaccine versus antigen storage. Particularly for FMD vaccine, great care is applied to adapt antigen strains to the national and regional needs. Virtual banks can also deliver at different times; hence cater for emergencies plus a necessary follow up vaccination.

The countries that request to use vaccines from and an OIE vaccine bank need to assure the OIE that they can provide all administrative aspects related to licensing and a cold chain for transportation up to the end user.

Examples of vaccine banks set up and run by OIE:

1. Avian Influenza

The bank was started in 2006 for use of vaccine in Africa with funding provided by the EU. With additional funds received in 2007 to 2010 from Canada, the scope was extended to worldwide delivery. Some vaccines were also donated in kind by Canada and UK. Additional funding was received in 2010 until 2013 from the EU with specific focus on Asia.

This Bank is a good example for continuity and sustainability.

2. Foot and mouth disease (FMD)

EU provided funding for an antigen/vaccine bank to be set up for Asia in 2010 to 2013. More donor input to expand the scope of this bank to include Africa is sought.

3. Rabies

The EU also provided funding to set up a bank for rabies for the vaccination of dogs, with focus on Asia in 2011 to 2013.

4. *Peste des petits ruminants* (PPR)

The Bill and Melinda Gates Foundation provided funding to set up a bank for PPR with focus on some priority countries in Africa in 2012 to 2014.

Given the importance of Rift Valley Fever as recognized also by GF-TAD and GLEWS, this could be a good candidate for another vaccine bank to be set up for the Africa and Middle East Region.

Q & A

Dr Jeff Mariner (ILRI) wonders how effective these vaccine banks will be, knowing that it might take more than 144 days of lead time to order the vaccine; hence, in his view, vaccine is not an option in emergencies.

Dr Vincent Martin (FAO) asks whether there exist any guidelines or on the governance of these vaccine banks, to which Dr. Münstermann answers that this depends on the strategies adopted by governments or regional instances and on the type of disease targeted.

STRATEGIES FOR VACCINATION PROGRAMMES

*Baptiste Dungu and Victor Mbao**

(*) Programme Manager – Large Ruminants
AU - Centre for Ticks and Tick-Borne Diseases
GALVmed
Lilongwe, Malawi

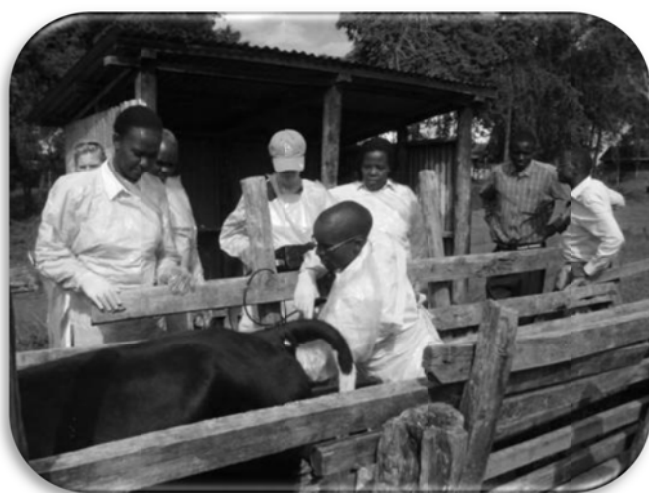
Vaccination continues to be the most effective way to control RVF, a zoonotic insect-borne viral disease of livestock. The irregular, cyclical and persistent nature of RVF in its occurrence in enzootic situations suggests that the vaccination strategy to be considered for these regions should be different to what could be envisaged for free, at risk regions. The occurrence of RVF in Africa seems to indicate two types of enzootic situations, i.e. those with regular outbreaks, and regions characterised by sporadic, irregular outbreaks.

Table 4. RVF situations and control approaches

RVF Situation	Examples of countries	Current Control strategy
Endemic with regular outbreaks	Kenya, Tanzania, Egypt, Senegal, Mali	Vaccination at sign of outbreak (Egypt : continuous vaccination) No vaccination at all
Endemic with sporadic / re-occurring outbreaks	South Africa, Saudi Arabia	Continuous / yearly vaccination
Free high risk	Middle East, North Africa	(Active) surveillance
Free low risk	Europe, Americas	Surveillance, talks of vaccine banks

RVF vaccination is however not part of the control strategy in all enzootic countries.

To date the currently available vaccines in use in enzootic regions include live attenuated vaccines, i.e. the Smithburn strain and the Clone 13, and the inactivated vaccines.



Trials using Clone 13 in Kenya. Picture © GALVmed.

While vaccination strategies for enzootic regions should form part of broader RVF control strategies, taking into account other aspects such as continuous surveillance, there are a number of characteristics that are critical for an effective vaccination strategy in these regions.

The aim of a vaccination strategy in enzootic regions should address two key issues: firstly to support the increase in herd immunity, which should minimise the impact of the disease when it occurs, and secondly to provide an emergency preparedness plan.

The increase in herd immunity could be achieved by relying on specific approaches such as the practice of yearly vaccination. The reality is however that not all enzootic countries practice yearly vaccination, due to the cost involved and the highly cyclical nature of RVF outbreaks, which makes it difficult to justify continuous vaccination.

Secondly, the emergency preparedness plan could be built around a number of strategies, including the use of sentinel animals and the establishment of strategic reserves or vaccine/antigen banks.

Different approaches and ways of implementing these vaccination strategies will be discussed.

Vaccination strategies to be considered in endemic regions

Annual vaccination

Multivalent or combination vaccine, consisting of RVF antigen and the antigen of a vaccine likely to be used regularly, e.g.

RVF + LSD

RVF + SGP

RVF + CBPP

Thermostability

Use of sentinel animals : need for good and effective diagnostics capability

Emergency preparedness: strategic reserves of vaccines or antigen bank

Possible suitable candidates:
Multivalent vaccines including a safe deleted RVFV vaccine.

Q & A

Dr Atef Elgorbagy from the General Organisation for Veterinary Services in Egypt asks what the difference in cost is between the Clone 13 and the Smithburn vaccines ? According to Dr. Geoffrey Mutai, CEO of KEVEVAPI, the Smithburn vaccine costs USD 0.51 per dose in Kenya, while the Clone 13 costs USD 0.75 when sourced from OBP in South Africa.

Dr. Ameha Sebsibe, Livestock Expert from the IGAD *Center for Pastoral Area and Livestock Development*, asks whether there are any legal provisions to deal with feedback from field level end-users. Drs Barbara Freischem (IFAH) and Karim Tounkara (AU-PANVAC) provide Dr Sebsibe with some examples from legal requirements in the US and the EU, whilst pointing out that PANVAC's role is limited to quality assessment of the product only. Dr Geoffrey Muttai from KEVEVAPI explains that in his facility all the batches are PANVAC certified and that there is a procedure in place to answer queries from the farmers.

Session 5

Prevention and early warning

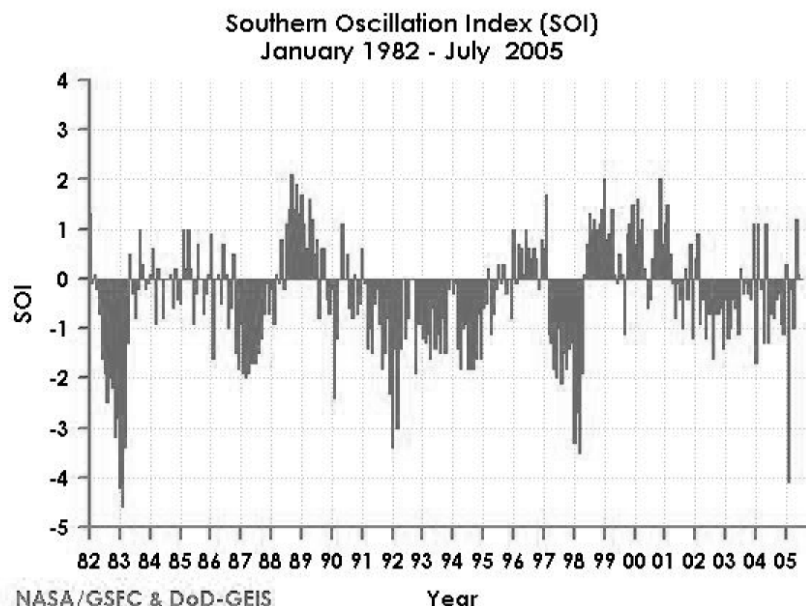
EXISTING EARLY WARNING SYSTEMS AND RISK ASSESSMENT TOOLS : PROSPECTS AND CHALLENGES FOR BETTER FORECASTING OF RVF

Vincent Martin, Carlenne Trevennec, Claudia Pittiglio, Véronique Chevalier, Ludovic Plee, Fulvio Biancifiori

Acting Head
EMPRES
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Because both the geographical and seasonal distribution of many infectious diseases are linked to climate, the possibility of using climate related environmental factors as predictive indicators, in association with regular disease surveillance activities, has proven to be relevant when establishing Early Warning Systems for climate-related diseases. RVF, an acute mosquito-borne viral zoonotic disease, is one of these diseases for which Early Warning Systems and tools have been efficiently developed in the past. These tools have shown their great potential and relevance for anticipating major epidemics and mitigate their public health and economic impact.

The objective of establishing RVF *Early Warning System* (RVF-EWS) is to assess the risk of occurrence of major epidemics of RVF ahead of time and enable National Veterinary Services to anticipate the risk and react promptly to prevent the devastating impact caused by the disease on animal and human health. RVF-EWS are based on the combination of ground surveillance activities associated with the monitoring of climatic data of different nature including three-months weather seasonal forecast, near-real time rainfall and NDVI (*Normalized Difference Vegetation Index*) estimates as well as ENSO (*El Niño–Southern Oscillation*) indicators. Ultimately, risk assessment and alerts generated by RVF-EWS are translated into visual decision support tools such as risk maps that can be used by decision makers to plan targeted interventions and develop communication and sensitisation campaigns in the face of an epidemic.



Prediction periods of 3 to 5 months are achievable using SOI. Reproduced from Linthicum et al. Nature, 1999

Over the past decades, climate change and extreme weather events have created the necessary conditions for RVF to occur more frequently with the potential to expand its geographical range northwards and cross the Mediterranean and Arabian seas, with an unexpected impact on the animal and human health of newly affected countries. Investing in effective national, regional and global early warning systems is therefore critical and more relevant than ever, as are coordinated research programmes on appropriate prevention and control measures.

However, while a body of knowledge on RVF-EWS and modelling techniques have emerged over the last ten years, monitoring environmental predictors to forecast potential epidemics of the disease in time and space is still considered a growing field. Assessing the risk of RVF epidemics within and outside of the HoA where models were initially developed still remains a major challenge and requires innovative approaches and more research in the area of RVF ecology and risk modelling. Attempts to include animal movements and social network analysis approaches in Madagascar represent new perspectives, so as the inclusion of new climate variables, higher resolution satellite images or the distinction between primary and secondary foci of RVF for defining RVF high risk areas. While these new techniques have improved the predictive capacity of current models and refine our understanding and knowledge of the disease ecology, are they robust and reliable enough to efficiently predict and respond adequately to the next epidemic in Africa?

Assaf Anyamba

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El Niño / Southern Oscillation (ENSO) related climate anomalies have been shown to have a significant influence on epizootic outbreaks of RVF disease in the HoA region. Knowledge of the links between ENSO driven climate anomalies and RVF can allow us to provide 1 to 5 month early warnings of an epidemic or epizootic as was illustrated by the RVF outbreak during 2006-2007. A combination of satellite measurements of elevated sea surface temperatures, and subsequent elevated rainfall and satellite derived normalized difference vegetation index data can be used to predict and map areas at risk to outbreaks of RVF in the HoA region. Predictions of areas at risk can be subsequently confirmed by entomological field investigations of virus activity in the areas identified. Such lead times should ideally allow for various preventive and control measures to be undertaken including mosquito control, early animal vaccination and public mobilisation.

The RVF risk model framework.

The current model exploits the normalized difference vegetation index (NDVI) from the *Advanced Very High Resolution Radiometer* (AVHRR) instrument aboard the *National Oceanic and Atmospheric Administration* (NOAA) polar orbiting satellite series for continental scale risk mapping. The AVHRR NDVI data set is supplemented by monthly vegetation index data at 1km resolution from the SPOT Vegetation instrument. The 1 km product is used during periods of high risk when detailed spatial information is required.

One calculates NDVI monthly anomalies to define the extremes in eco-climatic conditions from the long-term (1982-1999) monthly NDVI means as follows:

$$NDVI_{\Delta} = NDVI - \overline{NDVI}$$

where $NDVI_{\Delta}$ are the respective monthly anomalies, $NDVI$ are monthly values and \overline{NDVI} are long-term monthly means, respectively.

One also examines persistence in positive NDVI anomalies for selected periods defined by climatological seasons. For example for East Africa, one analyses the persistence in positive NDVI anomalies for the period September - November (the short rainy season denoted SON) when the ENSO-precipitation relationship is known to be most pronounced.

Risk is defined based on persistence of positive NDVI anomalies for any given 3-month period according to the following criteria:

1. Areas must have positive anomalies above the “noise” level (> 0.025 NDVI for three consecutive months). Expressed as anomalies, NDVI values over the desert areas fluctuate between ± 0.025 ; therefore, we consider any variation greater or less than these values of real significance to ecological dynamics.

2. Persistently positive anomalies must have a three-month mean NDVI anomaly exceeding a threshold of 0.1 NDVI :

$$\overline{NDVI}_{\Delta(3mon)} > 0.1$$

where $\overline{NDVI}_{\Delta(3mon)}$ is the average NDVI anomaly over the last three months (i.e. t, t-1, t-2; current and two previous months):

$$\overline{NDVI}_{\Delta(3mon)} = \frac{\sum_{t-2}^{t-1} NDVI_{\Delta t}}{3}$$

This algorithm attempts to mimic the RVF mosquito vector populations' succession in a flooded *dambo* habitat. RVF virus (RVFV) is thought to be maintained in an endemic cycle which depends upon intermittent heavy rainfall events and periodic short term flooding of low lying habitats, known as *dambos* or *pans*, and on the vertical transmission of the virus (i.e., transovarial inheritance of the virus from female mosquitoes to offspring) by floodwater *Aedes* mosquitoes. Sustained, wide spread and above normal rainfall and flooding creates ideal bio-climatic conditions (which can be detected by satellite) for the production and propagation of different generations of *Aedes* and *Culex* RVF vectors leading to epizootics and epidemics.

Results

The model is run using a 3-month moving method to capture the dynamics of changing climatic and ecological conditions. Any given pixel is mapped to be at risk of RVF activity if it conditions for persistent positive NDVI threshold and the presence of human and livestock population are met (high risk category). When the NDVI threshold is reached but without human and livestock populations risk is classified as zero (no risk) for an epidemic/epizootic; however, risk to humans and animals that enter these areas such as, displaced/refugee groups, and nomadic peoples may be classified as low to moderate. Therefore the presence of livestock and human population (based on FAO population databases) is a sufficient condition for high risk when the ecological and climatic indicators are suitable.

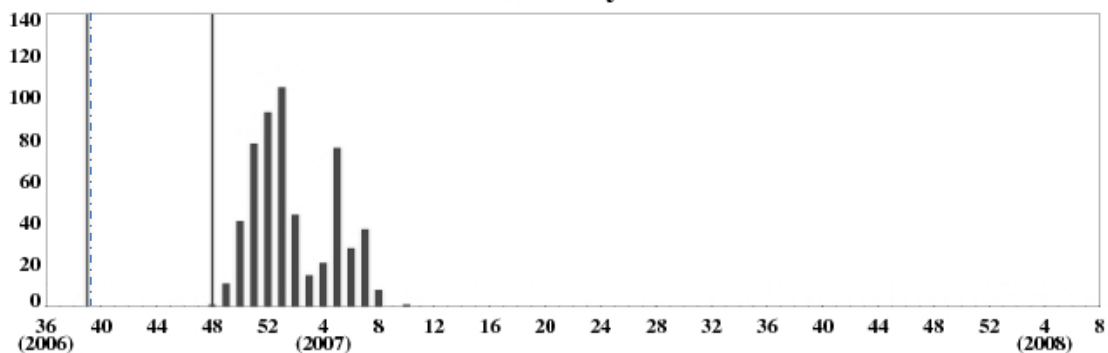
The system retrospectively predicted areas where RVF outbreaks occurred between 1981 and 1998 and subsequently predicted areas of recent RVF outbreaks in East Africa (2006-2007), Sudan (2007) and Southern Africa (2008-2011). All three of these regions had persistent above-normal rainfall (200-500 mm) and 2-4 months of 40-100% positive NDVI anomalies, which triggered risk alerts in the system months before RVFV activity was reported. The prolonged excess rainfall and resultant rapid green-up of vegetation created ideal conditions for hatching and survival of RVFV-infected mosquitoes, which rapidly increased vector mosquito populations leading to subsequent widespread infection of livestock and human populations.

For Eastern Africa, from December 2006 to May 2007, RVF human cases were reported in Somalia (114 cases reported, 51 deaths), Kenya (684 cases reported, 155 deaths), and Tanzania (290 cases reported, 117 deaths). A post-outbreak mapping of human case locations on the aggregate potential RVF risk map from September 2006 to May 2007 found that 64% of the cases were reported in areas mapped to be at risk within the RVF potential epizootic area, while 36% were reported in adjacent areas not mapped to be at risk of RVF activity. However, the spatial distribution of these case locations shows that most of the cases in non-risk areas were in close proximity (< 50 km) to areas mapped to be at risk. We are thus confident that most of the initial RVF infection locations were identified

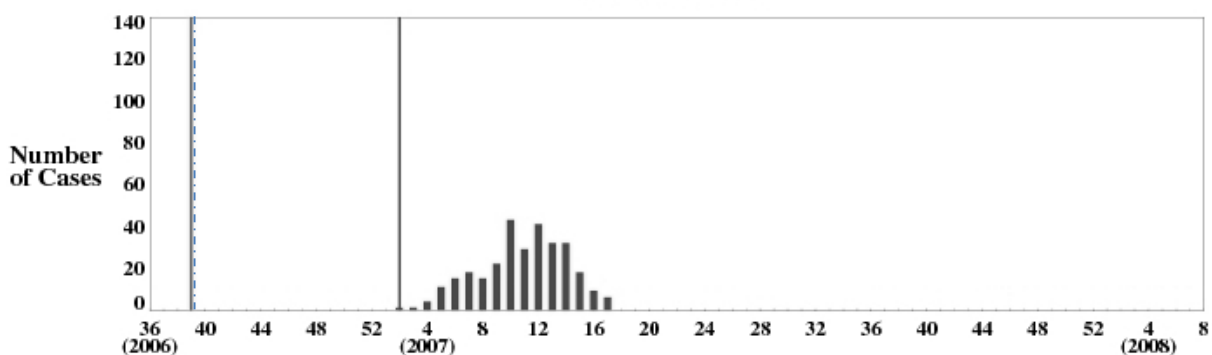
Overall, for East Africa the early warning information provided in 2006 enabled country preparedness and early detection and response activities to be undertaken ~2 months earlier

compared with the previous epidemic/epizootic of 1997–1998. Elsewhere various efforts including vaccination of livestock, vector control, and mass mobilisation were implemented to minimize impacts of the epizootics/epidemics

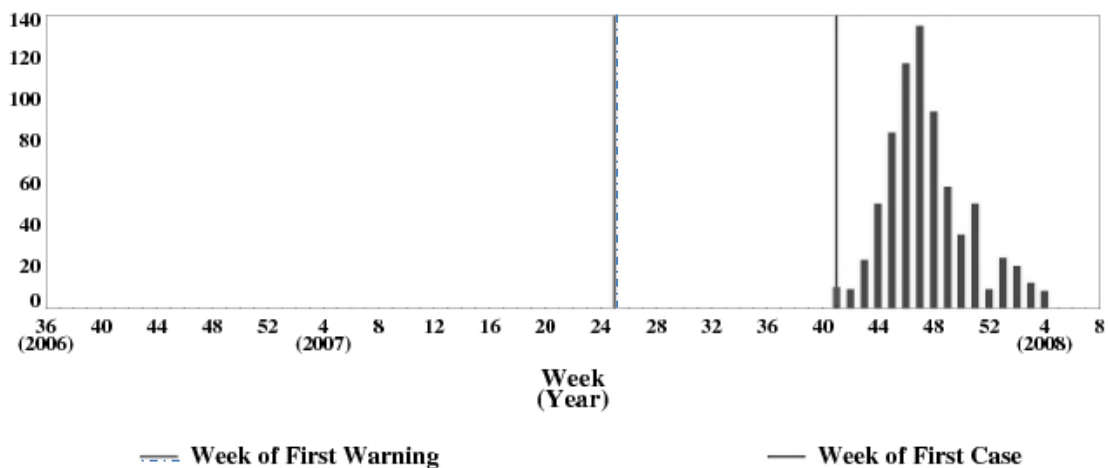
A. Kenya



B. Tanzania



C. Sudan



Prediction vs. outbreak timing : Kenya, Somalia, Tanzania : 4-5 months, Sudan: 5-6 months, Southern Africa: 2-3 months. Reproduced and adapted from Anyamba et al (AJTHM, 2010)

Conclusions

While progress has been made in prediction and risk mapping of RVF, a number of outstanding issues remain. Currently, the model uses NDVI as the primary data input as a proxy for both ecological dynamics and rainfall. The explicit incorporation of real-time rainfall in the model can enable the improvement of the risk mapping through a ranking of risk, based on accumulated rainfall as a measure of potential flood conditions. Secondly, the current RVF epizootic area mask is based on a RVF literature survey to identify countries where there have been episodes of RVF activity adjusted by coarse-scale long-term rainfall and NDVI to identify areas of pronounced inter-annual variability. This however does not take into consideration patterns of land cover/land use change that may create or destroy mosquito habitats thus changing risk characterisation at local level. This may have been the reason for model failure in identifying risk in RVF outbreaks along coastal Kenya in 2006-2007, in South Africa (January – February 2008), in Sudan within the Gezira irrigation scheme, and some areas in Madagascar. Better land cover characterisation using more fine-scale resolution data such as LANDSAT-based *Africover* classification can tremendously improve the identification of potential RVF epizootic/epidemic areas across all countries at risk. These are two important areas that remote sensing can make a contribution to model refinement and improvement.

Going forwards it is essential that the HoA countries, individually and as a region put in place a dedicated monitoring system of various climatic and ecological indicators relevant for RVF. In this case, the Ministries of Livestock Development, Public Health and Environment should work together with their respective Meteorological Departments to structure and set-up the operation of such a system. Monitoring is critically essential as it can inform changing conditions rather than relying on seasonal climatic predictions alone.

EMERGENCY PREPAREDNESS FOR RVF

Ludovic Plée*, Vincent Martin^Δ, Carlenne Trevennec

(*) Epidemiologist / Response Veterinary Officer
Crisis Management Centre – Animal Health
FAO
Rome, Italy

(^Δ) Acting Head
EMPRES
FAO
Rome, Italy

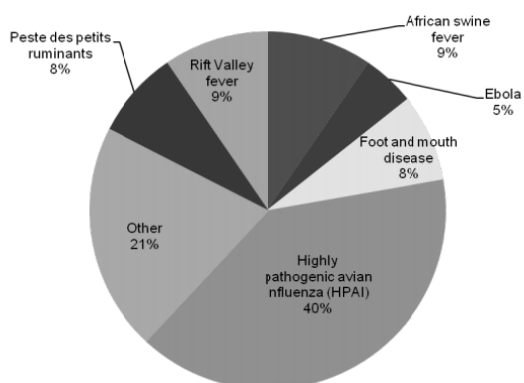
Prevalent in many areas of the world, TADs such as African swine fever, foot-and-mouth disease, RVF are often not recognized in time. Swift to spread from herds to markets and beyond, some of these diseases are also transmissible to humans and can move to cities, countries and regions if left unchecked. In light of the global repercussions of TADs on animal health and trade, and on human health, response efforts must be fast, well-coordinated and strategically planned to help stop diseases before they spread.

Created in October 2006 in order to address the international threat of the H₅N₁ epidemic, the FAO / OIE *Crisis Management Center - Animal Health* (CMC-AH) is a unique rapid response mechanism for trans-boundary animal disease emergencies. The Centre unites FAO's extensive technical and operational expertise with that of the OIE, the WHO and other international, national and local partners in order to provide technical and operational assistance to help governments develop and implement immediate solutions to prevent or stop disease spread.



Request from the European Food Safety Authority EFSA to investigate the risk of introduction of RVF in the European Union.

Since inception and through the daily tracking activities of the *Global Early Warning System* (GLEWS) of FAO's *Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases* (EMPRES), the Centre fielded several rapid deployment teams in Eastern and Western Africa to assist countries in addressing RVF outbreaks through assessment of the situation and support.



Diseases for which 62 CMC missions in 41 countries have been fielded. Source : CMC-AH (FAO) 2012.

While supporting veterinary services in controlling RVF outbreaks and in order to address the particular epidemiological feature of a trans-boundary disease such as RVF, CMC-AH also supported countries to increase their preparedness to future and likely new outbreaks, through risk communication, better inter-ministerial coordination of activities, investigation of new methods for a better surveillance and a more astute early warning system, especially for those where predicting models are still unreliable.

Q & A

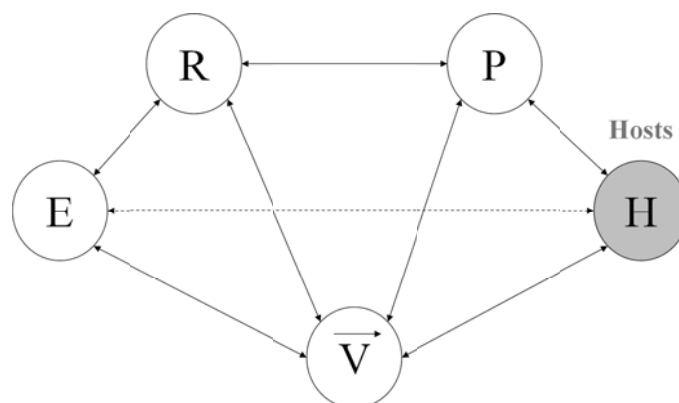
Dr. Danny Goovaerts (IFAH) refers to various outbreaks of Schmallenberg and bluetongue, similar diseases, in northern Europe, and wonders why outbreaks of vector (mosquito) borne disease always seem to crop up in the Benelux countries (Belgium, Netherlands and Luxemburg), could it have to do with the import of vegetables and fresh flowers from e.g. Kenya ?

Catherine Cêtre – Sossah, Eric Cardinale & Renaud Lancelot*

(*) Virologist (emerging diseases)
Département BIOS, Systèmes Biologiques
Groupe Virologie
Cyclotron et Recherche Biomédicale
CIRAD - CRVOI
Sainte Clotilde, La Réunion (France)

RVF is an arthropod-borne viral disease of veterinary and public health importance. Periodic severe animal epizootics are the drivers of human epidemics in Western and Eastern Africa (Egypt 1977, 1993, 1997, Mauritania 1987, 1993, 1998, 2003, 2010 and 2012, Eastern Africa 1997-1998, 2006-2008) with recent incursions to the Arabian Peninsula (Saudi Arabia and Yemen in 2000).

Following the first outbreaks occurring in a country, the implementation of surveillance programmes which may lead to disease specific risk maps is a key component for a better understanding of RVF epidemiology and could help developing an early-warning system and simulation models to assess climatic scenarios and control strategies.



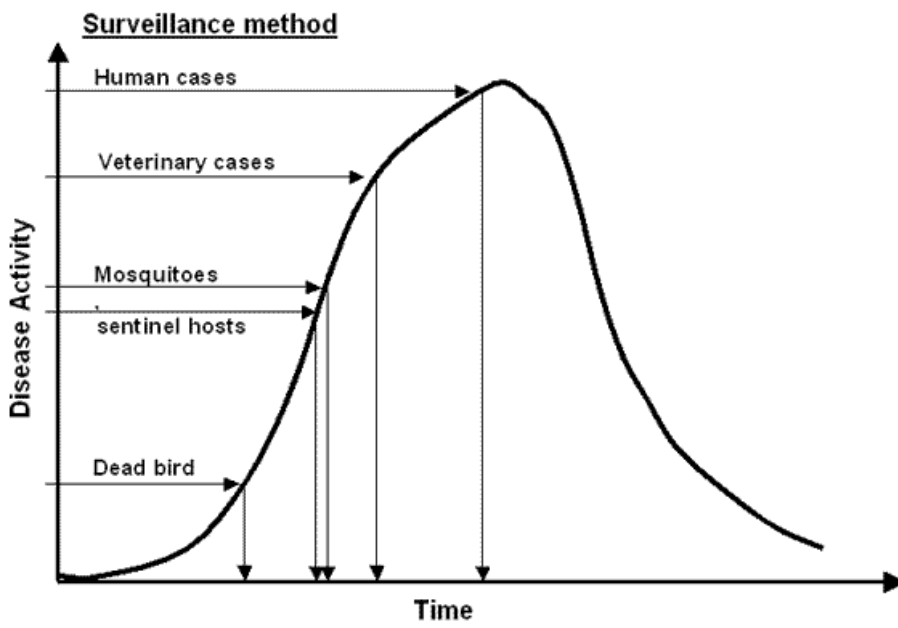
A vector-based approach to surveillance of RVF

The surveillance system, in the case of RVF must include the different following components:

- V : the vectors: identification (presence / absence) and quantification, dynamics and vector competence of the involved species
- H : the hosts (animals and/or humans): description of the syndrome, diagnosis (quantification of the infection by virological and serological surveys), herds movements, host susceptibility,
- P : the pathogen (identification, presence/absence, evolution)
- E : the environment (climate and meteorological events, land cover, landscape and ecosystem) with intensive use of satellite remote sensing
- R : the reservoir hosts (identification of the pathogen or antibodies in wild life animals)

In addition, the information gathered has to be stored in a database to be shared by surveillance partners. Communication and training materials should also be distributed to raise local awareness with regard to disease burden and cost on livestock and human health. Based on the information

collected for the 5 main components, risk maps can be designed and could help in a better management of vector-borne epizootics.



Surveillance model for West Nile fever reservoirs in the USA

DECISION SUPPORT TOOL FOR MANAGING RVF IN THE HORN OF AFRICA

Jeff Mariner, John Gachochi & Bernard Bett*

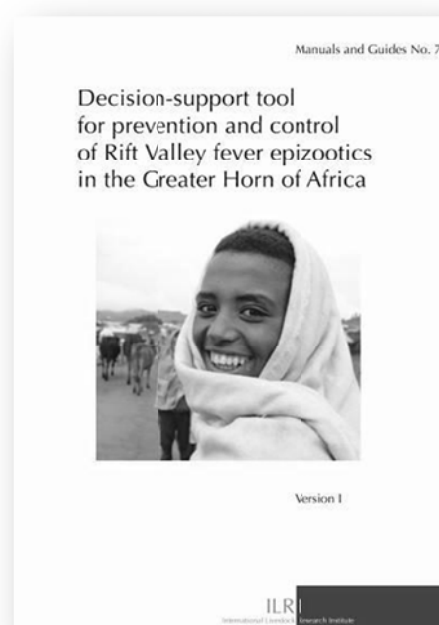
Research Scientist
ILRI
Nairobi, Kenya

RVF outbreaks in East Africa are often explosive events that unfold over a course of weeks with significant economic, livelihoods and health impacts. These impacts result from direct effects of infection on livestock and people as well as indirect effects of control measures that interrupt national and international marketing of livestock and livestock products. The rapid evolution of outbreaks is usually concurrent with flooding that limits access to rural areas. The historic approach of decision-makers to threat of RVF outbreaks has been not been risk-based. Often, responses are not initiated until after the first confirmed case when it is too late to change the course of events.

Following the 2006-2007 outbreak in East Africa, the *International Livestock Research Institute* (ILRI) undertook an analysis of events and together with the FAO, convened a series of stakeholder meetings to discuss how the response to outbreaks could be improved. Participants agreed that a primary constraint to effective response was the all-or-nothing decision process taken in previous outbreaks.

Stakeholders recognized that a phased approach to decision-making based on incremental responses to the escalating risk of an outbreak was more appropriate. Decision-makers noted that a series of events leading up to the outbreak were milestones indicative of increasing levels of risk that justified increased investment in prevention and mitigation. The outcome of the discussion was a matrix where one dimension was the decision point events and the second dimension a series of action categories where appropriate responses were listed for consideration at each decision point.

The ILRI Manual n° 7 on the Decision Support Tool



The risk-based decision-making framework was found to be useful in preparing preventive actions for the RVF warning of 2007. In addition to decision support, the framework was found to be a useful communication tool in hands of veterinary service personnel for highlighting the need for early allocation of resources to senior Ministry officials.

Table 6. Average time for RVF to manifest itself and for health care authorities (incl. veterinary) to respond.

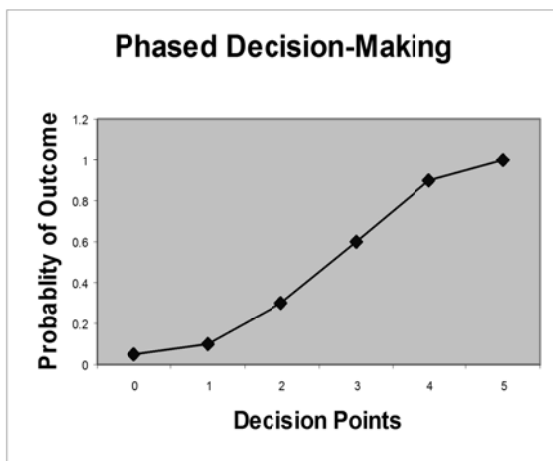
Risk Factors		Cases		Response	
Rains	Vectors	Livestock	Human	Human	Vet
33.1 days	19.2 days	21 days	35.6 days	12.3 days	

The RVF *Decision Support Framework* has the potential to serve as a framework for managing outbreak risk in the context of international trade. AU-IBAR and ILRI facilitated a meeting in Dubai in 2011 that brought together animal health authorities from the HoA and the Middle East to

discuss the *Decision Support Framework* use in managing trade. The meeting resolved that the tool should be adapted to managing trade risk through joint consultation and that decision support framework was a useful approach whose application to other disease issues should be explored.

The framework has been introduced to the veterinary departments in Kenya and Tanzania and it is being used, together with the existing RVF emergency preparedness and response plans, to plan interventions for RVF. Studies and workshops involving key decision makers from these departments have been implemented to review the level of utilisation of the framework and perceptions on its usefulness.

Initial findings suggest that the utilisation of the framework has improved over time and it has now been incorporated into the RVF Contingency Plan in Kenya. The decision makers have also suggested expanding the framework to allow for a one-health approach to RVF management and control. Currently, veterinary interventions form the bulk of the interventions suggested in the framework.



Research is also underway to develop tools such as RVF risk maps and transmission models that can be used to guide the implementation of the framework or assess the effectiveness of the interventions specified. The RVF risk mapping builds on the work that has been published by NASA and others and utilizes data on historical epizootics observed in Kenya and Tanzania since the 1930's. Statistical models are being fitted to these data to identify factors associated with incidence and prevalence of RVF in defined zones.

Schematic presentation of progressive risk mitigation, based on consequence vs probability of outcome, the justification for investment in risk mitigation vs the risk of making the wrong decision.

Q & A

Dr. Chip Stem (Livestock Trade Services, Ltd) states that it used to be very hard to convince veterinarians to alert that there might be an epidemic coming up. This being solved now, isn't there a risk that the problem is moving to the reluctance of farmers, producers and traders? What can be done about that? Dr Mariner replies that in the 2007 – 2008 RVF episodes, there was much less reluctance amongst farmers to report RVF. Once the full dimension of possible trade impediments are known, this reluctance might appear, but it's not the case now.

Dr. Karim Tounkara (AU-PANVAC) asks Dr Mariner how he thinks vaccines can be stockpiled, e.g. taking into account possible expiry dates. Dr. Mariner answers that some agency will have to absorb the cost of expired vaccines. The other alternative is to have multivalent vaccines which can be used against one of the components (e.g. LSD) before it expires. Dr Peter Ithondeka (CVO Kenya) adds that Kenya keeps stockpiles and Government assumes the cost of expired vaccines (200,000 doses). Dr. John Omolo from Tanzania clarifies that all emergency issues are under the Prime Minister's Office (PMO) authority and requires endorsement from the MoH and the MoA. Since RVF has indeed been declared a national disaster in the past, the availability of funds is not a concern. Unfortunately, there are no physical stockpiles which creates delays in terms of rapid response.

Session 6

Towards regional prevention and control strategies

GALV-MED REGIONAL INITIATIVES AND PROPOSALS

*Baptiste (Baty) Dungu & Victor Mbaob**

(*) Programme Manager – Large Ruminants
AU - Centre for Ticks and Tick-Borne Diseases
GALVmed
Lilongwe, Malawi

One key characteristic of RVF which complicates effective control is its cyclical nature characterised by long and irregular inter-epizootic periods, which can be up to 10 years. Subsequently animal owners or veterinary services struggle to sustain regular vaccination, and yearly vaccination based on current vaccines become difficult to implement.

Alternative control strategies thus become very critical to consider in order to limit losses when an outbreak occurs. The use of strategic reserves of vaccine or vaccine antigen has been shown to be very effective for diseases such as FMD. Similar approach is considered to be appropriate to RVF, given its cyclical nature. Experience has also shown that such strategies are more effective when they are considered for a grouping of countries, as outbreaks tend to affect more than one country.

Regional strategies for the control of RVF are likely to lead to more cohesive policies and mutual support between the different countries. A number of actions are already on-going in the SADC region.

Working with other partners, GALVMed is participating and supporting a number of actions that are expected to contribute to the development of a more effective regional strategy. These activities include the evaluation of RVF risk in each country, through the development of Risk maps, based on historic data on the occurrence of the disease, a RVF policy landscaping in order to understand current policies setup in each country around RVF control, and the establishment of a technical RVF interstate working group that would advise policy makers on most appropriate RVF control strategy, which would include aspects such as vaccination strategy and support to the establishment of a common vaccine or vaccine antigen bank. Similar approaches could be considered for other regions.

Q & A

Dr Shaif Abdo Salem Abdullah from Yemen asks what the shelf time for Clone 13 is, whilst Dr Susanne Münstermann (OIE) in turn asks what the production time of Clone 13 is. Dr Jeanette Heath from OBP (Pretoria) answers that the shelf life is currently nine months, but OBP is working to improve this. The production time is about 21 days.

AU-IBAR REGIONAL INITIATIVES

James Wabacha

Coordinator
SMP-AH Project
AU-IBAR
Nairobi, Kenya

AU-IBAR's recent past and on-going regional initiatives for the management of TADs and zoonoses were presented. A brief history of AU-IBAR was given, as an institution that was founded in 1951 to address rinderpest, which with time had expanded its mandate to include other aspect of animal health, Production and wildlife. The mandate of AU-IBAR is 'to support and coordinate the utilisation of animals (livestock, fisheries and wildlife) as a resource for human wellbeing in the Member States, and to contribute to economic development, particularly in rural areas'. The six strategic programmes AU-IBAR was embarking on in line with 2010-2014 Strategic plan were highlighted. An update was provided on AU-IBAR's initiatives addressing TADs and zoonoses in the region in line with strategic programme 1, reducing the Impacts of TADs and zoonoses in Africa.

The achievements of several projects that AU-IBAR and partners had implemented in the region were also highlighted for example the project, "*Vaccines for the Control of Neglected Animal Diseases in Africa (VACNADA)*" had supported capacity building by providing equipment and training to eight (8) vaccine producing laboratories in Africa that had led to doubling or tripling of their vaccine production capacity. In addition, the project had supported the development of a bio-safety level 3 (BL3) facilities for vaccine quality control and a *Process Development Laboratory (PDL)* in Ethiopia for technology incubation and training in vaccine production.

To support livestock trade in the HoA and the Middle East, AU-IBAR through the *Somali Livestock Certification Project (SOLICEP)*, in partnership with FAO and the NGO "Terra Nuova", with financial support of the European Union, had enhanced capacity for livestock inspection and certification in Somalia through training of animal health inspectors, rehabilitation of animal health inspection and certification facilities and by supporting logistics for animal health inspection and certification for livestock export. The project had also enhanced communication between trading partners from the HoA and Middle East through regular meetings.

Through the project, *Livestock Emergency Intervention to Mitigate Food Crisis in Somalia (LEISOM)* that was implemented by AU-IBAR in partnership with COOPI, "Terra Nuova" and VSF- Germany with financial support of the European Union, animal health services and support to livestock marketing to mitigate the negative effects of the high food prices were provided. AU-IBAR was also undertaking coordination of common positions on animal health standards for African CVOs during the OIE standard setting process. An update was provided on the *Integrated Regional Coordination Mechanism (IRCM)* through which AU-IBAR, in cooperation with partners, will coordinate the implementation of disease prevention and control interventions in the Member States through *Regional Economic Communities* or RECs.

To support Veterinary governance in Africa, AU-IBAR, OIE, FAO and RECs were implementing the *Veterinary Governance Project (VETGOV)* with financial support of the European Union. The specific objective of the project was to improve the institutional environment at national and regional levels to provide effective and efficient animal health services in Africa.

The AU-IBAR *Animal Health Information System (ARIS)* was also mentioned with its monthly collection, collation, analysis & dissemination of sanitary data among African Union Member States and the publication of the Pan African Animal Health Yearbook to enhance dissemination of animal health information across the continent.

A new project “*Standard Methods and Procedures in Animal Health*” (SMP-AH), coordinated by AU-IBAR in partnership with IGAD with financial support of USAID, is implemented in nine countries in the Greater Horn of Africa, Djibouti, Ethiopia, Eritrea, Kenya, Somalia, South Sudan, Sudan, Tanzania and Uganda. The aim of the project is to support coordination and harmonisation of prevention and control of regional priority trade related TADs that include RVF and PPR. The programme will provide regional uniformity in control and prevention of the targeted disease. In this design each disease has “Standard Methods and Procedures” that specify how the disease is to be controlled and/or eradicated in line with OIE standards. The project will contribute to safe, stabilized trade leading to safe, stabilized livelihoods all along the value chain regionally.

The *Pan-African Platform of Livestock Trading Countries* (PAFLEC), a continental initiative led by AU-IBAR in collaboration with RECs has as its objective to create awareness on trade issues on livestock and livestock products, help develop partnerships and synergies, promote and increase visibility of African livestock commodities and strengthen capacities of stakeholders. Lastly, the secretariat for the ALive platform, a partnership for Livestock Development, Poverty Alleviation, and Sustainable Growth in Africa established in 2004, is based at AU-IBAR.

Q & A

Dr. Shaif Abdo Salem Abdullah from Yemen congratulates IBAR on the programme aimed at mapping animal movement (corridors). Dr James Wabacha from AU IBAR confirms that the subject of livestock movement corridors is indeed very important. One of the remits of the SMP-AH project is to come up with an identification and registration system for the region, in support to certification. In terms of corridors, the project working on this is IBAR’s PAFLEC project, the *Pan-African Forum for Livestock Exporting Countries*, with very interesting studies in the pipeline

Dr. Assaf Anyamba from NASA would like to know more about the animal information system of IBAR, called ARIS. Dr James Wabacha answers that ARIS, the *Animal Resource Information System* is a system to collect, collate, analyse and disseminate animal health and production data from Member Countries. It should be owned (and is customisable) by the countries, for the benefit of the countries. Dr Anyamba, in addition, asks whether the system can provide crucial information on livestock density and distribution. Dr Wabacha then explains that ARIS is constituted of 5 modules. He elaborates further on the several levels of data entry and detail, as decided or available by the countries.

Dr. Barbara Freischem (IFAH) asks to what degree the vaccination development programmes also look at legislation ?

Dr. Karim Tounkara (AU-PANVAC) answers that during the last Johannesburg meeting, PANVAC was requested to take the lead on legislation and this work is now underway, especially in West Africa. Work is also starting in East Africa and a workshop was held in Libreville for Central Africa. The *Southern Africa Development Community* (SADC) already has on-going activities in respect of harmonised registration of veterinary products. The process will be repeated for the *East African Community* (EAC), based in Arusha.

REGIONAL ECONOMIC COMMUNITIES REGIONAL INITIATIVES : IGAD

Ameha Sebsibe

Livestock Expert
Center for Pastoral Area and Livestock Development
Liaison Office
IGAD
Nairobi, Kenya

The *Inter-Governmental Authority on Development* (IGAD) is a REC covering eight countries: Djibouti, Eritrea, Ethiopia, Kenya, Somalia, South Sudan, Sudan and Uganda. Eighty (80) % of the IGAD region is made up of arid and semi- arid lands dominated by livestock and have about 336 million ruminants. The demand for livestock and livestock products in the region, in other regions within Africa and in Middle East countries is high. Proximity to the Middle East countries and adaptation to the taste of our animals in the Gulf are also opportunities. However, some IGAD countries are only covering 40% of live animal and 6.4% of the meat required annually by the Middle East. One major reason is limited capacity to control trans-boundary diseases. There were also export bans on East African countries due to RVF which affected heavily the livelihood of the actors mainly of the producers.



Cognizant of the fact that the livestock sector in the region faces common challenges that require coordinated response and the development of an IGAD-wide free trade area that would require the free movement of livestock and livestock products across borders for trade purposes that need to be legalized, streamlined and promoted, the member states approved regional *Animal Health Policy Framework in the context of trade and vulnerability*.

IGAD Member States

This framework includes five articles in the following areas :

- Control and prevention of trans-boundary animal diseases, production diseases, animal welfare and livestock related emergencies;
- IGAD representation and participation in international standards setting institutions;
- Regional and national capacity building and provision of livestock services;
- Intra-regional trade in livestock and livestock products, inputs and services; and
- Establishment of the IGAD *Centre for Pastoral Areas and Livestock Development* (ICPALD) to serve as technical arm of the secretariat and provide technical support to member states.

ICPALD has been recently established to assist member states and the secretariat to discharge the responsibilities provided in the framework, coordinate relations with relevant technical institutions in the field of livestock including the AU-IBAR, FAO, OIE and Codex, undertake regular studies of relevant international standards, reviewing member state approaches, strategies and capacities and recommending appropriate steps to achieve compliance.

Q & A

Dr Faisal Bayoumi, representing Saudi Arabia adds that similar initiatives are underway in the Middle-East, but that countries have not yet met.

Conclusions

Recommendations

RECOMMENDATIONS

INTER-REGIONAL CONFERENCE ON RVF

13 – 15 November 2013
Mombasa, Kenya

CONSIDERING THAT :

- Outbreaks of RVF have occurred in the past in East Africa and the Middle East and that there is a risk, particularly through trade, to new territories;
- RVF is a zoonosis and causes socio-economic impact on livelihoods;
- Clone 13 vaccine (live, attenuated) is registered in South Africa and Namibia;
- Climate change could influence the risk of RVF outbreaks and its epidemiology;
- Trade bans imposed in 2000, 2006/7 did not stop all trade and therefore the spread of the disease;
- An update on the 5-years Global GF-TADs Action Plan was given;
- The recommendations from previous meetings are still valid, particularly those listed hereafter:
 - Training and technical assistance be provided to countries by international organisations and donors on diagnosis, prediction and contingency planning
 - OIE to promote the use of the PVS pathway to enhance good veterinary governance
 - The international organisations to support the accelerated development and registration of diagnostic tests and vaccines
 - Development of risk models for the two regions to forecast RVF
 - Collaboration between human and veterinary sector in line with the “One Health” concept
 - Countries must comply with their reporting obligations to the OIE through WAHIS
 - Trade between the regions should follow the OIE standards, in respect to diagnostic tests, quarantine and use of vaccines
 - Countries to put into effect the health certificates for intra-regional trade as developed in Cairo in 2004
 - Development of appropriate communication strategies on the socio-economic impact of the disease;

THE CONFERENCE ON RVF IN EASTERN AFRICA AND THE MIDDLE EAST RECOMMENDS :

A. TO COUNTRIES

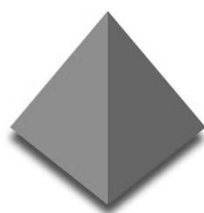
- To develop targeted surveillance and control strategies;
- To apply existing SPS and OIE standards for the trade of live animals and animal products;
- To discourage the use of trade bans as a tool to control the disease exceeding the timeframe provisions given in the Code;
- To promote transparent sanitary information exchange between trade partners in the two regions and the OIE;
- To enhance inter-sectoral collaboration through the nomination of dedicated contact persons in both Ministries;
- To ensure that all RVF vaccine produced in Africa be quality certified by Panvac;
- To promote the registration of Clone 13 vaccine;
- To learn from successful experiences in the implementation of surveillance and control measures carried out in affected countries;
- To explore the feasibility of the adaptation of “RVF risk based decision making framework” to their national context in order to improve the timeliness of preparations and linkage between EWS with response.

B. TO INTERNATIONAL, REGIONAL AND SUB-REGIONAL ORGANISATIONS

- To re-establish the GF-TADs “study group” on RVF;
- To strengthen their collaboration with private /NGO and industry partners in view of accelerated vaccine and diagnostics development. For the vaccine development, the recommendations on safety and efficacy as given by the GF TADs meeting in Rome 2011 and quoted in the revised chapter on Vaccine in the OIE *Terrestrial Manual* shall be taken into consideration;
- To harmonise at the regional level their approach/ projects aiming at the facilitation of safe trade between Africa and Middle East;
- FAO / OIE and partners to develop EWS models to fit the different eco-systems in Africa and the Middle East;
- FAO and OIE to assist in the transfer and capacity building of appropriate EWS to regional institutions.

Annexes

SEMINAR PROGRAMME



GF-TADs

GLOBAL FRAMEWORK FOR THE
PROGRESSIVE CONTROL OF
TRANSBOUNDARY ANIMAL DISEASES



CONFERENCE ON: "RVF: CHALLENGE, PREVENTION AND CONTROL"

MOMBASA (KENYA), 13 - 15 NOVEMBER 2012

P R O G R A M M E

Day 1: Tuesday 13 November 2012

08:30 - 09:00

Registration

09.00 - 10.00

Opening Ceremony

10.00 - 10.30

Photo Session and Coffee Break

SESSION 1:

THE DISEASE AND HOW IT IS CONTROLLED

Chair: Dr Ghazi Yehia, OIE

10:30 - 10:40 Objectives of the meeting

Walter Masiga, OIE

10:40 - 11:10 RVF: the disease epidemiology in animals and overview of its global spread

Susanne Munstermann, OIE

11:10 - 11:30 Key recommendations from previous important RVF meetings

Susanne Munstermann and Vincent Martin, FAO

SESSION 2:

CURRENT SITUATION OF RVF IN EAST AFRICA AND THE MIDDLE EAST

Chair: Dr James Wabacha, AU-IBAR

11:30 - 13:30 RVF in East Africa - an overview

Njenga Kariuki, Kenya

RVF in Kenya - a country presentation

Peter Ithondeka, Kenya

RVF in Somalia - a country presentation

Paul Rwambo, Somalia

RVF in the Middle East - an overview

Ghazi Yehia, OIE

RVF in the Yemen - a country presentation

Shaif Abdo Salem Abdullah, Yemen

RVF in Saudi Arabia - a country presentation

Faisal Bayoumi, Saudi Arabia

13:30 - 14:30 Lunch

SESSION 3:

IMPACT OF RVF ON TRADE

Chair: Dr Ameha Sebsibe

- 14:30 – 14:50** RVF Trade regulations in the OIE *Terrestrial Code* Ghazi Yehia, OIE
- 14:50 – 15:10** Trade patterns within and between East Africa and the Middle East Chip Stem, LTS, Ltd
- 15:10 – 15:30** Economic impact of RVF outbreaks on trade within and between East Africa and the Middle East Nicolas Antoine-Moussiaux, CIRAD
- 15:30 – 15:50** Infrastructure and legislation necessary to prevent spread of the disease through trade Patrick Bastiaensen, OIE
- 15:50 – 16:00** Discussion
- 16:00 – 16:30** Coffee break

SESSION 4:

CHALLENGES TO DISEASE CONTROL

Chair: Dr Vincent Martin, FAO

- 16:30 – 16:50** Diagnostic tests for RVF Gianmario Cossedu, IZS Teramo
- 16:50 – 17:15** Revision of the RVF chapter in the OIE *Terrestrial Manual*; R & D on vaccines Danny Goovaerts, IFAH
- 17:15 – 17:45** Discussion
- 19:00** Dinner Reception

Day 2: Wednesday 14 November 2012

SESSION 4:

CHALLENGES TO DISEASE CONTROL (continued)

Chair: Dr Vincent Martin, FAO

- 09:00 – 09:20** RVF vaccines currently available for use in the field and their issues Jeanette Heath, OBP
- 09:20 – 09:40** The global offer of RVF vaccines Danny Goovaerts, IFAH
- 09:40 – 10:00** Independent RVF vaccine quality control Karim Tounkara, PANVAC
- 10:00 – 10:20** OIE principles for Vaccine banks Susanne Munstermann, OIE
- 10:20 – 10:40** Strategies for vaccination programmes Victor Mbaou, GALVMED
- 10:40 – 11:00** Discussion
- 11:00 – 11:30** Coffee break

SESSION 5:**PREVENTION AND EARLY WARNING****Chair: Dr Fulvio Biancifiori, FAO**

11:30 – 11:50	Existing early warning systems and risk assessment tools: prospects and challenges for better forecasting of RVF	Vincent Martin, FAO
11:50 – 12:10	Geo-climatic prediction	Assaf Anyamba, NASA
12:10 – 12:30	Emergency preparedness for RVF	Ludovic Plee, FAO
12:30 – 13:00	Discussion	
13:00 – 14:30	Lunch	
14:30 – 15:00	Risk mapping and surveillance – methods and their applications	Catherine Cêtre-Sossah, CIRAD
15:00 – 15:20	Decision support tool for managing RVF in the Horn of Africa	Jeff Mariner, ILRI
15:20 – 15:30	Discussion	
15:30 – 16:00	Coffee break	

SESSION 6:**TOWARDS REGIONAL PREVENTION AND CONTROL STRATEGIES****Chair: Dr Bouna Diop, FAO**

16:00 – 16:30	GALVMed regional initiatives and proposals	Victor Mbao, GALVMED
16:30 – 17:10	AU-IBAR regional initiatives	James Wabacha, AU-IBAR
17:10 – 17:30	Regional Economic Communities (IGAD) regional initiatives	Ameha Sebsibe, IGAD
17:30 – 18:00	Discussion	
19:00	Dinner Reception	

Day 3: Thursday 15 November 2012

09:00 – 09:15	Summary of key points of Day 1 and 2 and introduction to the objectives of the Working Groups	Susanne Munstermann, OIE
09:15 – 10:45	Working Groups Session	
10:45 – 11:15	Coffee break	
11:15 – 12:15	Working Groups reporting to plenary	
12:15 – 12:30	Discussions	
12:30 – 13:00	Workshop recommendations and closing remarks	Ghazi Yehia, and Walter Masiga, OIE
13:00 – 14:00	Lunch	

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www.au-ibar.org

www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/rvf.htm

www.cirad.fr

www.eac.int

www.fao.org

www.galvmed.org

www.gcc-sg.org/eng/

www.ifahsec.org

www.igad

www.ilri.org

www.izs.it

www.keevapi.org

www.merial.com

www.msd-animal-health.co.uk

www.nasa.gov

www.nasa.gov/topics/earth/features/riftvalley_fever.html

www.obpvaccines.co.za

www.oie.int

www.rr-africa.oie.int

www.usaid.gov

www.usda.gov

www.who.int

www.who.int/mediacentre/factsheets/fs207/en/

CHAPTER 8.11. RVF

Article 8.11.1.

General provisions

For the purposes of the Terrestrial Code, the infective period for RVF shall be 30 days.

For the purposes of this chapter, ruminants include camels.

The historic distribution of RVF is the sub-Saharan African continent, Madagascar and the Arabian Peninsula.

Countries or zones within the historic distribution of RVF or adjacent to those that are historically infected should be subjected to surveillance.

Epidemics of RVF may occur in infected areas after flooding. They are separated by inter-epidemic periods that may last for several decades in arid areas and, during these periods, the prevalence of infection in humans, animals and mosquitoes can be difficult to detect.

In the absence of clinical disease, the RVF status of a country or zone within the historically infected regions of the world should be determined by a surveillance programme (carried out in accordance with Chapter 1.4.) focusing on mosquitoes and serology of susceptible mammals. The programme should concentrate on parts of the country or zone at high risk because of historical, geographic and climatic factors, ruminant and mosquito population distribution, and proximity to areas where epidemics have recently occurred.

Standards for diagnostic tests are described in the Terrestrial Manual.

When authorising import or transit of the commodities covered in the chapter, with the exception of those listed in Article 8.11.2., Veterinary Authorities should require the conditions prescribed in this chapter relevant to the RVF status of the ruminant population of the exporting country or zone.

Article 8.11.2.

Safe commodities

When authorising import or transit of the following commodities and any products made from them, Veterinary Authorities should not require any RVF related conditions, regardless of the RVF status of the ruminant population of the exporting country or zone:

- hides and skins;
- wool and fibre.

Article 8.11.3.

RVF infection free country or zone

A country or a zone may be considered free from RVF infection when the disease is notifiable in animals throughout the country and either:

- the country or zone lies outside the historically infected regions, and not adjacent to historically infected regions; or
- a surveillance programme as described in Article 8.11.1. has demonstrated no evidence of RVF infection in humans, animals or mosquitoes in the country or zone during the past four years following a RVF epidemic.

The provisions of the last paragraph of Article 8.11.1. may need to be complied with on a continuous basis in order to maintain freedom from infection, depending on the geographical location of the country or zone.

A RVF infection free country or zone in which surveillance and monitoring has found no evidence that RVF infection is present will not lose its free status through the importation of permanently marked seropositive animals or those destined for direct slaughter.

Article 8.11.4.

RVF infected country or zone without disease

A RVF disease free country or zone is a country or zone that is not infection free (see Article 8.11.3.) but in which disease has not occurred in humans or animals in the past six months provided that climatic changes predisposing to outbreaks of RVF have not occurred during this time.

Article 8.11.5.

RVF infected country or zone with disease

A RVF infected country or zone with disease is one in which clinical disease in humans or animals has occurred within the past six months.

Article 8.11.6.

Recommendations for importation from RVF infection free countries or zones

For ruminants

Veterinary Authorities should require the presentation of an international veterinary certificate attesting that the animals:

- were kept in a RVF free country or zone since birth or for at least 30 days prior to shipment; and
- if the animals were exported from a free zone, either:
 - did not transit through an infected zone during transportation to the place of shipment; or
 - were protected from mosquito attacks at all times when transiting through an infected zone.

Article 8.11.7.

Recommendations for importation from RVF infection free countries or zones

For meat and meat products of domestic and wild ruminants

Veterinary Authorities should require the presentation of an international veterinary certificate attesting that the products are derived from animals which remained in the RVF infection free country/free zone since birth or for the last 30 days.

Article 8.11.8.

Recommendations for importation from RVF infected countries/zones without disease

For ruminants

Veterinary Authorities should require the presentation of an international veterinary certificate attesting that the animals:

- showed no evidence of RVF on the day of shipment;
- met one of the following conditions:
 - were kept in a RVF infected country/zone free of disease since birth or for the last six months providing that climatic changes predisposing to outbreaks of RVF have not occurred during this time; or
 - were vaccinated against RVF at least 21 days prior to shipment with a modified live virus vaccine; or
 - were held in a mosquito-proof quarantine station for at least 30 days prior to shipment during which the animals showed no clinical sign of RVF and were protected from mosquitoes between quarantine and the place of shipment as well as at the place of shipment;

AND

- did not transit through an infected zone with disease during transportation of the place of shipment.

Article 8.11.9.

Recommendations for importation from RVF infected countries or zones without disease

For meat and meat products of domestic and wild ruminants

Veterinary Authorities should require the presentation of an international veterinary certificate attesting that:

- the products are derived from animals which:
- remained in the RVF infected country or zone without disease since birth or for the last 30 days;
- were slaughtered in an approved abattoir and were subjected to ante- and post-mortem inspections for RVF with favourable results;
- the carcasses from which the products were derived were submitted to maturation at a temperature above +2°C for a minimum period of 24 hours following slaughter.

Article 8.11.10.

Recommendations for importation from RVF infected countries or zones with disease

For ruminants

Veterinary Authorities should require the presentation of an international veterinary certificate attesting that the animals:

- showed no evidence of RVF on the day of shipment;
- were vaccinated against RVF at least 21 days prior to shipment with a modified live virus vaccine;

OR

- were held in a mosquito-proof quarantine station for at least 30 days prior to shipment during which the animals showed no clinical sign of RVF and were protected from mosquito attacks between quarantine and the place of shipment as well as at the place of shipment.

Article 8.11.11.

Recommendations for importation from RVF infected countries or zones with disease

For meat and meat products of domestic and wild ruminants

Veterinary Authorities should require the presentation of an international veterinary certificate attesting that the carcasses:

- are from animals which have been slaughtered in an approved abattoir and have been subjected to ante- and post-mortem inspections for RVF with favourable results; and
- have been fully eviscerated and submitted to maturation at a temperature above +2°C for a minimum period of 24 hours following slaughter.

Article 8.11.12.

Recommendations for importation from RVF infected countries or zones with disease

For in vivo derived embryos of ruminants

Veterinary Authorities should require the presentation of an international veterinary certificate attesting that the donor animals:

- showed no evidence of RVF within the period from 28 days prior to 28 days following collection of the embryos;
- were vaccinated against RVF at least 21 days prior to collection with a modified live virus vaccine;

OR

- were serologically tested on the day of collection and at least 14 days following collection and showed no significant rise in titre.

Article 8.11.13.

(Under study) Recommendations for importation from RVF infected countries or zones with disease or from RVF infected countries or zones without disease

For milk and milk products

Veterinary Authorities of importing countries should require the presentation of an international veterinary certificate attesting that the consignment:

- was subjected to pasteurisation; or
- was subjected to a combination of control measures with equivalent performance as described in the Codex Alimentarius *Code of Hygienic Practice for Milk and Milk Products*.

