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*Standard Methods and Procedures (SMPs)  
for control of  
**Rift Valley Fever (RVF)**  
in the Greater Horn of Africa*





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***for Control of***  
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***in the Greater Horn of Africa***

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**ISBN: 978-9966-077-07-3**

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Citation: AU-IBAR, 2014. Standard Methods and Procedures (SMPs) for Control of Rift Valley Fever (RVF) in the Greater Horn of Africa. Nairobi.

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## **Foreword**

The arid and semi-arid lands of the Horn of Africa (HOA) are home to poor and vulnerable populations, the majority of whom rely on livestock to sustain livelihoods. However, the performance of livestock in the region remains low, given the widespread occurrence of transboundary animal diseases (TADs) that are responsible for production losses, and reduced performance of intra- and inter-regional trade in livestock and livestock products. Because of disease outbreaks, live animal exports have been severely constrained during the past two decades, by bans imposed by importing countries to reduce risks associated with these diseases.

To address the negative impact of TADs on livestock trade, AU-IBAR and ICPALD together with the participating countries in the region, with financial support from the United States Agency for International Development (USAID), have developed a framework to support harmonization and coordination of the control of the diseases, referred to as the Standard Methods and Procedures (SMP) Approach. The SMP approach involves strengthening capacities of member states for surveillance, epidemiology, laboratory diagnostics, disease control programmes, and communications. The fundamental aspect of the approach is the linking of disease prevention and control activities in a country, to a set of regional minimum standards and procedures for TADs prevention and control in line with the World Organization for Animal Health (OIE) standards.

The minimum standards, procedures, methods and goals for a particular disease are contained in an individual SMPs. It deals with subject areas of surveillance, laboratory procedures and disease control, and states minimum standards, procedures and goals that must be met for harmonized regional control of a disease.

This booklet presents the SMPs for Rift Valley Fever (RVF) and deals with the specific dynamics of RVF prevention and control in the Greater Horn of Africa (GHOA).

The compilation of the materials in the SMPs for RVF, taking into consideration the characteristics of the Greater Horn of Africa, was made possible by technical experts from the region with technical support from AU-IBAR, FAO, OIE and AU-PANVAC. AU-IBAR is indebted to many scientists who reviewed and edited the document and especially to Dr. James Wabacha the coordinator of the SMP-AH project for coordinating the preparation of the SMPs.

The SMPs for RVF targets field veterinary personnel, policy makers, laboratory personnel and veterinary students in the region.

Professor Ahmed El-Sawalhy

Director

African Union Inter-African Bureau for Animal Resources (AU-IBAR)

## **1.0 Introduction**

### **1.1 Standard Methods and Procedures (SMP)**

The Standard Methods and Procedures (SMP) approach is designed to guide and harmonize the work of Departments of Veterinary Services (DVSs) in the Greater Horn of Africa (GHOA) region in their approach to the control of trade-related Transboundary Animal Diseases (TADs).

Standard Methods and Procedures are operational protocols to create uniformity in animal disease detection, diagnostic and control procedures throughout the Greater Horn of Africa (GHOA). An individual SMP is a protocol for control of a given disease that outlines the measures that must be undertaken. The SMP deals with subject areas of surveillance, epidemiology, laboratory procedures and disease control, and states minimum standards, procedures and goals that must be met for harmonized regional control of a disease. It is supported with details as specified in Standard Operating Procedures (SOPS) for each subject area that are designed to fit the structure and capabilities of a given nation.

An SMP is a functional, action oriented document and is not intended to provide a detailed description of the disease. It is also a live and flexible document and can be changed as new science and new techniques for control are discovered.

This SMP deals with the specific dynamics of Rift Valley Fever and specifies standards, methods, and procedures for management, diagnosis and control of the disease.

### **1.2. Rift Valley Fever**

Rift Valley Fever (RVF) is a peracute or acute zoonotic disease of domestic ruminants in Africa. It is transmitted by mosquitoes. It is caused by a bunyavirus of the genus *Phlebovirus*. The disease occurs in climatic conditions favouring the breeding of mosquito vectors and is characterised by abortions and high mortalities in young animals. The disease is most severe in sheep, goats, cattle and camels. Among ruminant game, buffalo also abort during an RVF infection. Humans are susceptible to infection through mosquito bites and contact with infected material, particularly slaughter fluids of infected animals. There are more human deaths from communities that practice consumption of raw infected organs during home slaughters during outbreaks. RVF has caused serious disease in laboratory workers and must be handled with high levels of biosafety and biosecurity. The GHOA region is considered a historically infected region.

For the purposes of implementation of this SMP, the region will be divided into the following main areas:

**1.2.1 Area with no known disease occurrence**

**1.2.2 Infected areas**

- a. Inter-epizootic phase without predisposing factors
- b. Inter-epizootic phase with predisposing factors
- c. Epizootic phase

Contingency planning for control of RVF is basic to effective control of any outbreak of RVF. During the inter-epizootic phase, it is important to develop capacity for surveillance especially Participatory Disease Search (PDS), risk analysis, information management and laboratory diagnosis in order to respond appropriately to any outbreak.

Simulation of the contingency plans and building collaboration and coordination mechanism with other public health agencies should be done during this period. Keeping continuous monitoring of the meteorological early warning systems for enhanced prolonged rains is also an important activity in the inter-epizootic phase without predisposing factors.

## **2.0 Definitions**

For common understanding of terminology, the following definitions will be used.

### **2.1 Surveillance and Epidemiology**

#### **Surveillance**

Means the systematic ongoing collection, collation and analysis of information related to animal health, and the timely dissemination of information so that action can be taken.

#### **Passive surveillance**

This is a method of surveillance that enables veterinary authorities to collect animal health data and information from disease reporting stakeholders.

#### **Active surveillance**

This is a method of surveillance in which epidemiological information is collected through purposeful and planned interventions.

#### **Syndromic surveillance**

This is a surveillance approach based on observation of the main signs of disease.

#### **Clinical surveillance**

This is a surveillance approach to investigate the occurrence of diseases based on observations of clinical signs. For RVF surveillance, high mortality rate in young animals, abortion, nasal discharge and diarrhoea – often hemorrhagic – and dysgalactia after abnormal heavy rainfall are clinical signs to be considered.

#### **Targeted surveillance**

A form of active surveillance based on probability of occurrence of disease in a given area.

#### **Risk-based surveillance**

A form of active surveillance that focuses on a certain area or livestock population based on perceived level of threat, risk and/or consequences.

#### **Participatory disease surveillance**

This is a form of active surveillance that uses participatory approaches in search of disease, including input from local livestock producers and others in the livestock value chain.

### ***Epidemiological unit***

This is a group of animals with a defined relationship sharing common likelihood of exposure to a disease.

### ***Risk mapping***

A tool used for identification, assessment, communication and mitigation of a disease in a certain geographical area.

### ***Zero reporting***

Periodic standard reports noting that surveillance in any form for a given disease has been carried out and no disease occurrence has been encountered. Zero reports are a valuable tool to indicate negative results of constant and ongoing passive and/or active surveillance.

## ***2.2 Disease Status Areas***

### ***Area with no known disease occurrence***

It is an area where the disease has never been reported.

### ***Infected areas***

An area where RVF has at some time been reported.

### ***Inter-epizootic phase without predisposing factors***

It is a period between outbreaks in a RVF infected area with absence of predisposing factors such as abnormal heavy prolonged rainfall, flooding, presence of vectors and naïve hosts.

### ***Inter-epizootic phase with predisposing factors***

It is a period between outbreaks in a RVF infected area with presence of predisposing factors such as abnormal heavy prolonged rainfall, flooding, presence of vectors and naïve hosts.

### ***Epizootic phase***

It is a period when RVF disease is reported and confirmed in a susceptible animal population or region in excess of the normal threshold.

## ***2.3 Planning Documents***

### ***Standard Operating Procedure (SOP)***

A plan of action for a particular undertaking that stipulates exact details of what must be done to accomplish the task.

### **Preparedness Plans**

Preparedness planning involves capacity building, equipment procurement, personnel responsibility allocation, and training in all the disciplines that support effective disease control, e.g. epidemiology, laboratory, disease management, etc.

### **Rapid Response Plan**

This is a pre-programmed plan for immediate response to a report of an outbreak of a TAD or other emergency disease with the goal of eliminating the index case and preventing an epizootic spread. The Rapid Response Plan includes three components: the Epidemiology Section for disease investigation; the Laboratory Section for confirmation sampling; and the Disease Control Section for immediate disease control interventions as needed.

### **Contingency Plan**

An operational plan designed for immediate control of a disease outbreak, typically composed by the Department of Veterinary Services for use within that country.

## **2.4 Personnel**

### **Veterinary Officer**

Government employed veterinarians and field staff.

### **Veterinary Personnel**

All people associated with veterinary work including public veterinary staff (government at any administrative level) and private veterinarians and their staff members.



## **3.0 Surveillance and Epidemiology**

### **3.1 Case definition for RVF**

A severe disease in sheep, goats, cattle, camels and other susceptible species, characterized by stormy abortion, high morbidity, high mortalities in young animals, occasionally with bloody nasal discharges in mature animals, haemorrhagic diarrhoea, dysgalactia and jaundice during heavy rainfall or flooding effects.

A tentative diagnosis of RVF can be proffered based on clinical signs but laboratory confirmation is required for differential diagnosis with other diseases in the syndromic abortion complex with similar signs, such as Brucellosis, Nairobi Sheep Disease, Bluetongue, Heartwater, Ephemeral fever, Wesselbron disease, Toxoplasmosis, Leptospirosis, Q fever, Salmonellosis and Peste des Petits Ruminants.

### **3.2 Predisposing Factors**

Predisposing factors are a variety of situations that harbour or promote disease. The following are the factors:

#### **a. Seasonality/climate:**

RVF outbreaks are episodic in nature and occur when exceptionally heavy prolonged rains cause unusual pooling of water in areas (dambos) that seldom experience such events. Exceptionally prolonged heavy rains causing floods are thereby a very important predisposing factor, and use of weather prediction data assists in making decisions for planning prevention and control measures. Floods persist in areas with specific soils types (solonchak). RVF outbreaks have been associated with river line flooding and bursting of dams that favours mosquito breeding.

#### **b. Naïve populations:**

Presence of naïve populations in an infected area is also a major predisposing factor. When exceptional numbers (blooms) of mosquitos hatch from the moistened areas and, because of transovarial transmission of the virus they are already infected and ready to pass on the RVF virus to susceptible mammalian hosts.

### **3.3 Surveillance in area with no known disease occurrence**

The aim here is early detection of virus incursion and circulation. Continuous passive surveillance and active surveillance should be carried out as needed and appropriate reactions to suspicious cases be implemented.

For active surveillance, the approach here is targeted /risk-based, on perceived risk factors like neighboring an infected area with or without disease. The activities to be

carried out include sero surveillance, syndromic surveillance and sentinel herd/flock.

### **3.3.1 Administrative preparations**

- a. Veterinary personnel working at all administrative levels must be trained on disease reporting using appropriate reporting systems, e.g. ARIS2.
- b. The veterinary services itself should be equipped, at appropriate administrative levels, with necessary sample collection equipment, disease reporting tools and materials including standardized reporting formats, mobile phones, digital pens, etc.
- c. Necessary capacity building should be undertaken to train and equip staff personnel at all levels.
- d. Policy/legal frame work should be supportive of surveillance.

### **3.3.2 Passive surveillance and passive surveillance field actions**

- a. Veterinary personnel undertaking routine animal health activities e.g. markets stock route inspection, vaccination campaigns, extension services, abattoir activities, etc. are expected to carry out syndromic surveillance during which they will inspect livestock for signs of clinical disease and collect data from livestock keepers.
- b. The national veterinary authorities will engage and sensitize livestock value chain actors, including producers, traders and transporters, and abattoir workers to report any disease events encountered to the nearest animal health facility, either public or private. This will include educational and informative materials on disease recognition and reporting, and use of methods such as mobile phones, digital pens, pen and paper, radio programmes, television programmes, posters, information leaflets, community meetings, etc.
- c. The veterinary authorities may involve wildlife agencies in surveillance and reporting of sickness, mortality, and abortion in wildlife.
- d. In case of reports of suspected RVF from the community, the responsible veterinary personnel, in collaboration with the relevant ministry, will conduct outbreak investigation with sample collection and submission to the laboratory. The field staff may involve the Central Epidemiology Unit to delineate the outbreak.
- e. The responsible veterinary personnel will immediately report to the CVO and make a record in the standard reporting format.
- f. The records will also be submitted to the Central Epidemiology Unit by the 15<sup>th</sup> of the following month in the standard monthly report.
- g. If a disease outbreak is confirmed, veterinary authorities shall institute appropriate control measures.
- h. A network of continuous reporting needs to be established and animated through constant communication, training, teamwork and motivation. Inter-ministerial/departmental cooperation, partnerships and trusting relationships are essential.

### **3.3.3 Active surveillance**

The purpose is to demonstrate the presence or absence of RVFV antibodies (IgM and IgG) and clinical disease in infected area without the disease. In order to achieve this objective, the following will be done:

#### **3.3.3.1 Sero-surveillance field actions**

- a. Ensure that all necessary technical and logistical equipment is in hand.
- b. Use a pre-design survey protocol outlining sample size determination, sampling method, target population, sampling units and sampling frame taking into consideration livestock and wildlife.
- c. Use pre-designed data collection tools, including, questionnaires for epidemiological interviews, forms, and data collection software.
- d. Mobilize survey teams composed of properly trained personnel.
- e. Develop a survey programme together with the survey teams.
- f. Share the programme with relevant stakeholders in targeted areas.
- g. Collect blood samples using appropriate tools and techniques such as vacutainers, filter paper, microbleeders, syringes, etc.
- h. Ensure proper environment and time for serum separation, and proper storage of sera.
- i. Ensure accurate labeling of samples, maintenance of test and identification records, the samples cold chain, and proper laboratory submission procedures.
- j. Data will be entered in the Central Epidemiology Unit database for analysis and reporting.
- k. If laboratory testing detects a positive sample, the responsible veterinary personnel should conduct an investigation.
- l. If a disease outbreak is confirmed, veterinary authorities should institute appropriate control measures.
- m. Ensure that activity reports are compiled by the 15<sup>th</sup> of the following month in the standard monthly report.
- n. Sero-surveillance for RVF can also be approached by the analysis of banked sera for RVF antibodies from previous active surveillance for other diseases in the target populations.

#### **3.3.3.2 Syndromic surveillance**

- a. Veterinary personnel undertaking routine animal health activities e.g. market stock route inspection, vaccination campaigns, extension services, abattoir activities, etc. are expected to carry out syndromic surveillance during which they will inspect livestock for signs of clinical disease and collect data from livestock keepers.
- b. Any disease syndrome characterized by sudden onset of abortion, high morbidity,

high mortalities in young animals, bloody nasal discharges in mature animals, haemorrhagic diarrhoea, dysgalactia and jaundice in sheep, goats, cattle, camels and other susceptible species during abnormal heavy rainfall will be investigated in order to confirm or rule out RVF.

- c. If symptoms are encountered, the responsible veterinary personnel should immediately report to the CVO and carry out an investigation. A report will be made in the standard reporting format.
- d. If the symptoms are not encountered the reporting officer should file a zero report, indicating that RVF was not found in the flock.
- e. Submit records to the Central Epidemiology Unit by the 15<sup>th</sup> of the following month.
- f. Share reports generated thereof promptly with the relevant stakeholders.

### **3.3.3.3 Sentinel Surveillance**

#### ***Management, maintenance and monitoring of sentinel herds***

The aim of this surveillance is to detect virus circulation as early as possible. Sentinel herds may be established in infected area with disease using small ruminants not exposed to RVFV. Small ruminants are deemed to be most susceptible. The herd will be monitored by collecting sera regularly (between 4 to 6 weeks) during the rains for antibodies detection (IgM and IgG). The following actions will be undertaken:

- a. Selection of herd locations based on risk factors i.e. areas with history of previous outbreaks in livestock and/or humans, flooding and high mosquito populations.
- b. Selection of animals for the sentinel herds i.e. species, ageing, sero-negativity.
- c. Preparation of monitoring schedules of disease incursion into herds both clinical and serological. Herds will be visited at 4-6 weeks' interval.
- d. Testing regimes involving sample collection, submission to the laboratory for analysis and generation of the report and feedback.
- e. Replacement of herds in the event of sero-conversion of herds as well as establishing new sentinel herds in other areas found to be at high-risk of RVF.
- f. Sentinel herds will be sampled before the onset of rains and thereafter every four weeks during the rainy season i.e. until the end of the rains.
- g. Apply an appropriate individual animal identification system for animals in the sentinel herd and for different sentinel sites.
- h. Carry out a baseline sero-survey. In subsequent sampling missions, samples will be collected from all the animals in the sentinel herds except those which tested positive for RVF antibodies during the baseline survey.
- i. Replace any ear tags lost or whose writing has faded.
- j. The sentinel herd should not be vaccinated against RVF.
- k. The sentinel herd should not be dipped or sprayed so as not to kill the mosquitoes

and therefore increase chances of picking any virus in circulation. In the event of loss through death or otherwise or if an animal tests positive to RVF antibodies in the subsequent tests, it shall be removed from the herd and a replacement be identified from the farm animals. Replacement animals should test negative for RVF antibodies.

### **3.4. Surveillance during inter-epizootic period with or without predisposing factors.**

This targets the period prior to and during the early warning of heavy rain by international and national meteorological agencies. It will be crucial at this point to assess the capacity in critical areas such as coordination, surveillance, laboratory diagnosis and response. Creation of public awareness on the risk factors and need to report the occurrence of risk factors such as heavy rains, flooding, or mosquito build up should be encouraged.

Surveillance activities should concentrate on parts of GHoA at high risk because of historical, geographic and climatic factors, ruminant and mosquito population distribution, and proximity to areas where epizootics have recently occurred.

During this phase there should be weather monitoring using meteorological reports, briefs from EMPRESS, FAO, internet reports from NASA Goddard Space Flight Centre of USA, Southern African Development Community Drought Monitoring Centre and IGAD Climatic Prediction and Application Center (ICPAC), or any other source.

Surveillance and reporting will be enhanced during the inter-epizootic period with predisposing factors.

The following administrative preparations and surveillance methodologies in livestock, wildlife, environment, vectors and human can be undertaken.

#### **3.4.1 Administrative preparations**

As described in 3.3.1

#### **3.4.2 Passive surveillance and passive surveillance field actions**

The principle in passive surveillance is to enhance early warning and prediction of possible outbreaks. Disease reporting and outbreak investigation of suspect cases is of essence. Reporting will be guided by the case definition. The reporting should be from the lowest veterinary jurisdiction or village.

The approach to the passive surveillance is as described in 3.3.2

### **3.4.3 Active surveillance**

The purpose is to demonstrate the presence or absence of RVFV antibodies (IgM and IgG) and clinical disease in infected area without the disease. In order to achieve this objective, the following will be done:

#### **3.4.3.1 Sero-surveillance field actions**

As described in 3.3.3.1

#### **3.4.3.2 Syndromic surveillance**

As described in 3.3.3.2

#### **3.4.3.3 Vector surveillance**

Surveillance aims at building up baseline information during inter-epizootic period with or without predisposing factors. The vector surveillance should be enhanced during inter-epizootic period with predisposing factors. The surveillance provides information on vector and virus activity and informs early warning of any increased virus activity or build-up in vector mosquito populations.

#### **3.4.3.4 Participatory disease surveillance (PDS)**

The purpose of PDS is to identify early cases. PDS is a good tool to establish the disease history for “the abortion syndrome” or the disease in an area. PDS is based on communication and transfer of indigenous knowledge for animal diseases, using a variety of procedures. To implement PDS follow the actions below:

- a. Training (capacity building) of veterinary personnel on the technique of PDS.
- b. Relevant veterinary authorities identify targeted risk areas and communities concerned.
- c. Prepare relevant checklists.
- d. Draw up a PDS programme and share it with the target communities.
- e. Identify key contact people and if possible translators to be used.
- f. Implement informal interviewing.
- g. Undertake ranking/ scoring, seasonal calendar, time lines, mapping and any other relevant tools in a participatory manner with the local communities.
- h. Undertake visualization of data to achieve a common understanding with the communities.
- i. Undertake data cross-checking by probing, triangulation and laboratory diagnosis for confirmation.
- j. Complement information so far collected with secondary information sources, direct observation and laboratory diagnosis.
- k. Submit a report to veterinary authority.

- I. Share reports generated thereof promptly with the relevant stakeholders to enhance ownership.

#### **3.4.3.5 Wildlife surveillance**

Retrospective surveillance and opportunistic serum collection: wildlife sera in cryobanks may be tested to provide a baseline of the prevalence and geographical distribution of RVF in wildlife during inter-epizootic with or without the predisposing factors. Serum should continue to be collected opportunistically from wildlife and banked at  $-70^{\circ}\text{C}$  (with proper labels and geo-referencing) for future analysis. Since wildlife is not vaccinated, trends and patterns in RVF serology of wildlife can be very useful as a sentinel.

#### **3.4.3.6 Sentinel surveillance**

As described in 3.3.3.3

### **3.5 Epizootic phase**

The aim of surveillance during this phase is to determine the spatial and temporal distribution of the disease in human and animals, disease incidence and understand the epidemiology of RVFV, isolating and sequencing the virus; and undertake research on the role of wildlife in the transmission of the disease.

The following surveillance methodologies will be carried out in the RVF epizootic areas:

#### **3.5.1 Administrative field actions**

As described in 3.3.1

#### **3.5.2 Passive surveillance and passive surveillance field actions**

As described in 3.3.2

#### **3.5.3 Active surveillance**

As described in 3.3.3

##### **3.5.3.1 Sero-surveillance**

As described in 3.3.3.1

##### **3.5.3.2 Vector surveillance**

As described in 3.4.3.3

##### **3.5.3.3 Syndromic surveillance**

As described in 3.3.3.2

#### **3.5.3.4 Wildlife surveillance**

As described in 3.4.3.5

#### **3.5.3.5 Participatory disease search**

As described in 3.4.3.4

#### **3.5.4 Outbreak investigation**

This will be undertaken immediately after the first index case has been confirmed in a population. In the event that positive RVF test-results are received, the Veterinary Services will do the following:

- a. Mobilize the Rapid Response Teams (RRTs) from their bases to the affected areas.
- b. Use standardized RVF outbreak investigation form. Sero-surveillance and vector surveillance to be done in order to determine the extent of the disease. It is worth noting that sentinel herd surveillance will not be practical at this point because most of the herds in the area will be infected.
- c. Collect data and information on temporal and spatial distribution of RVF outbreak, the species of animals affected and the numbers affected and dead.
- d. Sample will be collected, transported, stored and analyzed in the laboratory.
- e. Data will be entered in the central epidemiology unit database.
- f. Data will be analyzed and reports generated thereof.
- g. The reports generated thereof will be shared with the relevant stakeholders.
- h. Notify the OIE and other organizations.
- i. Inform members of the public of the outbreak through appropriate media and gazettelement.
- j. Convene an Inter-ministerial RVF Technical Working Group on Zoonoses to steer the RVF response activities and this group will continue to meet weekly until the outbreak is over.
- k. Share surveillance information with the Director of Medical Services and Director of Public Health and Sanitation.
- l. Declare the end of RVF outbreak when there is absence of clinical disease evaluated through two participatory disease searches within 30 days in an area; quarantine restrictions will be lifted and members of the public advised accordingly.

## **4.0 RVF Diagnosis, Laboratory Detection**

For national disease control programmes, the manager should use CVO approved tests based on the capacity. For livestock export trade and any other animals moving internationally, all laboratory testing must use OIE approved tests, or other tests as agreed on between importer and exporter.

### **4.1 Minimum pre-requisite in laboratory detection of RVF**

- a. All countries in the GHoA should have a capacity to carry out basic diagnosis tests that can identify RVF.
- b. Laboratory should have standard operating procedures for biosecurity and biosafety on sample collection, handling, packaging, transportation and storage.
- c. Should create a schedule for participation in proficiency testing programmes to improve laboratory standards and harmonization.
- d. All countries in the GHoA may carry out sero-monitoring to evaluate progress in sero-conversion. The basic assays which should be performed by MS are: Agar Immunodiffusion Gel (AGID), Indirect ELISA for antigen detection, IgG Indirect ELISA, Competitive enzyme-linked immunosorbent assay (C-ELISA) for antibody detection, and IgM capture ELISA.
- e. Due to the significant zoonotic nature of RVF, any agent detection procedures must be done only under proper biosafety and biosecurity conditions.

### **4.2 Clinical diagnosis**

The RVF will be suspected when the following clinical signs are observed: storm of abortion in goats, sheep, cattle and camel, high mortalities in young animals, bloody nasal discharges in mature animals, hemorrhagic diarrhoea, dysgalactia and jaundice during abnormally prolonged heavy rainfall.

### **4.3 Post mortem examination**

Appropriate bio-security and biosafety must be exercised as RVF is a serious zoonotic pathogen.

The following lesions are generally observed: generalized jaundices, liver necrosis, petechial and ecchymotic haemorrhages on all serous surfaces, lymph nodes, subcutis, the kidneys and various tissues.

### **4.4 Samples collection**

Samples will be collected according to the expected laboratory assay to be performed but basically the following are required:

#### **4.4.1 For antibody detection**

In live animals: whole blood for serum collection.

#### **4.4.2 For antigen detection or virus isolation**

Samples for virus isolation must be kept chilled and transported under refrigeration or on ice to the laboratory.

In live animals: serum and whole blood in anticoagulant collected from suspect animals.

In dead animals: aborted foetus liver, spleen and brain tissues should be collected in sterile normal saline and transported under refrigeration or on ice to the laboratory and for histopathology, preserve the tissues in 10% formalin.

#### **4.4.3 Storage of samples after arrival in the laboratory**

Samples should be preserved in appropriate conditions: samples for virus isolation or antigen detection should be kept at -20 °C or lower temperatures.

For sera, storage at +4 °C and at -20 °C or lower temperatures if samples are going to be stored for more than a week.

### **4.5 Sample testing**

All laboratory procedures described in this SMP are as prescribed in the OIE Manual of diagnostics. Sample testing will be carried out in laboratories approved by the veterinary authorities.

#### **4.5.1 Direct diagnostic assays - identification of the agent**

##### **4.5.1.1 Virus isolation methods: observation of cytopathic effect on tissue culture**

Suitable samples are animal tissues (lymph nodes, spleen and liver) and whole blood at early stage of the disease.

Suitable cell cultures for RVFV isolation are:

- Primary lamb kidney
- Cell lines (Vero, B95a, BHK21, AP61 (mosquito cells))

##### **4.5.1.2 Virus antigen detection**

Agar Gel Immuno-diffusion (AGID): basic and simple to perform as a screening test but not very sensitive.

Indirect ELISA, Competitive ELISA (c-ELISA), serum and virus neutralization tests (SNT and VNT)

Virus nucleic acid recognition methods: reverse transcription PCR (RT-PCR) techniques; Real-time RT-PCR.

#### **4.5.2 Indirect diagnostic assays – antibody detection tests**

There is currently available assay that can differentiate vaccinated animals from infected animals.

- Virus neutralization (VNT/SNT - the prescribed test for international trade)
- Competitive enzyme-linked immunosorbent assay (C-ELISA)
- Several competitive ELISAs have been described for antibody detection, based on the use of monoclonal antibodies (MAbs) that recognize virus proteins.

#### **4.6 Interpretation of diagnostic test and disposal of positive responding animals:**

- For national disease control programmes, the disposal of positive animals and cohort animals may be as proposed in the disease control section;
- For international livestock trade, testing at quarantine stations will be done according to OIE recommendations and/ in concurrence with importing nations regulations;
- Disposal of positive animals and cohort animals for international shipment will be in accordance with importing nation's regulations and in concurrence with national programme standards;
- All diagnostic testing and interpretation will be done in accordance with OIE guidelines.



## **5.0 Disease Control**

### **5.1. RVF vaccine**

There are two vaccines currently available and used in the region:

- Live attenuated vaccines: Smithburn vaccine and Clone 13.

It is recommended to use the quality certified vaccine (AU-PANVAC Certificate).

Sero-monitoring that involves levels of antibody assays pre and post vaccination is a good procedure to assess the control programme.

Regional support laboratories in the GHoA countries may be used for vaccine performance monitoring.

The RVF vaccines currently being used in Africa are: Formalin inactivated Attenuated Smithburn strain and live clone 13. The live clone 13 vaccine is in use in South Africa and Namibia, and on field trial in Kenya. RVF control will be possible if affordable, safe and efficacious vaccine is readily available in the region. A concerted regional effort should be undertaken to make such a vaccine readily available. In this respect, partnerships, such as those developed and engaged for Rinderpest eradication with development agencies and research institutes are highly encouraged. The response to RVF disease may consider the different phases as follow:

### **5.2 Inter-epizootic phase**

#### **5.2.1 Inter-epizootic phase without predisposing factors**

During the inter-epizootic phase without predisposing factors, the following control measures may be applied as follows:

- Vaccination in identified high risk areas using a vaccine approved by the veterinary authority;
- Public education/awareness;
- Vector control using synthetic pyrethroids on animals;
- Livestock movement control.

#### **5.2.2 Inter-epizootic phase with predisposing factors**

During inter-epizootic phase with predisposing factors, the following control measures may be undertaken as follows:

- Vaccination is enhanced in identified high risk areas using a vaccine approved by the veterinary authority. However, vaccination should not be done in areas with suspected clinical disease;
- Vector control is enhanced by applying insecticides on livestock in flooded areas. As feasible, areas likely to maintain RVFV in mosquito eggs may be treated with sustained release insect growth regulator or other WHO approved mosquito control products;

- Use of larvicidals targeting mosquitoes larvae in stagnant water;
- Enhance public education and awareness creation; and
- Enhance livestock movement control.

### **5.3 Epizootic phase**

#### **5.3.1 Movement control and quarantine**

The objective of movement control and quarantine is to minimize the spread of disease and to mitigate its spread. Both quarantine and movement control as disease control tools should be enhanced.

#### **5.3.2 Movement control**

Regulation of livestock movement is a routine activity and animals are only moved when their health status does not pose a risk to humans and animals in their destination. Regulating movement of animals from an infected area to disease-free areas protects national livestock-derived foods market, but does not completely prevent spread of the disease. The pastoral production systems in GHoA and the inadequate enforcement of animal movement control pose a challenge to RVF control.

Effective livestock movement control should, among others, focus on markets operations, checks posts, stock routes and border post management/controls. Any livestock movement will be as directed by an authorized veterinary officer and a movement permit shall accompany moving animals. Movement control can have adverse effects e.g. increased use of informal routes/trade if not well managed. Therefore, communication with stakeholders and use of other strategies to limit spread disease is necessary.

#### **5.3.3 Quarantine**

*Note:* The application of quarantine is not very useful as one cannot quarantine the vectors i.e. mosquitoes.

- Apply provisional quarantine as laboratory confirmation is awaited and lift the provisional quarantine if RVF is not confirmed;
- Once RVF is confirmed apply full quarantine in the identified area;
- Quarantine is imposed immediately the index case is identified;
- Ban on animal slaughter in areas with the disease;
- Closure of livestock markets;
- Stoppage and enforcement of livestock movement;
- Create awareness and buy-in for the control measures;
- Continuous surveillance is carried out to monitor for new cases;
- Quarantine is lifted four weeks after the last case.

#### **5.3.4 Treatment of sick animals**

It is recommended to provide supportive therapy to animals with clinical signs. Care should be taken not to spread infection through equipments and self infection during treatment of the sick animals.

#### **5.3.5 Vaccination**

Refer to section 5.2.1 and 5.2.2. for vaccination during inter-epizootic phase. Do not vaccinate in areas where RVF disease is suspected or confirmed.

#### **5.3.6 Vector control**

Vector control by applying insecticides on livestock in affected (flooded) and surrounding areas and as feasible, spray the same areas with approved synthetic pyrethroids to control insects.

Spray and/or dip animals to control both ticks and mosquitoes with synthetic pyrethroids for animals to serve as moving targets that reduce mosquitos and other external parasites load.

## **6.0 Disease Reporting and Information Management**

All surveillance data collected goes immediately to the designated epidemiologist for analysis, the epidemiologist will be responsible for advising disease control decision makers.

Upon confirmation of first case, an immediate notification to OIE, AU-IBAR and all departments of veterinary services in the GHoA region.

Capacity building on information management is crucial to handle data emanating from surveillance, laboratory diagnosis and response activities. To realize this, countries in the region are advised to:

- Adopt common information management system such as ARIS-2;
- Establish a disease notification system;
- Strengthen feedback mechanisms to stakeholders within countries and in the region.

## **7.0 RVF and Trade**

It is also imperative that when there are predictions of heavy rains that may predispose an outbreak of RVF, surveillance should be enhanced, disease prevention/control interventions should be planned well ahead of the time when they are needed, and public information campaigns about the disease in areas likely to be affected should be undertaken before the outbreak occurs. To this end, the one health approach with human health authorities and continuous dialogue and update on risk status with other stakeholders including trading partners is critically important.

The window of opportunity for exporting animals and animal products can take place at all times based on surveillance and corresponding risk mitigations at all times. To this end, trust and transparency among trading partners both for domestic and export is paramount.

### **7.1 Requirements for livestock and livestock products export**

It is a requirement of importing countries that veterinary authorities of exporting countries attest that animals and their products.

1. Showed no evidence of RVF on the day of shipment.
2. Met one of the following conditions:
  - a. Livestock were vaccinated against RVF at least 14 days prior to shipment with a modified live virus; or
  - b. Livestock were held for at least 14 days prior to shipment in a mosquito-proof quarantine stations which is located in an area of demonstrated low vector activity.

#### **AND**

- a. Livestock did not transit through an area experiencing an epizootic during transportation to the place of shipment; or
- b. Livestock were protected from mosquito attack between quarantine and the place of shipment.

During the epizootic period of RVF in GHoA, importing countries require for live ruminants and their meat, certification attesting that the animals:

1. Showed no evidence of RVF on the day of shipment;
2. Did not originate in the area of the epizootic;
3. Were vaccinated against RVF at least 14 days prior to shipment;
4. Were held for at least 14 days prior to shipment in a quarantine station, which is located in an area of demonstrated low vector activity outside the areas of the epizootic. During this period the animals showed sign of RVF.

**EITHER**

- a. Did not transit through an area experiencing an epizootic during transportation to the place of shipment; or
- b. Were protected from mosquito attack between quarantine and the place of shipment.

For meat and meat products of domestic and wild ruminants; certification attesting that the carcasses:

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

**7.2 Verification or infection status of animals for trade**

1. The vaccination or infection status of animals that arrive into the importing or transit country can be verified by quarantine of the animals for a minimum of 14 days (incubation period is 14 days as per the OIE Terrestrial Animal Health Code).
2. During this period, animals are tested for presence of virus antigen or antibodies (paired sera days apart) and observation for absence of clinical signs.
3. If on arrival no antibodies are detected, then the animals were not vaccinated; or they were vaccinated within the last seven days and have not yet sero-converted, in which case a second serum sample collected at 14 days will indicate sero-conversion.
4. Available tests can differentiate infected from vaccinated animals and can target IgM and IgG.

## **8.0 Risk Analysis and Risk Mapping**

### **8.1. Risk analysis**

The risk analysis (RA) paradigm includes four components – hazard identification, risk assessment, risk management, and risk communication. Risk assessment is a scientifically based process of evaluating hazards and the likelihood of exposure to those hazards, and then estimating the resulting impact. The risk management phase involves using all of the information gathered during the assessment to evaluate policy options. Risk communication refers to communicating the results of the risk analysis involving all stakeholders.

It is essential for the countries in the Greater Horn of Africa to better understand the disease situation in order to implement appropriate disease control strategies that will progressively control RVF. In this regard, risk analysis is required to:

- Determine the risk of RVF introduction (release, exposure and consequence) to areas of no known disease and to mitigate the risk due to RVF;
- Assess the progress of intervention in the control of RVF in endemic and epidemic areas; and
- Communicate the results of RA to all the relevant stakeholders to assist in the mitigation of RVF.

### **8.2. Risk Mapping**

Risk mapping is a critical issue and must be kept up to date. It is very important to know endemic areas for planning of increased surveillance and epidemiology, prevention (vaccination) campaigns, disease control interventions, distribution of public information, etc.

Hot spots of RVF outbreaks during predisposing factors requires to be mapped in all areas of GHoA disease control including vaccinations of livestock undertaken in good time to pre-empt outbreaks.

Additionally, for purposes of trade and prevention of RVF–related bans on livestock exports from GHoA region, risk mapping and spatial epidemiology are extremely important. If a spatial characterization of the boundaries of an outbreak of RVF can be accurately described, negotiations with importers for continuation of trade from non-epizootic areas are strengthened.

A well defined map is a tool of enormous importance for all of the above activities.



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