

ABSTRACT BOOK

RIFT VALLEY FEVER: NEW OPTIONS FOR TRADE, PREVENTION AND CONTROL

Djibouti
21 - 23 April 2015

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Contents

FOREWORD.....	5
SESSION I	
SETTING THE SCENE.....	7
Recall of previous meetings, their outcomes and recommendations	10
RVF in the Horn Africa, East of Africa and the Middle East – a historical overview –.....	11
Recent RVF outbreaks in north-western Africa.....	12
Recent outbreaks of Rift Valley fever in Southern Africa	13
SESSION II	
CHALLENGES TO DISEASE CONTROL	15
Rift Valley Fever: Available Control Options.....	17
Vaccination strategies, vaccine availability and quality control.....	18
Rift Valley Fever Disease Control: vaccines and associated challenges	19
Progress towards registration of the first reverse genetics vaccine against Rift Valley fever and an update on the safety and efficacy of an experimental Newcastle disease virus-vectored RVF vaccine.....	20
Development of a live attenuated thermostable vaccine against Rift Valley Fever.....	21
Diagnostic Tests for RVF and the Role of an OIE Reference Laboratory	22
OIE Twinning onn Rift Valley Fever: South Africa and Yemen	23
A practical perspective on current Rift Valley fever diagnostics and future developments	24
Challenges to control RVF disease: Research required to improve diagnostics	25
SESSION III	
TRADE ISSUES.....	27
OIE Code Chapters relevant to RVF and trade	29
Current livestock trade between the Horn of Africa and the Middle East The new RVF OIE Code Chapter and what it means to inter-regional trade	30
SESSION IV	
PREVENTION, BIOTHREAT AND EARLY WARNING	33
RVF Surveillance systems in ruminant population of the IAG Region	35
Bridging WHO and OIE tools for the assessment of national capacities	36
National Contingency Plan for Rift Valley Fever.....	37
Rift Valley fever Decision Support Framework for eastern Africa	38
Rift Valley fever Prediction and Risk Mapping: 2014-2015 Season.	39
The joint Early Warning release	40

SESSION V	
REGIONAL COORDINATION	41
GF-TADs Africa	43
GF-TADs in the Middle East	44
Interventions of AU-IBAR for prevention and control of Rift Valley Fever in support of livestock trade	45
Status and progress of Regional Animal health projects in IGAD region.....	46
Eastern Africa epidemiology and Laboratory regional networks	47
POSTERS	49
Comparative genome sequence analysis of RVF virus isolates from 2008 to 2010 outbreaks in South Africa	51
Seroprevalence of Rift Valley Fever antibodies in South African Suids.....	52
Linkages between socio-cultural practices and vulnerability to Rift Valley Fever (RVF) in Baringo County, Kenya	53
Perceived risk factors and risk pathways of Rift Valley fever in cattle in Ijara district, Kenya	54
PROGRAMME	55

Foreword

Under the auspices of the FAO & OIE *Global Framework for the control of transboundary animal diseases (GF-TADs)*, some x participants from x countries have been invited to Djibouti on 21 – 23 April 2015 to discuss *Rift Valley fever: new options for trade, prevention and control*.

Rift Valley fever, a vector borne disease endemic in many countries in Africa and in the Arabian Peninsula, is not only a disease with great impact on human and animal health, but, should there be an epizootic outbreak, is closely associated to changes in trade patterns of ruminants between the Horn of Africa and the Middle East.

Having learnt lessons from the 2006/2007 major outbreaks in East Africa and their impact on trade by means of trade bans and subsequent development of illegal trade routes, the OIE has revised the *Terrestrial Animal Health Code* Chapter on Rift Valley fever in 2014.

These changes provide Member Countries with new options that will be discussed during the Conference. In addition, new advances have also been reported on the side of vaccine and diagnostic test development and regional and sub-regional programmes and projects, supported by the Regional Economic Communities of the different regions and the African Union promote regional coordination and collaboration for a disease that does not recognise national boundaries.

This Conference fits into a series of previous meetings and therefore builds on their conclusions and recommendations I view of improving the prevention and control of Rift Valley fever at national and regional levels and to facilitate legal trade using the new tools that will be presented and discussed in Djibouti.

The input by all speakers to this *Book of Abstracts* is appreciated and the support by the sponsors of the event and the Organising Committee is fully acknowledged.

SESSION I

Setting the Scene

Recall of previous meetings, their outcomes and recommendations

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Rift Valley fever (RVF) has been the subject of several previous conferences and meetings organised by the OIE or FAO or organised jointly. This underlines the importance of RVF as one of the priority diseases for the regions and subsequently RVF can also be found as one of the diseases in the 5-year action plans of the *Global Framework for the Control of Transboundary Animal Diseases (GF-TADs)* for the two regions.

A summary of the recommendations and the action plans for GF-TADs will be presented. For those that have already been presented in previous meetings such as in Mombasa in 2012, reference is made to the respective online reports.

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

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

Rome, Italy, 2008:

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

Rome, Italy, 2011: <http://www.fao.org/docrep/014/i2310e/i2310e00.pdf>

Mombasa, Kenya, 2012: <http://www.rr-africa.oie.int/docspdf/en/2012/RVF/REPORT.pdf>

Recommendations from the last RVF Technical Workshop organized by FAO in *Rome in 2014* can be found under <http://www.fao.org/3/a-i4466e.pdf>

The recommendations are presented in 2 sets, the first of which supports and reiterates those that were made during all the above listed previous meetings, while the 2nd set of recommendations lists the specific and new recommendations emanating from this meeting, which was targeted mainly at vaccine producers and researchers to report on their recent findings, while CVOs from a selected number of countries were in attention. The 2nd set of recommendations includes the following:

- At least three vaccine candidates (DDvax, NDV-GnGc, MP-12) are being evaluated in registration trials and may offer new options in the near future.
- Production and quality assessment of vaccines in line with the OIE Manual is encouraged.
- Accurate serological tests for camels (IgM and IgG) and vaccines need to be developed.
- Laboratory diagnostic capacity for RVF need to be strengthened, including ring trials (with support of FAO, OIE, IAEA).
- Routine vaccination of populations at elevated risk is encouraged.
- South Africa is encouraged to share experiences such as communication strategies and educational tools targeting farmers during outbreaks.

RVF in the Horn Africa, East of Africa and the Middle East – a historical overview –

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Rift Valley fever (RVF) is a Phlebovirus arthropod-borne zoonosis that primarily affects sheep, goats, cattle, camels, buffalos, dromedaries, antelopes, wildebeest, and humans. Sheep are the most susceptible while goats and cattle are somewhat less susceptible. While animals get infected through mosquito bites, most human cases are attributed to contact with body fluids released during slaughtering or contact with viremic animals. Nevertheless, human can also be infected via bite of infected mosquitoes. The virus is transmitted by a large and diverse number of arthropod species and therefore it has potential to spread widely and rapidly when environmental conditions are conducive.

RVF was first described in Nakuru District of Rift Valley province in Kenya in 1912 occurring as sporadic cases. The virus, however, was first isolated in 1931. Between 1912 and 1936, RVF was confined to Nakuru District which is prone to flooding and where livestock were raised in proximity with wildlife. No RVF outbreaks were reported between the periods 1936 to 1950. From 1951 to 2007, eleven RVF epizootics were recorded with an average inter-epizootic period of 3.6 years.

RVF reports outside Kenya begun in 1950s where between 1951 and 2007, large RVF epidemics have been reported in many African countries. In 2000, the disease was detected in the Arabian Peninsula, having spread outside of Africa for the first time.

Somalia experienced the last two major RVF outbreaks in Eastern Africa. Between December 2006 and February 2007, the disease was reported in both humans and livestock in many regions including: Gedo, Lower and Middle Juba, Lower and Middle Shabelle, and Hiran.

In Sudan, the first evidence of RVFV presence was described in 1936 while the first recorded epizootic occurred only in 1973 in sheep and cattle in White Nile State. Since then, RVF seropositivity has been shown in different Sudanese states. The last outbreak occurred in 2007 in several Sudanese states along the white and blue Nile.

In Tanzania, the most notable epidemic occurred in 2006-2007 although events were also reported from 1947 to 1998. Average inter-epidemic period is 7.9 years (3-17). During the period 1930 to 1979, the cases were confined to four districts in northern Tanzania. From 1980 to 2007, RVF was reported in more areas located in north to east, central, and southern regions.

In Egypt, the largest RVF outbreak occurred in 1977–1978. Despite biannual vaccination with inactivated vaccine, a second outbreak occurred in 1993–1994. The vaccination campaign (using Smithburn vaccine) performed during the outbreaks of 1996–1997 and 2003 did not stop the disease. The reasons remain undetermined but could have contributed to the unusually short inter-epidemic periods observed in Egypt.

In September 2000 RVF epizootics were identified in Saudi Arabia and Yemen. The Tihama/Jizan regions of Yemen and the southwest Saudi Arabia (Gizan region) were principally involved.

RVF remain a regional concern and more collective action is needed to prevent and control the disease.

Recent RVF outbreaks in north-western Africa

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Rift Valley fever (RVF) is a viral vector-borne disease caused by a single serotype of the Bunyaviridae family affecting human and animal health. The disease - characterized mainly by high rates of abortion and neonatal mortality - is nowadays present in the African continent and Arabian Peninsula mostly occurring in climatic conditions which facilitate the breeding of mosquitos.

Data reported in the published literature revealed virological or serological evidence of RVF virus circulation in the West African region prior to 1987 without noticeable clinical manifestations. The first substantial outbreak in the West African region which caused more than 200 human deaths was reported 1987 after the building of the Diama dam in the framework of the Senegal River Project. This construction - and its related floodings - led to the changes of some local ecological characteristics such as the creation of more water accumulation points so as to increase mosquito breeding sites.

After 1987 outbreaks were reported regularly from the West African region but generally in the zones at the border between Senegal and Southern Mauritania - along the Senegal River - which is considered a suitable environment for vector populations.

The unexpected occurrence of RVF in the northern Sahelian region of Mauritania in late 2010 with major impact on both human and animal health, confirmed that this disease represents a serious threat for the entire Maghreb area. For this reason, the Mediterranean Animal Health Network (REMESA) platform - which is an official network that created an undoubted sustainable link between the CVOs on both sides of the Mediterranean - identified RVF as one of the priority diseases to control in the North African region. In this context - and under the umbrella of REMESA the first External Quality Assessment (EQA) study for molecular and serological detection of RVF virus was organized in order to perform a preliminary assessment of the diagnostic capability of the laboratories involved in the surveillance of this disease in the REMESA zone.

Today an endemic zone can be recognised in the Western part including Mauritania and a zone - so called Little Maghreb (Morocco-Algeria-Tunisia) - where the disease has never been detected up to date. It is also acknowledged that an active surveillance is in place in Mauritania and permanent passive surveillance along with occasional sero-surveys in the Little Maghreb.

The re-occurrence of RVF in Mauritania in October 2013 confirmed that this disease is a continuous threat for the entire region and that more targeted actions are necessary to build an effective surveillance system in the region. In this context, the OIE Sub regional Representation for North Africa is providing support to these countries to implement such activities in line with the OIE International Standards.

Recent outbreaks of Rift Valley fever in Southern Africa

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Rift Valley fever is a disease which affects a wide variety of animals including humans, sheep, cattle, goats, camels and some wild animals. The virus responsible for the disease is spread by competent mosquito species, such as *Aedes* and *Culex*. Since the disease was first diagnosed in Kenya in 1931, it has been reported in, among other countries, South Africa, Botswana, Namibia, Zambia, Mozambique, Madagascar, Egypt and Senegal. It is characterised by high levels of mortality among young animals and abortion in animals. The susceptibility of the animal host depends on age and animal species. Outbreaks of RVF normally follows heavy rainfall and floods. Since the first case of RVF was observed in the 1950s in South Africa, there have been sporadic outbreaks at unpredictable intervals. The latest outbreak was reported in South Africa in 2010 with 14 342 animal cases and 8 877 animal deaths. During this period, 242 laboratory-confirmed human cases with 26 deaths were identified. The disease has severe direct and indirect socio-economic impacts. Direct impacts include the dying of animals and humans affected by the disease. In-direct impacts include decrease/loss of production (e.g wool, beef and milk). People whose livelihoods depend on these kinds of income suffer as a result of RVF outbreaks. Six countries in SADC reported RVF outbreaks in the period spanning 2005 to 2014. Those countries were Tanzania, Madagascar, Namibia, Botswana, Swaziland and South Africa. In all the countries, the outbreaks followed heavy rainfalls. The outbreaks occurred in both commercial and small scale farms. The majority of animals affected were sheep and cattle. Goats and buffaloes were also affected, but to a lesser extent. To manage the outbreaks, animals were vaccinated and movement of animals inside the countries were controlled. During the same period, no RVF outbreaks were reported in Lesotho, Angola, DRC, Malawi, Mauritius, Mozambique, Zambia and Zimbabwe. Thus these countries are considered free from the disease. However, it is possible that there was no surveillance done or the virus might be circulating at levels beyond detection limits. RVF is a notifiable disease in South Africa. Farmers are advised to vaccinate their animals against RVF. The vaccines that are currently available in SA are Smithburn, inactivated vaccine and Clone 13. High mortality rate of young animals, abortion in animals and febrile disease in humans are indicative of RVF. Veterinary and human health authorities should be informed immediately, to investigate the situation. The challenges faced by South Africa regarding RVF are that the disease is sporadic, people are not always ready when the outbreaks occur and vaccines cannot be stockpiled for various reasons. The other challenge is that the initial symptoms of RVF can be confused with other diseases that cause abortion. During the period 2005-2014, 8 600 samples from animals were tested for RVF at ARC-OVI. Public education programmes/Farmer awareness and other publicity campaigns are often done to make stakeholders aware of the nature of the disease, consequences of livestock diseases and the benefits of preventing such diseases.

SESSION II

Challenges to Disease Control

Rift Valley Fever: Available Control Options

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The periodic Rift Valley fever (RVF) epidemics in the greater horn of Africa (GHA) have a significant impact on lives and livelihoods of people living in the region, and they negatively affect the local, national, and regional economies. As a step towards improving management and response to the epidemics, regional and international experts developed a decision support tool for the purpose of identifying the sequence of events related to increasing and decreasing the RVF epizootic risk, compiling a list of interventions that can be used to prevent and control the epidemics, and matching these interventions with the specific stage of the RVF disease cycle¹¹. During the normal phase (non-epidemic period) of the RVF cycle, the primary option available for controlling the disease is livestock vaccination. During the pre-outbreak (outbreak warning) and outbreak phases of the disease, the available control options include livestock vaccination, quarantine and slaughter ban, vector control, and public education. To be effective, livestock vaccination requires a clear national policy that identifies areas at high risk and a position on routine vaccination and emergency vaccination in the face of a threat of an RVF outbreak. Unfortunately, there are few broadly licensed RVF livestock vaccines; and to our knowledge, no country in the GHA has a clear policy on RVF vaccination. In addition, livestock vaccination is not recommended during an outbreak. Public education, livestock quarantine, and slaughter ban are perhaps the most effective measures against disease spread during an outbreak. There is often a problem of sustaining quarantine and slaughter ban for a long time since many affected areas have pastoralist livestock production systems and food of animal origin is the primary diet. Vector control, primarily through aerial spraying, is often attempted during heavy flooding that accompanies RVF outbreaks but it has limited effectiveness due to expansiveness of the affected areas and cost.

¹ RVF Consultative Group. Decision support tool for prevention and control of Rift valley fever in the greater horn of Africa. *Amer J Trop Med Hyg* **83** (Suppl 2):75-85, 2010

Vaccination strategies, vaccine availability and quality control

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For RVF since long both 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. Recently several improved live attenuated, vector, DNA, subunit or replicon vaccine candidates are under development, in the licensing process or licensed. 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 commercialization to bring these candidates to the market and to implement them in a well-designed control program. 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. The disease besides being endemic also has a characteristic epidemic outbreak cycle depending on climate, rainfall and flooding. Based on limited economic damage in between large epidemic outbreaks it is difficult to economically justify or support vaccination or 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. Vaccine or antigen banks can play a role in an improved availability of RVF vaccines for emergency use. All of this highlights the need for a well-designed vaccination strategy in a RVF control program.

Combination vaccines offering protection against not only RVF but also against other important ruminant diseases, resulting in broader and long term protection with one immunization, have the potential to decrease overall costs, increase uptake of RVF vaccination, expand the market and therefore be attractive both to vaccine manufacturers as well as to end users. Their development and commercialization should therefore be strongly encouraged.

External control and quality harmonization of RVF vaccines is needed as well as a more centralized quality control and regulatory platform. This could certainly play a role in creating an equal level playing field, harmonizing regulatory requirements and therefore increase attractiveness to companies to invest in RVF control.

Rift Valley Fever Disease Control: vaccines and associated challenges

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Rift Valley fever (RVF) outbreaks have adverse impact on the livestock industry and with the disease being a zoonosis, the impact is most often spread into the human population. The most effective method of controlling this vector-borne disease is ensuring that susceptible livestock populations have immunity achieved through consistent annual vaccination programmes. Currently Onderstepoort Biological Products (OBP) has three registered vaccines for the control of RVF disease. An inactivated aluminium-hydroxide adjuvanted RVF virus vaccine isolated in 1974 from an infected bovine and adapted for growth in baby hamster kidney (BHK-21) cells. This vaccine requires a booster vaccination and annual re-vaccination. The second available vaccine is the modified RVF Smithburn virus strain which is an attenuated live vaccine used since 1951. This vaccine is able to provide lifelong immunity making it a cheaper alternative to the inactivated vaccine. However, due to the residual virulence of the Smithburn strain; there is a potential risk of the virus to cause teratogenicity when administered to gestating adults. The third vaccine available is the RVF Clone 13 vaccine which is a live attenuated vaccine isolated from a benign human case in Central Africa Republic. The strain contains a large deletion in the NSs gene which renders the virus a-virulent in mice, hamsters and livestock. The major challenge that has been associated with RVF Clone 13 have been instability and short shelf life of the vaccine product. This presentation will highlight research activities focused on identifying appropriate methods and facilities for bulk RVF Clone 13 antigen storage to allow vaccine availability to customers in a limited time frame during high demand periods. The study will also provide some insights in the possible RVF vaccination strategies of certain African countries based on OBP RVF vaccine product registration status and requests.

Progress towards registration of the first reverse genetics vaccine against Rift Valley fever and an update on the safety and efficacy of an experimental Newcastle disease virus-vectored RVF vaccine

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Although the currently-available vaccines have made major contributions to the control of Rift Valley fever (RVF) in endemic areas, safety concerns with some of these products and the regulatory requirements of countries at risk in non-endemic areas drive the search for novel improved vaccines against this globally-important disease.

Many different vaccination platforms, including reverse genetics technology, recombinant (vector) vaccines, DNA vaccines and adjuvanted subunit vaccines are currently in various stages of evaluation.

Major advances have been made in the assessment of safety and efficacy of a promising new RVF vaccine candidate developed through the use of reverse genetics technology. This attenuated strain, which lacks the non-structural NSs and NSm genes on the small and medium genomic segments respectively, showed an excellent safety profile in laboratory animal models as well as in the target livestock species. A series of trials in pregnant-ewes indicated that this strain provides robust immunity against RVF which can fully-protect heavily-pregnant animals against clinical signs, viraemia and abortion. Vaccination experiments in first-trimester pregnant ewes (42 days of gestation) clearly demonstrated that RVF virus lacking these non-structural virulence factors has a negligible abortogenic potential and, when used correctly, also an extremely low teratogenic potential. Entomological studies also showed that the absence of the NSm-gene impairs insect transmission, which together with the absence of significant levels of viraemia in the vaccines, practically eliminates the possibility of spreading in the environment and gaining virulence under conditions of natural selection. This vaccine candidate is now approaching the pre-registration phase of the assessment process. Approval has been granted by the South African Department of Agriculture, Forestry and Fisheries (DAFF) to use the vaccine outside containment and applications for authorisation to do field trials will be submitted in the near future.

Significant progress has also been made with regards to the safety and efficacy testing of a novel Newcastle disease virus-vectored vaccine expressing the Gn and Gc glycoprotein genes of RVFV. The potential environmental risk of this recombinant virus was assessed under BSL3 containment in a series of safety trials. The results of these studies indicated that NDV-GnGc remains localised at the site of inoculation, does not cause significant levels of viraemia in the vaccines and does not spread from vaccinated target species (sheep) to in-contact control animals or birds (sheep and chickens). Deliberate vaccine administration to avian hosts resulted in seroconversion of the vaccines, but unlike natural NDV, the recombinant virus failed to infect fully-susceptible in-contact control birds or birds exposed to the tissues of vaccines by the oral route. Based on the favourable outcome of the environmental safety study, DAFF approved further vaccination experiments outside BSL3 containment. Subsequent trials focussed on optimisation of the vaccine formulation by the addition of different adjuvants suitable for use with live antigens. Two formulations were identified which induced demonstrable levels of neutralising antibodies and durable immunity (> 5 months) protective against clinical disease and viraemia. A full safety and efficacy evaluation in the pregnant ewe model is planned for this vaccine candidate in the near future.

Development of a live attenuated thermostable vaccine against Rift Valley Fever

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Rift Valley fever is a vector borne disease, endemic in most Sub Saharan countries, including West Africa and has spread to the Middle East since 2010 causing huge economical loses in livestock (ruminant and camels) and also human fatalities.

Vaccination is the only way to prevent and control the expansion of the disease. Live attenuated vaccines are preferable to inactivated ones because of higher immunogenicity, lower price and no need of a booster vaccination.

The available live vaccines are either thermolabile (Clone 13) or cause abortion and teratogenic effects (Smithburn strain). Clone 13 is a naturally attenuated strain because of NSs gene deletion. This virus has been produced on Vero cells, heated at 56°C and resistant viral particles were selected. Three cycles of heating and cloning were performed and the most resistant clones were purified using the high dilution method. The C61 showed a characteristic and precocious CPE, high titer and better stability if compared to other clones or the original C13 strain.

A pilot batch of RVF C61 vaccine has been produced and tested for efficacy in cattle, sheep, goats and camels using virus neutralization test. Good levels of antibodies have been detected as soon as two weeks after vaccination and they last for a minimum of one year, probably more. The vaccine is stable at 4°C for two years and could represent an efficient tool for Rift Valley fever control in endemic countries, once commercialised.

The new Clone 61 vaccine candidate is derived from the deleted Clone 13 strain and is unlikely to reverse to virulence in addition to its potential as a DIVA vaccine. Vaccinated animals showed very low or no viraemia at all when tested by PCR which reduces the risk of diffusion.

C61 candidate RVF vaccine should now be tested on large scale for mass vaccination in the field.

Diagnostic Tests for RVF and the Role of an OIE Reference Laboratory

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Rift Valley Fever virus (RVFV), a *Phlebovirus* in the *Bunyaviridae* family, causes Rift Valley Fever (RVF), an economically devastating zoonotic disease in Africa and the Arabian Peninsula. Vaccination remains the only practical control measure for susceptible livestock, and there is no vaccine registered for humans. Diagnostic testing is usually done for disease confirmation, epidemiological studies, vaccine efficacy evaluations and export certification, using serological, virus isolation, RNA detection and antigen identification methods. Biosafety and biosecurity regulations, type of specimen submitted and history of the animal, and assay availability, affordability, validation status, purpose, turnaround time and DIVA capacity, remain major challenges in RVF diagnoses. As part of endeavours to address some of these challenges, the OIE Reference Laboratory for RVF based at ARC-Onderstepoort Veterinary Institute undertakes the following:

1. Invests in providing a safe working environment to include personnel vaccination, purchase of personal protective equipment and maintenance of BSL3 facilities for working with live RVFV;
2. Develops or establishes various assays to meet different testing requirements;
3. Continuously validates the methods through formal and extensive processes, including participation in inter-laboratory test comparisons (ILTC);
4. Harnesses collaborations with researchers elsewhere in the world for exchange of materials, technical skills and information used in research, including diagnostic assay development, optimization and validation. Great strides have been made in the development of different RVF diagnostic methods to date. Nonetheless further investigations are key to addressing limitations of the currently available tests. Reference Laboratories can mobilise financial and other resources, and have the skills needed to provide diagnostic testing for various purposes, execute technical training in diagnostic testing, produce reagents, develop and validate test methods, contribute to quality assurance of the methods through ILTC with other laboratories, and generate knowledge and tools that could be used in development of novel diagnostic tests or improvement of current assays.

OIE Twinning on Rift Valley Fever: South Africa and Yemen

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Rift Valley Fever (RVF) is an economically devastating zoonotic disease caused by RVF virus (RVFV), a *Phlebovirus* in the *Bunyaviridae* family. Abortion storms and mortalities among neonates in susceptible animal species, and flu-like symptoms which can progress to death in humans, characterise RVF. The disease was first diagnosed in sheep in the Rift Valley of Kenya in 1931 and was found to be enzootic in many African countries since then. The first incursion of RVF outside the African continent was recorded in Saudi Arabia, followed by Yemen in 2000. Animals get infected with RVFV through bites of infected mosquitos or in-utero. Humans contract the disease through manipulation of carcasses of infected animals, consumption of infected and unpasteurized milk or, similar to other susceptible animals, through bites of infected mosquitos. The clinical signs caused by RVF are not pathognomonic and laboratory confirmation is crucial for mobilisation of resources and institution of control measures during outbreaks. Reference Laboratories often perform disease confirmation since they have the expertise and resources necessary to perform the different assays required for the purpose. There are only two Office International des Epizooties (OIE) Reference Laboratories for RVF, situated in the northern and southern hemispheres, in France and South Africa, respectively. Their location are not in, or at close proximity to all the RVF enzootic regions to facilitate prompt outbreak responses. The OIE twinning project on RVF between ARC-Onderstepoort Veterinary Institute (OVI) in South Africa and the Central Veterinary Laboratory (CVL) in Yemen is aimed at increasing RVF diagnostic capacity in Yemen, in the form of different antibody ELISAs, Virus Neutralisation Test, RT-PCR and qRT-PCR and Virus Isolation in different media, and various aspects of Laboratory Quality Assurance. The established scientific and technological expertise will hopefully earn the CVL OIE reference laboratory status for RVF, that would benefit the entire Arabian Peninsula Region through self-sufficiency in the early detection and diagnosis of the disease, thus contributing to good veterinary governance.

A practical perspective on current Rift Valley fever diagnostics and future developments

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Rift Valley fever is a peracute to acute viral disease of mammals, notably of ruminants and man. Antigen can be detected in the blood and serum of infected animals for a limited period of time (generally from the second to the third day until the fifth to the seventh day post infection). In extreme cases (*e.g.* in very young animals) viraemia can be detected as early as sixteen hours post infection and in some individuals the viraemic stage can persist up to day 12. Surviving animals show a prominent neutralising antibody response (demonstrable from about 5 days post infection). This response usually peaks 14 to 21 days post infection, and slowly declines to a stable plateau which may persist for many years. Further characterisation of the humoral response may provide important epidemiological information since the presence of IgM antibodies in the serum of animals is a reliable indicator of recent infection (detectable from the fourth day post infection until approximately day 50), while the presence of IgG in the absence of IgM signifies previous infections with negligible risk of active replication.

Antigen can be detected in the blood, serum and plasma of viraemic animals or in the tissues of infected animal carcasses using a variety of diagnostic tests. Infectious virus can be demonstrated by standard virus isolation in cell culture or suckling mice. A large variety of reverse transcriptase polymerase chain reactions (rt-PCR) have been developed with significant advantages in terms of sensitivity, specificity and reaction time. A recently-developed multiplex rt-PCR allows the differentiation of certain RVFV vaccine strains from field strains. Refinement of the different rt-PCR techniques is taking place continuously. Virus neutralisation tests (VNT), although laborious, are still considered the golden standard for antibody detection against RVF, since cross-reactivity with other closely-related bunyaviruses does not interfere with the interpretation of this assay. The VNT is, however, not suitable for handling large sample volumes.

The versatility and suitability of enzyme linked immunosorbent assays (ELISA) for large sample volumes, resulted in considerable development and continuous improvement of these techniques. A variety of indirect and competitive ELISA's, are available. Most of these have excellent sensitivity and specificity profiles but, are restricted in terms of their use for samples from multiple animal species. An IgM-detecting blocking ELISA is available which can be used across the species barrier and enables efficient detection of recent infections.

There is a need for inexpensive, reliable pen-side tests to facilitate prompt and accurate field diagnoses. Although promising results have been obtained with immunochromatographic lateral flow assays, these tests are still not readily available for use in the field and in many instances lack sufficient sensitivity.

Climatic change and the potential of RVFV to spread to previously uninfected areas, sparked renewed interest in the development of multiplex assays to facilitate syndromic testing in humans and animals (*e.g.* a multiplex test for arbovirus infections). Preliminary results obtained with assays based on microarray or fluorescent microsphere immunoassay technology (Luminex), are encouraging but none of these are freely available yet.

Challenges to control RVF disease: Research required to improve diagnostics

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Rift Valley fever (RVF) is a zoonotic disease and one of the Transboundary *Animal* Diseases (TADs) which can dramatically affect livestock trade between countries. The ban on livestock imports instituted by Middle East countries to Eastern Africa countries after the 1997/1998 RVF outbreak in Kenya and Somalia, affected export trade particularly in Somalia. Losses due to the ban from February 1998 to May 1999 were estimated at \$109 million for the Somaliland region alone. By the time the ban on animal imports was lifted in 2009, East Africa had already endured many years of lost income because of prevailing fears concerning RVF.

RVF is caused by a single serotype of a mosquito-borne virus member of the family Bunyaviridae, genus *Phlebovirus*. Implementation of appropriate control measures for RVF requires good early warning and early detection systems. The laboratory diagnostic tools for the detection of RVFV RNA, antigens and antibodies are essential to confirm disease outbreak. The currently available diagnostic tests for detection of RVF need to be improved for early screening and surveillance of the RVF disease. There is a need to develop rapid pen side tests or field based tests which are currently not available but would be important for field testing. There is also a need to differentiate natural infection from vaccinated animals through the development of new RVF vaccines and companion diagnostics. Syndromic approach to diagnosis (neonatal mortality and abortion) should be considered in the development of new Multiplex assays which can differentiate RVF from other pathogens like brucella. The relatively high cost of commercial diagnostic kits currently available in the market pose a major challenge to African laboratories which may not be able to afford it. AU-PANVAC with its continental mission "To promote the use of good quality vaccines and reagents for the control and eradication of animal diseases in Africa" has embarked on the development and production of essential diagnostic reagents to support AU MS veterinary laboratories for the diagnosis of priority diseases. During the consultative workshop organized in collaboration with African laboratories at the AUC Headquarters in 2013, laboratories identified RVF as one of the priority diseases for their diagnostic activities and requested support from AU-PANVAC in this regard. Following that Workshop, a strategic framework document on AU-PANVAC Diagnostic activities was prepared and the development and production of biological reagents for RVF is indicated in that document.

SESSION III

Trade Issues

OIE Code Chapters relevant to RVF and trade

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The OIE *Terrestrial Animal Health Code* (the *Code*) details conditions to enhance and render trade in live animals and their products safe in the Section 5 covering everything from certification, transport, transit, quarantine requirements and inspection on arrival. In this context, the OIE allocates a lot of importance to the quality of the Veterinary Services that supervise these different measures on the side of the exporting and importing country and Section 3 of the *Code* is devoted to describing the quality criteria that Veterinary Services should comply with and how they can be evaluated using the Performance of Veterinary Services tool (the PVS pathway).

More specifically addressing Rift Valley fever (RVF), the *Code* Chapter 8.13 was revised in 2013 and accepted by the OIE General Assembly of Delegates in 2014 in order to provide OIE Member Countries with more flexible options to deal with the specificities of this disease, mainly the fact that countries, once they experienced an outbreak, can never be considered again free of the diseases and the fact that countries can find themselves in extended inter-epizootic periods.

Accordingly the revised *Code* Chapter differentiates between countries/zones free of RVFV, countries infected with RVFV during an inter-epizootic period and those during an epizootic period.

Recommendations for the importation of live animals or their products are subsequently aligned with these three country situations.

It should be noted that vaccination is now offered as an option in each of the three situations, underlining the importance of the availability of effective, safe and affordable vaccines for countries in the Region, manufactured in line with the provisions as described in the *OIE Manual*, Chapter 2.1.14.

Furthermore, the importance of surveillance using different approaches in inter-epizootic and epizootic periods is highlighted. However, surveillance for virus detection in the vector is not recommended.

While the revised Chapter maintains that hides, skin, wool and fibre are safe commodities as they are, it now also considers fresh meat and meat products as safe provided ante- and post mortem inspection has been carried out without any findings and that meat has been properly matured.

In conclusion, the revised *Code* Chapter offers feasible options for countries to maintain trade even in the face of a localised outbreak, provided that Veterinary Services comply with the requirements and maintain a high standard of performance to guarantee that preventive and control measures have been implemented.

Current livestock trade between the Horn of Africa and the Middle East The new RVF OIE *Code* Chapter and what it means to inter-regional trade

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Historically, the Horn of Africa and the Arabian Peninsula have been partners in trade. Dhows would carry livestock from Africa and return with spices and other goods. This trade continued for centuries, perhaps millennia and with the oil boom of the 20th century livestock trade expanded rapidly as the oil economies became wealthier and sought more meat in their diet. In the latter half of the 1900s, livestock trade further expanded with the rapid development of Mecca and the dramatic increase in Hajj and Umra pilgrims. From these historic times all the way until the early 1980's the Horn of Africa and Sudan were the predominant suppliers of livestock to the Arabian Peninsula. By the late 1970s livestock export from Somalia alone reached numbers of 2.5 – 3 million.

This trade was abruptly interrupted due to a series of import bans by GCC states, beginning in 1983 with a ban on export from the Horn of Africa due to the fear of the spread of rinderpest. Sudan, largely escaped the bans, but livestock export from there was affected due to the long-standing civil war and trade deals between political figures on both the importing and exporting sides which were considered unfavourable terms by livestock producers and exporters.

Thus from controlling approximately 85% of the livestock imports into the Arabian Peninsula, the Horn of Africa / Sudanese market share dropped to approximately 15% and was filled by distant countries, principally Australia and Uruguay. With the establishment and opening of the Djibouti quarantine in 2006, African livestock export trade has experienced phenomenal growth. For example in its second year of operation the Djibouti quarantine exported 3.1 million head. Once the Somali quarantines were established, export increased dramatically once again. For example in 2012, UNDP data gathered from quarantine records and port data showed that the quarantines of Berbera, Bosasso, and Djibouti exported 5.7 – 5.9 million head. IGAD data for 2014 list 3.6 million head exported from Berbera, 1 million head exported from Bosasso, and 5.2 million head exported from Port Sudan, a total of nearly 10 million head.

Concurrently, animal welfare concerns expressed by Australians resulted in a change in the government's legal and policy framework, which caused Saudi Arabia, by far the largest Arabian importer, to halt the importation of livestock from this country. However, the current boon for African export trade which has placed billions of dollars into the hands of the regions' pastoralists remains threatened by livestock disease.

This is because of two reasons: First, is the perception on the part of the importing authorities of a conflict of interest in the management of the quarantines – traders manage and staff the quarantines and their veterinarians and technicians often perform the inspections. Importing authorities have commented that the traders often "cheat" and report that they frequently experience problems with diseased livestock on importing ships resulting in a rejection of the entire shipment or worse, diseased animals entering their country and causing outbreaks which unfortunately has been the case in several Arabian and Middle Eastern countries.

Second, epizootic trans-boundary diseases and in particular RVF epizootics have had a serious impact in some of the importing countries and there is a strong memory of the serious epidemic 15 years ago in the Arabian Peninsula which resulted in over 300 human deaths. Because of the risk of RVF in a situation such as the Hajj, it has become an emotive disease and its occurrence on the exporting side could potentially result in a reaction on the part of the importers that is based on fear rather than science. Further, the old Chapter on RVF in the Terrestrial *Code* required updating so that science-based decisions made by both the exporters and the importers could be made to protect the integrity of the trade, prevent the spread of disease and increase confidence between the parties.

The new *Code* is now science-based and if followed, can prevent the introduction of RVF into the Arabian and Middle East importing countries while minimizing disruptions in trade. The changes in the *Code* are fundamental and hopefully will be the basis for proactive decisions on the side of the exporting Veterinary Authorities to restrict or and control trade and animal movement in the face of an outbreak ensuring that diseased livestock are not exported. Furthermore, by maintaining open communications between the parties, it is hoped that in the future, long term import bans placed by the importing authorities can be prevented.

This presentation will highlight the changes to the *Code* and help to demonstrate that if The *Code* is followed, then disease free trade between these two regions can flourish for the benefit of both sides.

SESSION IV

Prevention, Biothreat and Early Warning

RVF Surveillance systems in ruminant population of the IAG Region

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The IGAD region is endowed with the highest ruminant population in Africa. However, the region is also severely affected by the impacts of animal diseases including RVF. The Greater Horn of Africa (GHoA) region is a global hotspot for the emergence of RVF epizootics as evidenced by recurrent waves of outbreaks over the past decades. Occurrence of RVF epizootics has significantly affected the region by causing mortalities of animals and humans as well as sustained restrictions on export of animals and animal products.

Taking lessons from past experiences, most of the countries in the IGAD region have put in place surveillance systems targeting RVF. The main objective of RVF surveillance in the region aims at early detection of epizootics in order to trigger rapid response and curb subsequent devastations that maybe caused by the disease. To guide their surveillance activities, most countries have identified high risk areas for RVF epizootics using historical data on geographical distribution of previous outbreaks. The surveillance systems in place largely focus on detection of the pathogen and evidences of RVFV activity. During inter-epizootic periods, targeted surveillance is undertaken in most countries to monitor RVFV activity in high risk areas through detection of RVF antibodies, which is a practice consistent with the recommendations of chapter 8.13 of the OIE *Terrestrial Code*. The sampling method applied in this case is random selection of individuals from susceptible ruminants in high risk areas (Ethiopia, Kenya, and Sudan) or from sentinel herds established to monitor RVFV activity (Kenya, Uganda). As identification of high risk areas is largely informed by the geographical extent and mapping of previous epizootics, targeted surveillance based on such descriptive analysis may not be sensitive enough to capture all future outbreaks.

Furthermore, RVF surveillance systems are linked with meteorological alert systems in most countries. Surveillance is usually heightened and triggered when forecasts of favourable/predisposing environmental phenomenon particularly predictions of excessive rainfall are received from meteorological agencies and other responsible regional agencies. The application of meteorological data and information as RVF early warning mechanism apparently enhances the efficiency and effectiveness of surveillance systems. In preparedness for an unfortunate event of RVF epizootics, countries of the region have developed emergency preparedness plans that spell out the surveillance SOPs that should be complied with in order to determine the extent of the outbreak for effective and rapid containment of the disease, which is also consistent with the provisions of chapter 8.13 of the *Code*.

However, surveillance systems in most countries don't usually involve vectors, which is an important activity to identify areas with low and high vector densities. Such information on RVF vector activities, as described under chapter 8.13 of the *Code*, could facilitate safe trade of ruminants and their products. Furthermore, the identification and designation of high risk areas should be informed by an analytical study that combines disease data as well as information on risk factors. In this regard, a plan has been finalized to undertake a cross-sectional study of RVF including its potential risk factors aiming at developing risk maps using analytical methods and tools.

Bridging WHO and OIE tools for the assessment of national capacities

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Experience gathered from emergencies of major zoonotic infectious diseases, including the wave of Rift Valley fever outbreaks from 2006 to 2010, confirmed that collaboration between human and animal health systems is crucial to effectively manage such events. Human and animal health systems need to be robust, have sufficient capacities and work in close partnership to address common issues regarding early detection, assessment and rapid response, whilst respecting international standards. OIE and WHO are the intergovernmental organizations mandated to improve animal and human health respectively, on a global scale; they assist countries with strengthening their capacities and improving their compliance under the normative frameworks of the international standards described in OIE's *Terrestrial* and *Aquatic Animal Health Codes* and the International Health Regulations (IHR, 2005).

The use of these normative frameworks has provided opportunities to engage human and animal health systems in a constructive and operations-oriented dialogue, exploring ways to improve their coordination. Stemming from this, significant results have been recently obtained and are in line with good governance principles. To support countries improve their governance systems, the OIE and WHO have developed complementary tools to assess national capacities and analyse gaps in their compliance to OIE international standards and IHR (2005). OIE and WHO have also conducted an in-depth analysis of the differences and synergies between the frameworks and tools used in the two sectors. Joint WHO IHR/OIE PVS Pathway national bridging workshops offer a structured approach to help countries identify strengths and weaknesses and accordingly define concerted corrective measures and strategic investments. Participation in these workshops helps countries define national strategies targeting capacity building at the human-animal health interface. This approach has been tested in pilot countries and will be included in future programmes undertaken by OIE and WHO.

In his presentation, the speaker will use his experience from RVF outbreaks management campaigns to describe the process and potential outputs. These RVF outbreaks have actually largely inspired the development of this approach and concrete case studies are used to illustrate the approach which finally contributes to globally promoting the importance of a One Health approach, while accelerating progress towards Global Health Security.

National Contingency Plan for Rift Valley Fever

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Rift Valley Fever (RVF) is an mosquito borne viral disease that poses a significant global threat to humans and livestock. In East Africa, RVF usually occurs as explosive epizootics with prolonged inter-epidemic periods of between 8 to 10 years. In Kenya, the 2006/2007 RVF outbreak induced estimated losses to the economy of more than Ksh 2.1 billion (US\$24.5 million), based on the outbreaks' negative impacts on both agriculture and other sectors. The episodic nature of the disease and the rapid evolution of outbreaks create special challenges for its mitigation and control. Since 2008, the Government of Kenya and partners have developed a Contingency Plan for RVF prevention and control. The Contingency Plan describes how the Government and partners prepare for and respond to Rift Valley Fever outbreaks. This systematic plan invests in ensuring capacity and focuses on early detection and rapid response to outbreaks of RVF in the country. A RVF early warning system have been established to assess the risk of occurrence of a major RVF epidemic before it arrives and to enable national veterinary services to anticipate the risk and react promptly and effectively to prevent the disease's devastating impact on animal and human health. In the contingency plan, key decision points and actions have been identified within the RVF outbreak cycle (inter-epidemic, pre-outbreak, outbreak and recovery phases) that inform actions to be taken in each phase.

Rift Valley fever Decision Support Framework for eastern Africa

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In the eastern Africa region, Rift Valley fever (RVF) epidemics occur in irregular cycles that make it difficult for mitigation agents to implement effective interventions in the face of an outbreak. Furthermore, the existing prediction systems do not offer an adequate lead time given that there is inadequate knowledge on drivers and processes that promote outbreaks. The Rift Valley fever (RVF) Decision Support Framework (DSF) has therefore been developed to guide timely, evidenced based decision-making in the control of the disease considering that uncertainties on decision making can paralyse the deployment of effective response measures. The last (2006/2007) outbreak for instance caused substantial socio-economic impacts in the region due to by delays in the recognition of risk and in making decisions to control the disease.

The framework breaks the RVF epidemic cycle into five explicit steps and matches them with appropriate actions. These steps identified in the framework include: (i) inter-epidemic period, (ii) pre-outbreak period (classified into early warning, localised rain, flooding and mosquito swarms), (iii) outbreak period (classified into suspected and confirmed outbreak sub-phases), (iv) recovery phase including a 45-day period when no further livestock cases are observed, and (v) post-outbreak recovery and reflection. Interventions matched to these epidemic stages are: capacity building and training, communication, advocacy and public awareness, national and regional coordination, early warning, surveillance, disease prevention, case management, regulation of trade and markets for livestock, resource mobilisation, establishing or strengthening institutions and policies, and risk and impact assessment. The development of the framework has involved multiple partners, decision-makers to ensure ownership and relevance to the decision-making challenges that have been experienced during previous RVF outbreaks. The framework has also been aligned with the One Health principles by specifying interventions for both veterinary and human health sectors at each decision point.

For the framework to be effectively operationalized, three key issues will have to be addressed: (i) a national RVF emergency fund has been established and procedures and modalities put in place to enable the fund to be made available rapidly in response to predetermined criteria, (ii) an effective communication system has been established including a clear chain of command and feedback from the Chief Veterinary/Medical Officers to field officers and communities, and (iii) that approved RVF Contingency Plans integrate the framework in their designs.

Rift Valley fever Prediction and Risk Mapping: 2014-2015 Season.

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Rift Valley fever outbreaks are known to follow periods of anomalously high rainfall in Eastern Africa. Past studies indicate that periods of such above-normal rainfall in equatorial eastern Africa are associated with warm El Niño Southern Oscillation (ENSO) events. In June 2014, the National Oceanographic and Atmospheric Administration's Climate Prediction Center issued a consensus model forecast indicating a 70 % chance for the development of a warm ENSO event in the late summer (Niño-3.4 index: between 1.0°C and 1.4°C) and 80% in the fall. However given the delayed development of the event, a revised forecast was issued early in the fall indicating about 60-65% to peak at weak strength during the late fall and early winter (3-month values of the Niño 3.4 index between +0.5°C and +0.9°C). The Rift Valley fever risk mapping model did not identify any areas at potential risk in September, however in October – November some contiguous areas in South Sudan and Sudan were mapped to be are potential risk - where ecological conditions would support the emergence of RVF vectors. A series of advisories were posted on the RVF Monitor website (<http://www.ars.usda.gov/Business/docs.htm?docid=23461>) and shared with international partners (OIE, FAO and WHO) advising enhanced vector surveillance in areas shown to be at risk. Some of these areas in Sudan reported outbreaks of undiagnosed haemorrhagic fever and cholera in several locations in El Gezira state (<http://www.promedmail.org/>). Lack of a clear and strong coupling between the atmosphere and the warm SSTs in the eastern equatorial Pacific Ocean and weak warming in the Indian Ocean, resulted in a poor and aborted rainfall season in large parts of East Africa. Overall, the above normal rainfall belt remained in the northern half of the region and areas at potential risk for Rift Valley fever activity persisted in Sudan and South Sudan throughout the remainder of the season.

The immediate future seasons portends elevated risk due to lapsed time since the last regional epizootic, restocking of livestock after the 2010-2011 drought period and the higher probability of a medium (+1.5) to strong (+2.0) El Niño event during the coming seasons. It is advisable therefore for all national and regional early warning institutions to be on alert and prepare for early surveillance.

The joint Early Warning release

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In December 2014, climate models predicted persistent above-average rains and risk of flooding in East Africa. In response, FAO, OIE and WHO warned countries to remain vigilant about Rift Valley fever (RVF). The availability of near-real time satellite-based climate data, such as rainfall, temperature and vegetation indices, provides an opportunity to monitor climatic conditions that are linked to vector abundance and population dynamics. This has facilitated the development of cost-effective Early Warning Systems (EWSs) for vector-borne diseases, including RVF. The aim of such EWSs is to monitor the first signals of a possible increase in vector abundance and RVF risk and provide information for prevention and risk mitigation.

Given the predicted risk for potential RVF activity based on abnormally high rainfall in the identified areas of the Republic of Sudan, the Republic of South Sudan, the Federal Republic of Somalia, the Republic of Kenya and the United Republic of Tanzania, FAO, WHO and OIE encouraged these countries to:

- a) Heighten their level of surveillance for RVF in human and animals in at-risk areas;
- b) Increase their level of preparedness, and implement targeted vaccination in known at-risk areas;
- c) Raise awareness and communicate with communities the risk of emergence of the disease in animals first and later in humans.

SESSION V

Regional Coordination

GF-TADs Africa

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The *Global Framework for the Progressive Control of Transboundary Animal Diseases* (GF-TADs), launched in 2004 is a joint initiative of OIE and FAO to achieve the prevention and control of transboundary animal diseases (TADs). The initiative is built on experiences in the past showing that progress in controlling TADs at country level is not likely to be successful and sustainable unless the efforts are part of a coordinated regional approach/embedded into supra-national frameworks.

The GF-TADs for Africa was established in 2006 with a view to respond to priority diseases of the continent. It is governed by a Regional Steering Committee (RSC) chaired by FAO with AU-IBAR as vice-chair; the Secretariat is provided by the OIE Representation for Africa. CVOs, members of the OIE Commission for Africa and representatives from the Regional Economic Communities (RECs) and partners attend the RSC annual meetings. The GF-TADs for Africa operates under the overall guidance and supervision of the GF-TADs Global Steering Committee.

The GF-TADs for Africa 5-year Action Plan 2012-2016 target different objectives including (i) facilitating regional and cross-border collaboration, including networking activities; (ii) improving national and regional knowledge and sharing quality information/data on priority animal diseases; (iii) providing technical guidance to improve disease prevention, surveillance, early detection, notification and rapid response systems; (iv) improving diagnostic laboratory capacity and performance at national level and supporting the establishment/reinforcement of national and regional vaccine production laboratories, reference laboratories; (v) supporting the reinforcement of Veterinary Services (VS); (vi) ensuring the appropriate advocacy for animal disease prevention and control activities; and (vii) developing alliances and foster collaboration between public VS, private veterinarians and livestock professional organisations. The Plan focuses on 7 priority diseases: Peste des petits ruminants (PPR), Foot and mouth disease (FMD), Rift Valley fever (RVF), rabies, African swine fever (ASF), Newcastle disease (ND) and Contagious bovine pleuropneumonia (CBPP).

The GF-TADs Africa 9th Steering Committee meeting held on 8 – 9 July 2014 in Ouagadougou adopted different recommendations including:

1. The GF-TADs for Africa Action plan be completed with baseline situation provided by countries, AU-IBAR, FAO, OIE, RECs and other relevant partners for the following diseases: FMD, PPR, CBPP, ASF and RVF.
2. The Secretariat of the Alive Executive Committee, supported by key partners of GF-TADs for Africa, ensure a proper advocacy at the highest authority to promote ownership of the GF-TADs for Africa mechanism and its 5 year Action Plan by the RECs and Members Countries.
3. African countries be encouraged to continue their progression in the OIE PVS Pathway, especially by requesting, when relevant, PVS Evaluation Follow-up mission and taking ownership of the outcomes in order to improve the good governance of their VS and to ease access to funding both internally and externally using round tables with donors.

Under the GF-TADs for Africa *aegis*, different initiatives have been taking place including the preparation of the ASF regional strategy, the PCP FMD Roadmap meetings, as well as the RVF conference in Djibouti.

GF-TADs in the Middle East

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The previous GF-TADs Regional Steering Committee (RSC) for the Middle East gathered in Dubai (UAE) in April 26, 2012, and in Amman (Jordan) in September 22, 2013, succeeded to raise a regional consensus on the governance aspects of the GF-TADs and on the terms of reference of a regional action plan for the period 2012-2016 aiming in particular at:

- generating information and data for monitoring the regional activities related to the priority TADs;
- establishing a reporting mechanism of the GF-TADs Middle East activities, linked to the Global GF-TADs Secretariat.

The specific objectives of this 5 years action plan are to:

- promote the control and eradication of specific TADs in the region;
- provide strategic direction to the Secretariat;
- foster cooperation between member countries, donors, Regional Specialized Organisations (RSOs) and the Regional Support Units (RSUs);
- and, together with the Secretariat, to ensure guidance for field, laboratory, epidemiological events and control efforts.

Actions conducted by the GF TADs RSC addressed priority diseases prevailing in the region such as foot and mouth disease, peste des petits ruminants, Rift Valley fever and lumpy skin disease, through assistance to organise regional meetings to discuss and agree on common procedures for the surveillance and control of these diseases, including the assessment of national plans and elaboration of regional strategies.

Among others, the RSC will continue to:

- facilitate collaboration and maximize synergies among the countries and stakeholders in the region;
- and promote adequate governance of Veterinary Services in accordance with OIE standards through capacity building programmes at national and regional levels.

The next RSC meeting will be held in the margins of the 13th Regional Commission conference to be held in Doha/Qatar or to be held in Doha/Qatar Beirut/Lebanon in November 2015.

Interventions of AU-IBAR for prevention and control of Rift Valley Fever in support of livestock trade

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The Interafrican Bureau for Animal Resources (AU-IBAR) is a specialized technical office of the African Union Commission. Its mandate is to support and coordinate the sustainable development and utilization of animal resources to enhance nutrition and food security and contribute to the wellbeing and prosperity of the people in the Member States (MS) of the African Union (AU). Livestock contributes significantly to the livelihoods of Africa's people and to their national economies but transboundary animal diseases (TADs) including Rift Valley fever (RVF) pose a major challenge due to the negative effects on productivity and access to livestock markets. To address the challenges facing the livestock sectors in Africa, the African Union (AU) Heads of States and Governments recently approved the Livestock Development Strategy for Africa (LiDeSA) as a long-term framework for the transformation of the livestock sector. AU-IBAR is addressing RVF and other TADs within the framework of LiDeSA. To improve information sharing among the MS and Regional Economic communities (RECs), AU-IBAR compiles and disseminates information on the sanitary status. Further support to animal health information systems is being provided through the rolling out of the Animal Resources Information System (ARIS) in the AU Member States through trainings and the provision of information and communication equipment. To enhance knowledge on the epidemiology of RVF to aid decision making on prevention and control of RVF outbreaks, cross-sectional surveys for RVF are being undertaken in IGAD MS.

AU-IBAR and the IGAD Centre for Pastoral Areas and Livestock Development (ICPALD) through the Standard Methods and Procedures in Animal Health (SMP-AH) project with financial support from USAID are supporting regional coordination and harmonization of animal disease surveillance, prevention and control in the Greater Horn of Africa (GHOA). The coordination and harmonization of the control of RVF and other TADs is based on the Standard Methods and Procedures (SMPs) approach. This involves capacity building for laboratory testing, surveillance and disease control and the application of SMPs as protocols for the prevention and control of RVF in line with OIE standards. To guarantee the health status and welfare of livestock for export, veterinary personnel in quarantine stations have been trained on sanitary processes and certification. Support has also been provided for the development of SMPs for export quarantine stations. Technical and managerial capacity for veterinary personnel from the GHOA has also been enhanced through trainings. The capacity of veterinary vaccine production laboratories is also being strengthened and AU-IBAR is coordinating and promoting the participation of AU MS in animal health standard setting processes. The development of responsive policy and regulatory environment for the delivery of veterinary services is also supported. To enhance coordination, communication and information sharing on livestock trade among countries in the Great Horn of Africa (GHOA) and with importing countries in the Middle East, AU-IBAR and ICPALD are supporting a livestock commodity association, the North Eastern Africa Livestock Council (NEALCO).

Status and progress of Regional Animal health projects in IGAD region

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The Intergovernmental Authority on Development (IGAD) is a Regional Economic Community covering eight countries: Djibouti, Eritrea, Ethiopia Kenya, Somalia, South Sudan, Sudan and Uganda. The livestock resources are estimated at about 373 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 member states (MS) are covering about 50% of live animal and less than 10% of the meat required annually by the Middle East. One major reason hampering the growth of market share is limited capacity to control trans-boundary diseases. There were also export bans on East African countries due to Rift Valley fever (RVF) which affected heavily the livelihood of producers and traders.

IGAD Centre for Pastoral Areas and Livestock Development (ICPALD) and AUIBAR have been able to develop two project proposals; Standard Methods and Procedures in Animal Health (SMP-AH,) and Improving Surveillance of Animal Diseases in IGAD MS (STSD) and mobilize resources from USAID and EU respectively.

The main progress of the two regional projects and support to MS with special focus to RVF control are summarized below: Under SMP-AH nine priority TADs were identified together with MS for special attention and joint efforts to control TADs and RVF is one of them. SMP for RVF was also developed and validated with MS and development partners; the project is working with MS on streamlining of the SMP into the national development programmes. Veterinary Officers, laboratory technicians and export quarantine workers were also trained on epidemiology and surveillance, inspection, certification, diagnostic techniques and management skills.

With the support of the STSD project, ICPALD and AU-IBAR developed the regional Guidelines for Animal Identification, Traceability (LITs) and Animal Health Certification (AHC) Systems and validated by MS and development partners. A regional LITs and AHC forum has also been established to provide guidance and support MS to exchange lessons in the area. MSs were also supported to improve their capacity of undertaking active animal diseases surveillance through personnel training for labs, provision of reagents, cars and motor bikes. RVF is one of the four diseases for which a cross sectional survey design was developed. A regional coordination mechanism on disease surveillance is also supported through the Animal health networks to enhance exchange of lessons and good practices and improve disease reporting. The regional framework for progressive control and eradication of PPR and other small ruminant diseases were also developed and validated. A regional PPR Control Coordination Committee embracing MS has also been established to provide guidance on development of national strategies and facilitate implementation and share lesson. The same regional Coordination Committee will also coordinate activities regarding RVF and other TADs.

Eastern Africa epidemiology and Laboratory regional networks

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The regional epidemiology and laboratory networks were established in 2009 and 2008 respectively through Food and Agriculture Organization of the United Nations (FAO) facilitation to coordinate animal health work in the region. The first, being the Eastern Africa Regional Epidemiology Network (EAREN) focuses on surveillance for early detection and reporting of animal diseases to enable planning, regional coordination and harmonization. The second, the Eastern Africa Regional Laboratory Network (EARLN), focuses on national laboratories for diagnosis to support early detection of diseases and their management plans. The Regional networks, supported by functional national networks, serve to share expertise and information. The activities of national networks include collecting quality data, disease surveillance, risk analysis and early warning. The Regional networks seek to create a sustainable regional infrastructure for animal health, functioning in the long-term beyond individual finite projects. Plans to anchor the regional networks into the Regional Economic Communities (RECs) are on-going to ensure their sustainability. Until 2010, both regional networks met separately after which joint network meetings were adopted in order to give participants the opportunity to discuss early detection and warning for diseases. An epidemiology-surveillance system encompasses both networks. To ensure sustainability and ownership by countries, two regional coordinators and their deputies were nominated in 2012 during the joint EAREN & EARLN meeting held in Mombasa, Kenya. The coordinators and deputies are based in different countries on rotational basis. Information on emergency and priority disease outbreaks and other epidemiology-surveillance issues and activities is shared regularly. Currently, Ethiopia and Rwanda coordinate the EAREN activities, while Uganda and Kenya coordinate the EARLN. Since the establishment of EAREN and EARLN, two sub-networks based on diseases (FMD and ASF) have been established and actively meet annually. Other sub networks (rabies and CBPP) are being established as recommended in the last joint annual meeting held in September 2014 in Arusha Tanzania. The EAREN and EARLN networks meet annually, bringing together two representatives from each of the twelve countries in the region that act as focal points to discuss issues related to epidemiology and laboratory activities. This is augmented with representation from the current two sub-networks on FMD and ASF.

In 2013, an umbrella network of the Chief Veterinary Officers (CVOs) - the Chief Animal Health Regional Network (C-AHRN) - was established. Considered responsible for all activities related to animal health, the CVOs from all twelve countries participate in the meeting. The information to be shared by the countries is validated and endorsement by the CVOs before the sharing process usually done through the two coordinators. While functionality of the networks can be said to be more or less a success story and since IGAD has agreed to take a leading role in coordinating the regional networks, there is need to enhance sustainability and ownership by countries by mainstreaming the activities into the budgetary processes.

POSTERS

Comparative genome sequence analysis of RVF virus isolates from 2008 to 2010 outbreaks in South Africa

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ABSTRACT

Rift Valley fever is a zoonotic disease. Since the 1930s when it was first noticed in Kenya, the disease has appeared in other African countries and in the Arabian Peninsula. The disease affects both humans and animals, causing major losses in livestock and negative impact on the livelihoods of people who depend on them. Because of its zoonotic nature, RVF is recognized as a disease which is a threat to all who live in countries where its mosquito vector thrives. Because of the changing weather patterns, it is essential to institute and sustain in-country bio-surveillance of this disease using the best tools available, to stop potential outbreaks at source or effectively manage them if they were to occur.

Outbreaks of RVF usually follow weather conditions which favour increase in mosquito populations. Such outbreaks are normally cyclical, occurring once every 30 or so years. However, this is not always the case. For example, recent outbreaks of the disease in South Africa have occurred with increasing frequency and rather unexpectedly: in 2008 (in Mpumalanga, Limpopo and Gauteng), in 2009 (KwaZulu-Natal, Mpumalanga and Northern Cape provinces) and in 2010 (Eastern Cape, Northern Cape, Western Cape, North West, Free State and Mpumalanga). As of August 2010, there were 232 human cases, with 26 confirmed human deaths. In order to obtain comprehensive background information on the genetic composition of the RVF viruses circulating in South Africa, genome sequence analyses WERE undertaken on RVF viruses isolated from samples collected over time from animals at discrete foci of the outbreaks. The oldest isolate whose genome was analysed is from a 1955 case and the most recent one from a case in the 2010 outbreak.

Complete sequences have been obtained from 20 different isolates so far. We report on, and discuss, phylogenetic relationships among the isolates as reflected by their genome sequences, and implicit recombination among genes encoding glycoproteins Gc and Gn, which have a role in host protective humoral immune responses.

Seroprevalence of Rift Valley Fever antibodies in South African Suids

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ABSTRACT

Rift valley fever (RVF) is a serious viral zoonotic disease causing wide-spread abortions, mortalities and illness in clinically susceptible species. The virus responsible for the disease is transmitted by mosquito vectors and epidemics coincide with periods of high rainfall when the vectors are abundant. However, low circulation of RVF virus (RVFV) and sporadic outbreaks of the disease often occur outside epidemic seasons, raising suspicion of existence of inter-epidemic maintenance hosts of RVFV, in the form of wildlife and other sub-clinically affected animals such as those in the *Suidae* Family. The current study was aimed at determining the sero-prevalence of RVF antibodies in suids from the 9 provinces of South Africa, to determine whether these animals had been exposed to RVFV infected mosquitos, have subsequently been infected and sero-converted. Approximately 4000 sera collected between 2007 and 2013 were screened with an indirect RVF IgG ELISA and 700 of these, were tested using serum neutralisation test (SNT). Overall ELISA sero-prevalence was 2.2 % and the rates per province ranged from 0.8 % to 6.3 %. Among the randomly selected sample subset tested, the SNT recovered a country-wide seroprevalence of 16.4 %, whereas ELISA prevalence was 0.1 %. The SNT results indicate that the serological prevalence of RVF in South African suids is higher than what is discernible by the indirect ELISA, a result that is likely due to lower binding capacity of the ELISA conjugate to suid IgG. The results indicate that suids exposed to RVFV seroconvert, corroborating earlier findings by investigators in Egypt. Further studies to investigate the role of these species in the epidemiology of RVF in enzootic areas are warranted.

Linkages between socio-cultural practices and vulnerability to Rift Valley Fever (RVF) in Baringo County, Kenya

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ABSTRACT

Rift Valley Fever (RVF) is a zoonotic disease that affects domestic ruminants, particularly sheep, cattle and goats. In livestock and humans, RVF is spread through bites from infected *aedes* and *culex* mosquitoes. Additional avenues of human infections include contact with infected animal secretions, tissues and aerosols. In Kenya, RVF outbreaks have occurred ten times with the first recorded in 1931 and the last in 2006. During the 2006-2007 outbreak, RVF occurred in Baringo County for the first time. The outbreak was associated with El Nino/Southern Oscillations related climatic anomalies.

Through an on-going study on community adaptation to Malaria and RVF, which specifically focuses on how culture influences disease, data on socio-cultural practices in livestock production has been collected through focus group discussions and key informant interviews among the Tugen and Ilchamus communities of Baringo County.

Preliminary findings show that both communities largely depend on livestock for their livelihoods. In terms of risk of exposure to RVF, both communities exhibit vulnerability based on their low level of awareness of the disease; consumption of meat from animals that die of diseases and unknown causes; disposal of dead animals; close contact with both healthy and sickly livestock; and management of human febrile illnesses. The study concludes that both communities are vulnerable to RVF and recommends that they should receive targeted awareness creation messages on the occurrence, transmission and prevention of RVF in order to decrease vulnerability to human and livestock infections.

Perceived risk factors and risk pathways of Rift Valley fever in cattle in Ijara district, Kenya

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ABSTRACT

Ijara district in Kenya was one of the hotspots of Rift Valley Fever (RVF) during the 2006/2007 outbreak which led to human and animal deaths causing huge economic losses. The main constraint in the control and prevention of RVF is inadequate knowledge about the risks factors promoting its occurrence and maintenance. This study was aimed at understanding the perceived risk factors and risk pathways of RVF in cattle in Ijara to enable the development of improved community-based disease surveillance, prediction, control and prevention.

A cross-sectional study was carried out from September 2012 to June 2013. Thirty-one key informant interviews were conducted with relevant stakeholders to determine the local pastoralists' understanding of risk factors and risk pathways of RVF in cattle in Ijara district. The key informants rated the high presence of mosquitoes, availability of large herds of cattle and once in a while high rainfall leading to floods in the relatively flat land of the region to be the main risk factors. Close contact between wildlife and cattle was suggested to be another main risk factor for occurrence of RVF. The main risk pathways were infected mosquitoes that bite cattle while grazing and at watering points as well as the close contact between domestic animals and wildlife. The mobility of the cattle to markets and search of pasture suggested the likelihood of infection transfer over a wide area. The likelihood of contamination of the environment due to poor handling of carcasses and aborted foetuses during RVF outbreaks was considered an important pathway.

The findings pointed that availability of mosquitoes, livestock and wildlife as well as rainfall leading to floods were the main risk factors towards occurrence and maintenance of RVF in cattle in Ijara. On the other hand, the contact between livestock and wildlife around watering points and grazing fields were perceived to be the main risk pathways for RVF in cattle in Ijara. The transmission through poor handling of carcasses was perceived to be negligible. As a result there is need to carry out regular participatory community awareness campaigns on handling of both domestic and wildlife carcasses for preparedness, prevention and control of any possible RVF epizootics. Additionally, monitoring of environmental conditions to detect enhanced rainfall and flooding should be prioritized for preparedness.

Programme

Tuesday, 21 April 2015		
<i>Time</i>	<i>Topic</i>	<i>Speaker</i>
08.00 – 09.00	Registration	G. Omwega, R. Rizk
09.00 – 10.30	Official Opening	
	Statement by OIE RR / Middle-East	Ghazi Yehia
	Statement by OIE SRR / Eastern Africa	Walter Masiga
	Statement by FAO	Emmanuelle Guerne-Bleich
	Statement by AU-IBAR	Ahmed El-Sawalhy
	Statement by AU-PANVAC	Charles Bodjo
	Statement by IGAD Secretariat	Mahboub Maalim
	Opening by the Guest of Honour	Mohamed Ahmed Awaleh
	Objectives of the meeting	S. Münstermann
	Participants' introductions and expectations	Participants
	Group photograph with Guest of Honour	Photographer
10.30 – 11.00	Coffee break	
	SESSION 1 : SETTING THE SCENE	
11.00 – 11.20	Recall of previous meetings, their outcomes and recommendations	S. Münstermann (OIE)
11.20 – 12.00	RVF in the Horn of Africa, East Africa, and the Middle East – a historical overview :	
	<ul style="list-style-type: none"> • Animal health • Public health 	Bouna Diop (FAO) Pierre Formenty (WHO)
12.00 – 12.40	Recent RVF outbreaks :	
	<ul style="list-style-type: none"> • in north-western Africa • in southern Africa 	A. Ripani (OIE NA) Rachel Maluleke (ARC OVI)
12.40 – 13.00	Questions for clarification	
13.00 – 14.00	Lunch	

SESSION 2 : CHALLENGES TO DISEASE CONTROL		
14.00 – 14.20	Available control options	Kariuki Njenga (KEMRI)
14.20 – 14.40	Vaccination strategies, vaccine availability and quality control	D. Goovaerts (GalvMED)
14.40 - 15.20	Vaccines <ul style="list-style-type: none"> • Vaccines currently used in the field and their issues • Novel vaccines • Novel vaccines 	B. Nthangeni (OBP) L. Maartens (Deltamune) Mehdi Elharrak (MCI)
15.20 – 15.40	Discussion	
15.40 – 16.00	Coffee break	
16.00 – 16.15	Diagnostic tests for RVF and role of Reference Laboratories: what is available?	Kariuki Njenga (KEMRI) Alison B. Lubisi (ARC – OVI)
16.00 – 16.15	Role of Reference Laboratories : twinning (South Africa – Yemen)	Alison B. Lubisi (ARC – OVI) Ghazi Yehia (OIE ME)
16.20 – 17.20	Research and development for RVF diagnostic tests: what is new? <ul style="list-style-type: none"> • Deltamune • PANVAC 	L. Maartens (Deltamune) Charles Bodjo (PANVAC)
17.40 – 18.00	Discussion	
20.00	Dinner Reception	

Wednesday, 22 April 2015		
Time	Topic	Speaker
	SESSION 3 : TRADE ISSUES	
09.00 – 09.20	OIE Code Chapters relevant to RVF and trade	S. Münstermann (OIE)
09.20 – 09.40	Current livestock trade between the Horn of Africa and the Middle East. The new RVF OIE Code Chapter and what it means to inter-regional trade	Chip Stem (OIE AHG)
09.40 – 10.00	Perspectives from the traders	To be identified
10.00 – 10.30	Discussion	
10.30 – 11.00	Coffee break	
11.00 – 13.00	Working session 1 : Case studies / Different scenarios	
13.00 – 14.00	LUNCH	

SESSION 4 : PREVENTION, BIOTHREAT AND EARLY WARNING		
14.00 – 14.30	Surveillance systems in place <ul style="list-style-type: none"> • Human • Animal (in reference to OIE Code) 	Pierre Formenty (WHO) Zelalem Tadesse (AU-IBAR)
14.30 – 14.50	Bridging WHO and OIE tools for the assessment of national capacities	S. de la Rocque (OIE/WHO)
14.50 – 15.10	Contingency planning for RVF : Kenya	Austine Bitek (ZDU Kenya)
15.10 – 16.40	Working session 2: Case studies / Contingency plans <i>(including coffee break)</i>	
16.40 – 17.00	Decision – support framework for East Africa	Bernard Bett (ILRI)
17.00 – 17.20	Early Warning Systems in place	Assaf Anyamba (NASA)
17.20 – 17.40	The joint Early Warning release	D. Beltrán-Alcrudo (FAO) P. Bastiaensen (OIE)

Thursday, 23 April 2015		
Time	Topic	Facilitators
07:00 – 12:00	Visit of the Djibouti Quarantine Facilities (Prima)	Moussa Cheikh Ibrahim
12:00 – 13:00	Lunch at the Djibouti Quarantine Facilities (courtesy of PRIMA International C°)	
13:00 – 14.00	Reports from the Working groups of Sessions 1 and 2 and resulting recommendations	Rapporteurs
	SESSION 5 : REGIONAL COORDINATION	
14.00 – 14.15	OIE Vaccine banks	S. Münstermann (OIE)
14.15 – 14.45	GF-TADs – Africa, GF-TADs – Middle East	Bouna Diop (FAO) Ghazi Yehia (OIE)
14.45 – 15.00	AU-IBAR	James Wabacha (IBAR)
15.00 – 15.15	IGAD	Ameha Sebsibe (IGAD)
15.15 – 15.30	Eastern African Epidemiology and Laboratory Networks (EAREN, EARLN)	Bouna Diop (FAO)
15.30 – 16.00	Discussion	
16.00 – 16.30	Tea break	
16.30 – 17.00	Conclusions	
	Closing remarks	

POSTER SESSION

Theme A. Vaccines Theme D. Climate Change
Theme B. Diagnostics Theme E. Surveillance
Theme C. Forecasting Theme F. Human cases

