WORKSHOP ON PPR PREVENTION AND CONTROL

Dar es Salaam (Tanzania), 10-12 June 2013

GF-TADs
GLOBAL FRAMEWORK FOR THE PROGRESSIVE CONTROL OF TRANSBOUNDARY ANIMAL DISEASES

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ACKNOWLEDGEMENT

This report was prepared and edited by Susanne Münstermann, OIE Scientific and Technical Department, Paris and William Dundon, Joint FAO/IAEA division, Animal Production and Health. The organisers gratefully acknowledge the contributions from all authors as well as the staff of the FAO ECTAD office in Nairobi, Kenya and the organising Committee in the MoA, Tanzania, for their assistance in organising this meeting.

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PREFACE

Under the auspices of the FAO and OIE *Global Framework for the progressive control of Trans-boundary animal diseases (GF-TADs)* some 40 veterinary professionals and scientists met in Dar es Salaam, Tanzanian, from 10 – 12 June 2013 to assess the situation of *Peste des petits ruminants* (PPR) in the *Southern African Development Community* (SADC) region, the challenges posed by the disease and the options for prevention and control.

The Workshop was organised jointly by FAO, OIE and IAEA with the support of the FAO-ECTAD office in Nairobi, Kenya and the organising committee in the Ministry of Livestock and Fisheries Development, Tanzania.

The Workshop was attended by 13 of the 14 SADC member countries, namely Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mozambique, Namibia, South Africa, Seychelles, Swaziland, Tanzania, Zambia and Zimbabwe. Experts from the organising organisations FAO, OIE and IAEA as well as experts on specific topics such as disease surveillance, diagnostics and control and involvement of wildlife (CIRAD, France and Royal Veterinary College, UK) participated. The SADC Secretariat was represented by the Livestock Desk Officer, Mr Beedeenan Hulman. Other organisations such as PANVAC-Ethiopia; and USDA-APHIS, South Africa, were also present.

The Workshop was officially opened by Dr Peter Njau, the Acting Chief veterinary Officer, on behalf of the Tanzanian Government and the Ministry of Livestock and Fisheries Development.

Participants of the Workshop discussed the current situation regarding the intrusion of PPR into the SADC region, the threat this poses to the non-affected countries and possibilities to prevent and control the disease.

A key component of the Workshop was the introduction and discussion of the work of FAO and OIE to develop a *Global PPR Control Strategy*. The objectives of this work, the elements of the Control Strategy and the time plan for its establishment were presented and discussed in small working groups. These discussions are summarised in these proceedings, in addition to abstracts of the different presentations delivered.

OPENING ADRESS BY SADC

Beedeenan Hulman

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Chairperson, Dr P. Njau, representing the Permanent Secretary of the Ministry of Livestock and Fisheries Development of the United Republic of Tanzania
Dr V. Martin, representing the FAO
Dr N. Mapitse, Sub-Regional Representation of the OIE, in Gaborone
Dr A. Diallo, representing the IAEA Division of the FAO
Invited guests
Ladies and Gentlemen
Good morning

On behalf of the Executive Secretary and the Director of the Food, Agriculture and Natural Resources (FANR) Directorate of the SADC Secretariat, I wish to thank the organizers for kindly inviting the Secretariat to participate in this very important meeting and to give some opening remarks. I wish to thank the Government of the United Republic of Tanzania for accepting to host the meeting for the SADC region.

Chair, PPR is very important for us as we see it as a threat for the livelihoods of the people of this region as they own the 48 million goats and 37 million sheep found in the Member States of SADC. The disease will impact negatively on the food security situation of SADC and will impoverish the population who depend on small ruminants for a living, and who are mainly smallholders.

Chair, I am happy to inform the house that since 2011, the SADC region has been alerted to the threat of PPR in the small ruminant population, especially as the United Republic of Tanzania and DRC were already infected, and Angola, Zambia, Malawi and Mozambique were at immediate risk, by virtue of being neighbours of Tanzania and DRC.

The Secretariat decided to bring the issue to the Livestock Technical Committee (LTC), which directed that a strategy for the control and eradication of PPR be developed for the region. The Secretariat, with the assistance of the SADC TADs project, set up a Working Group from the Epidemiology and Informatics and Veterinary Laboratory and Diagnostics Sub-Committees of the LTC to develop the strategy.

Chair, I am happy to inform this meeting that the SADC Regional Strategy for the Control and Eradication of PPR has been developed and submitted to the LTC at its meeting in November 2012. The LTC has advised all Member States to implement the strategy. The PPR issue was also discussed at the recently concluded meeting of SADC Ministers responsible for Agriculture and Food Security held in Maputo on 7 June 2013. Ministers decided to allocate resources for the implementation of the regional strategy so that in time to come, the region can be free from PPR.

I thank you for your attention

OPENING ADRESS BY IAEA

Adama Diallo

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Ladies and Gentlemen,
Dear Participants,

First of all, I would like to thank:

- the Permanent Secretary of the Ministry of Livestock and Fisheries Development of the United Republic of Tanzania,
- Dr Peter Njau, Acting Director of Veterinary Services of the United Republic of Tanzania,
- Dr Das, the Executive Secretary of the Tanzania Veterinary Laboratory Agency (TVLA)

for having accepted to host this workshop co-organized by the IAEA, FAO and OIE on PPR and its control in the SADC region.

As many of you know, the IAEA has played an important role in the rinderpest global eradication programme by promoting and enabling the transfer of appropriate technologies for monitoring vaccination campaigns. The IAEA is continuing to do so, in close collaboration with FAO and OIE, for the control of important animal diseases in the fight against hunger in its Member States. With this in mind the IAEA acts by building disease diagnostic capacities in Member States through provision of supplies, equipment and training to ensure the sustainability of transferred technologies. It is why this workshop will be followed by a 10 days training course at TVLA on the diagnosis of PPR, and in particular, its differentiation with Caprine Contagious Pleuropneumonia (CCPP).

For IAEA, FAO and OIE, this workshop on the control of PPR in the SADC region is not meant to give a "cooked" strategy to SADC which already has such a strategy but is meant to promote the exchange of ideas between participants, to share experiences on the control of PPR with the objective of developing a global strategy for the control, even the eradication of this disease, as has been achieved in the case of rinderpest. Convinced that for such a global strategy to be successful it should be built on a regional basis to take into consideration specificities of each region, the IAEA, FAO and OIE are promoting workshops such as this one in which we all are participating for the next 3 days.

Dear participants, I hope that at the end of the 3 days we will come up with clear recommendations for an efficient control of PPR in SADC infected countries and to prevent its further spread. I will end this talk by wishing you all a successful meeting and a nice stay in Dar es Salaam.

OPENING ADRESS BY OIE

Neo Joel Mapiste

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The OIE Delegate Dr G. Nsengwa,
Acting Director of Veterinary Services Dr P. Njau
Representatives of International and Regional Organisations,
OIE Delegates and Chief Veterinary Officers of SADC MS
Heads of Central Veterinary Laboratories
Distinguished guests
Ladies and Gentlemen, Good Morning

It is my privilege to address you, on behalf of the Director-General of the World Organization for Animal Health, Dr B. Vallat, at this important workshop "Preparing SADC countries for progress towards PPR-Free areas (Disease identification, control and management)".

Let me first of all take this opportunity to convey warm regards from the Director General of the OIE to the Delegate of Tanzania for hosting us at this beautiful venue and Tanzania`s positive contributions towards OIE activities. The Tanzania Veterinary Laboratory Agency has received a number of events from the OIE recently and it is our hope that they yield some positive results.

Ladies and Gentlemen,

OIE Member Countries of SADC are not new to the concept of disease free areas and this meeting has come at the right time as the disease (PPR) has already been identified in Tanzania, DRC and Angola. It is pleasing to note that the neighbouring countries at high risk such as Zambia, Malawi and Mozambique have heightened their surveillance systems. This does not mean to say other countries are safe. Small ruminants can travel easily and quickly and uncontrolled animal movements can spell disaster for the sub region. In recognizing this eminent threat SADC Member States developed a Regional PPR Strategy which we will hear more about. Implementation of this strategy needs resources and it was encouraging that the SADC Ministers responsible for livestock resolved in 2013 to increase resources and improve PPR surveillance in Members Countries. The increase in resources and cooperation between Angola, DRC and Zambia in the prevention and control of PPR should be commended.

More extensive research on PPR is needed to update OIE standards. The PPR chapter in the OIE Terrestrial Animal Health Code is under review and we expect Members to contribute to the development of these standards from the experiences in the sub region. At the OIE we recognize that there exist effective vaccines, and if they are combined with coordinated, efficient vaccination campaigns, PPR can be eradicated to lessen the devastating impact of the disease on poor livestock keepers in the region. The key word here is "coordinated campaigns" which leads us to the objective "To prepare SADC members for the progress towards PPR free areas (identification, early detection and management of PPR)".

Mr Chairman,

Talking of effective vaccines and coordinated campaigns, the OIE is implementing a project “Vaccine Standards and Pilot Approach to PPR Control in Africa (VSPA)” and within this project we awarded a grant of USD 1 Million to AU/PANVAC to “Strengthen its capacity to guarantee the quality of PPR vaccines produced in Africa and also imported into Africa. Among others, the project results include: (i) the establishment of a PPR Vaccine Bank and (ii) the development of a pilot strategy to progressively reduce and control PPR in Ghana and Burkina Faso.

What will be learnt from these two countries will benefit the rest of the continent and we are very grateful for financial support from the Bill & Melinda Gates Foundation.

Mr Chairman,

In concluding, let me highlight that at the OIE, we are working with our partners to improve PPR identification, surveillance, control and management through development of standards including biologicals and vaccines. The Twinning of Laboratories is another programme where OIE provides assistance to its Members to improve their diagnostic capacity and we are committed to this program to increase this capacity in Africa, PPR not being an exception. We are also in discussions with our partners to set up a research network to share scientific knowledge on PPR.

OPENING ADRESS BY TANZANIA CVO

P.Z Njau

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The OIE representative
The FAO representative
The IAEA representative
The AU-IBAR representative
The SADC Secretariat representative
The CIRAD representative
SADC member states representatives
Invited Participants,
Ladies and Gentlemen,

It is a great honour for Tanzania to host this important international workshop on with the specific objective of assisting infected SADC countries to control the disease and to prevent its introduction into non-infected areas.

Let me at the very beginning take this opportunity to thank you for inviting me to officiate the opening of this workshop. I would like to welcome all of you to Dar es Salaam especially those who have travelled all the way from the OIE, FAO, IAEA, CIRAD, AU-IBAR and SADC member states to attend this three day workshop. Please feel at home while in Dar es Salaam and it is my hope that you will find your stay enriched with the varieties of lifestyle and culture that you will find in the city.

Chairperson,

The government of Tanzania is implementing a poverty alleviation programme that takes into account the Tanzanian Vision 2025, Ruling Party Election Manifesto, National Strategy for Growth and Reduction of Poverty (MKUKUTA) and the Millenium Development Goals which fits well with the agenda of this meeting.

Small ruminants, particularly goats, play an important role in the livelihoods of livestock farmers. They are widely distributed in the country and it is well recognized that goats can play a significant role in household food security and poverty alleviation.

Sheep and goats are kept by the majority of rural households for both subsistence and income generation purposes. Small stock marketing is done in informal and formal markets all over the country. In addition there are social transactions involving movement of small stock and these include dowry payment, entrustment, donation and barter trade. All these lead to high mobility of

small ruminants and consequently possible spread of infectious diseases including PPR. These important production system features need to be considered when drawing up a PPR control and eradication strategy.

Ladies and Gentlemen,

Since PPR was first reported in the country in 2008 more than 30 Local Government authorities have reported the disease that has killed more than 150,000 sheep and goats.

Apart from deaths as a result of PPR, trade in both sheep and goat meat has been affected due to imposition of quarantines.

Dear participants,

Our Ministry in collaboration with FAO and AU-IBAR through the VACNADA programme undertook various efforts to control the disease and around 7 million doses were purchased and delivered to affected areas.

Alongside the vaccination campaigns training of staff both in field and laboratory practices was undertaken and equipment including diagnostic kits was provided. I would like to extend our gratitude to all who supported us.

In spite of these efforts the country is still at high risk of infection due to the persistence of livestock movements in search of pastures and water especially during the dry seasons. Also, the low percentage of animals vaccinated due to low livestock farmers' awareness is another challenge and a reason why the disease has become endemic.

Dear participants,

Through the FAO PPR TCP that is winding up at the end of this month a contingency plan has been developed that will soon be completed.

However, implementation of this plan will only be meaningful and instrumental if it ensures that the disease does not cross over and spread to other SADC neighbours. It is my sincere hope that during this workshop you will come out with a feasible plan to assist Tanzania to control and eventually eradicate the disease and therefore spare the rest of the SADC countries from the disease.

Chairperson,

Finally, let me wish you all good deliberations in the workshop and we all look forward to receiving your recommendations.

I now have the pleasure and honour to declare this Workshop on Prevention and Control of PPR officially opened.

OPENING ADRESS BY HOST ORGANISATION

Sanchindra Das

Chief Executive
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I have the honour and pleasure to welcome all the Delegates attending this important workshop on PPR prevention and control with emphasis on "assisting SDC countries to control PPR and prevent its introduction into non-affected areas". I would like to thank the IAEA, FAO and OIE for organising this workshop in Tanzania and inviting the experts dealing with PPR globally and in their respective countries to attend this workshop.

On behalf of the Tanzanian Government and Ministry of Livestock and Fisheries Development, Tanzania, I would like to welcome all the distinguished Delegates from IAEA, FAO Rome, OIE, AU IBAR, DVS and Heads of Laboratories from the SADC Countries to Dar es Salaam, Tanzania, for fruitful deliberations on control of PPR.

Thanking you all and welcome.

OPENING ADRESS BY FAO

Vincent Martin

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Transboundary Animal Diseases (TADs) continue to give rise to increasing and widespread social and economic impact in an increasingly globalized world. Peste des petits ruminants (PPR) is one of them and has shown during the last decades its potential to spread widely across borders, affect new territories and severely impact on small ruminant production and livelihoods in Africa and Asia.

Stopping the disease is feasible, and tools are currently available to revert the trend and protect the assets of smallholder farmers. Indeed, the tools and methods for prevention and control of PPR are well known and can be very efficient when applied appropriately.

Today, PPR is of particular interest to FAO and other development agencies because of the important role small ruminants play in food security and livelihood resilience. Likewise, as observed during the Global Rinderpest Eradication Programme (GREP) Symposium (October 2010) in Rome, marking the end of rinderpest, government ministers and experts raised concerns about the major spread of PPR. Experts recommended that "international and regional organizations and all stakeholders should apply the lessons learned from the eradication of rinderpest to other diseases, in particular the progressive control and eventual eradication of PPR". This recommendation was further stressed during the three regional workshops organized by the GREP Secretariat in Asia, Africa and the Middle East and, again, in the global declaration made in June 2011 by heads of states, heads of governments, ministers, CVOs and other participants at the 37th FAO Conference. As a result, FAO was requested "to initiate, in collaboration with global, regional and national partners, appropriate programmes for the control and eradication of peste des petits ruminants within the framework of improved ruminant health".

Finally, fighting against PPR is also in line with the Millennium Development Goals (MDGs) and the renewed commitment of member countries through the "1000 days" campaign, urging countries to move forward towards the common goals to be achieved by the year 2015.

SADC countries have already shown their commitment and have been at the forefront of PPR progressive control over the last years. They should be commended for the work already done and steps already taken at regional level to develop a harmonized approach to curb the spread of the disease and protect unaffected, at risk countries.

However, the region is still facing significant technical challenges to bring the disease under control. The meeting should assist in reviewing the current national and regional strategies and establish bridges with ongoing global initiatives such as the FAO/OIE GF-TADs global PPR control strategy under development. It should also provide an opportunity for key stakeholders in the region to exchange their experiences, successes and challenges as well as state-of-the art techniques to control the disease and to progress along the PPR control pathway.

Session 1

Setting the scene

PPR SITUATION WORLDWIDE

Joseph Domenech

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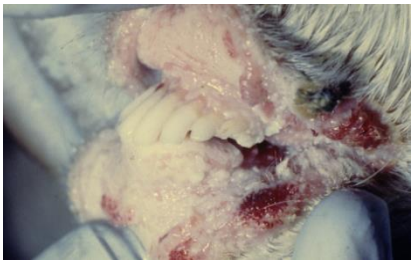
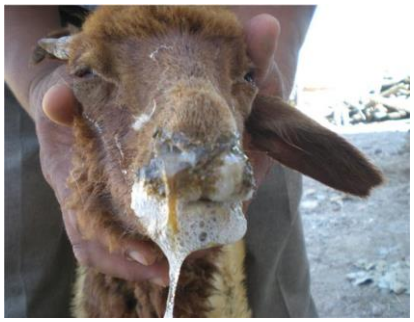
Animal diseases are a major problem for animal production and human health. They have severe impacts not only on animal health and production but also on small holder's livelihoods, human health and well-being, rural development, food security and domestic, regional or international trade. Due to increased movements of animals, animal products and humans, particularly related to globalization of trade and development of tourism, pathogens can move from one region to another very rapidly and over long distances. Global changes, including climate, natural and cultivated land management systems, wildlife and vector ecosystems as well as human demography, urbanization and changes of diet habits are among the driving factors for the emergence or re-emergence of diseases and international crises. The strategies to control transboundary diseases including PPR and/or zoonotic diseases are considered to be public goods and decision makers and donors should invest more in this field.

Among animal diseases, Peste des Petits Ruminants (PPR) is an increasingly important viral disease of livestock. One billion small ruminants are at risk annually. In developing countries PPR impact is due to mortalities and reduction of production.

PPR is caused by a virus of the family Paramyxoviridae, genus Morbillivirus (like rinderpest, Newcastle disease, distemper, meales) with 4 known genotypes (phylogenic classification of N gene sequences). The recent emergence of the genotype IV (Asia) in Africa is noteworthy.

Clinical signs are dominated by febrile illness, mucopurulent ocular and nasal discharges, erosion of the mucosa and death caused by bronchopneumonia or severe dehydration caused by acute diarrhoea. Symptoms are often confused with, and exacerbated by, secondary infections making PPR a difficult disease to characterise and diagnose. At necropsy, characteristic "zebra" markings may occur in the large intestine. Lesions also occur in the lungs showing congestion or bronchopneumonia when associated with bacterial infection.





The disease is highly contagious and easily transmitted by direct contact between the secretions and/or excretions of infected animals and nearby healthy animals. Natural disease mainly affects goats and sheep and PPR is usually more severe in goats. They are the main species with a significant role in the epidemiology of PPR.

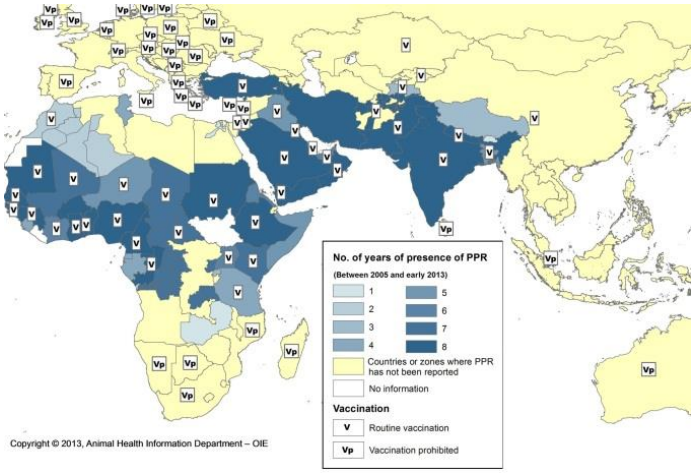
Regarding PPR in other domestic species, PPR in cattle is generally subclinical. It was isolated in buffaloes from an outbreak of rinderpest-like disease in India in 1995 and camels were suspected to be involved in disease transmission in Ethiopia in 1995–1996.

Wildlife is not considered to play an important role even if several ruminant wildlife species in Africa are known to be susceptible (e.g. buffalo, topi, eland, hartebeest, waterbuck, hartebeest, kob). No clinical cases have been reported in Sub-Saharan Africa. In the Middle and Near East, morbidity and mortality in semi-captive desert ungulates (e.g. hippotragines, caprines and gazelles) has been reported as well as in wild goats in Central Asia (Kurdistan) and free ranging wildlife in South Asia (Pakistan).

The PPR situation worldwide was recently presented by K Ben Jebara and J Domenech during the 20th Conference of the OIE Regional Commission for Africa (18-22 February 2013, Lomé, Togo) and during the 81th OIE General Assembly of the OIE (plenary session and Regional Commission for Africa, 26-31 May 2013, Paris, France). A special note was made on the importance of transparency and timeliness of reporting to the OIE. The statistical trends regarding immediate notifications and follow-up reports as well as the six-monthly reports were given. The reporting situation is improving but there is still a need to do more particularly in Sub-Saharan Africa.

The evolution of PPR in Africa, the Middle East and Asia between 2005 and early 2013, and vaccination strategies reported for 2011/2012 are shown in Fig 3. Between 2005 and early 2013, 58 countries/territories in Africa, the Middle East and Asia reported PPR (present or suspected) at least.

For 2011 and 2012, 175 countries/ territories reported information on PPR. 47 (27%) declared the presence or suspicion of the disease, 111 (63%) declared that the disease had never been reported and 17 (10%) notified that the disease had been absent between 2011 and 2012.



Evolution of PPR in Africa, the Middle East and Asia between 2005 and early 2013, and vaccination strategies reported for 2011/2012

In the Middle East and Asia, 21 reporting countries have been affected by PPR at least during the past eight years. In Africa, 37 reporting countries have been affected by PPR during the past eight years and the disease is endemic in many countries. In 2012 and early 2013, 8 immediate notifications on PPR were submitted to the OIE by African countries.

In conclusion, the distribution of PPR has expanded during the past eight years. It is now present in a large part of Africa and the Middle East and in parts of Asia and it threatens the food security and livelihood of smallholders by affecting the development of the small ruminants' sector as a result of the high mortality and morbidity it has caused over a long period.

With reference to the 2012-2013 situation in Africa, reoccurrences were reported in Algeria (in Ghardaia in March 2012 and later in January 2013), in Comoros (in Grande Comore in September 2012), in Egypt (in Al Qahirah and Al Isma'iliyah in August 2012), in Tunisia (in Sidi Bouzid in April 2012, and later in several regions of the country, including Sidi Bouzid and the neighbouring regions of Ariana and Gafsa in August 2012). A first occurrence was reported by Angola (in Cabinda in October 2012) and an unexpected increase in morbidity and mortality of PPR was reported by DRC in January 2012.

Several national initiatives to control PPR took place in 2012 such as the organization of coordination meetings in North Africa (REMESA, EC) and in Angola, DRC, Zambia, the implementation of control programmes in Angola (vaccination in northern regions, surveillance), South Africa (support to

passive surveillance and diagnostic capabilities), Togo (vaccination with the goal of reaching a 70% vaccine coverage in 3 years), simulation exercises in Mozambique, the preparation of new national control programmes in Mozambique (vaccination and diagnostic tests), in Nigeria (vaccination, transborder cooperation) or in Zimbabwe (vaccination, communication).

At the regional and sub-regional levels, several programmes were implemented such as VACNADA (support for 17.4 million vaccinations in 14 countries, diagnostic testing and vaccine production), LEISOM (2.4 million of vaccinations in Somalia), AU-IBAR/ILRI pilot studies in two East African countries (use of thermostable vaccine, institutional delivery systems), IAEA (support to 10 African laboratories (virus sequencing), FAO (support to countries, emergency vaccination, epidemiological surveillance, diagnostic, socio-economics, delivery systems), AU-IBAR/IGAD/FAO initiative in Eastern Africa (the SHARE programme in the IGAD Region on "PPR and small ruminant diseases control for building resilience amongst the pastoralist communities of the Horn of Africa"). OIE is implementing a project called "Vaccine Standards and Pilot Approach to PPR Control in Africa (VSPA) funded by the Bill and Melinda Gates Foundation, which is composed of three components (the establishment of a PPR Vaccine Bank, the strengthening of the capacities of the AU/PANVAC and the development of a pilot strategy to progressively control/eradicate PPR in Ghana and Burkina Faso).

AU-IBAR prepared a Pan African Programme for the Progressive Control of PPR in Africa, which was presented at the Conference of Ministers in charge of animal resources of the African Union (Abidjan, Cote d'Ivoire, April 2013).

The available tools to control PPR were summarized very briefly (see other presentations during this meeting) such as laboratory diagnostic tests, the new articles of the OIE Animal Terrestrial Health Code (Chapter 14.8. on PPR with articles related to the recognition of the country PPR status and of the official endorsement of national PPR control programmes and to the importation of animals and animal products), disease information tools (OIE WAHIS/WAHID, FAO/OIE/WHO Global Early Warning System), the FAO-OIE Crises Management Center, laboratory and epidemiosurveillance regional and international networks, the OIE PVS Pathway (a process to improve the compliance of Veterinary Services with international standards, including several tools such as the PVS Evaluations, Gap Analysis, support for legislation revisions, veterinary education, Veterinary Statutory Bodies or laboratories, PVS Pathway Follow-up Evaluations, organization of round tables with donors), the definition of "day one minimum competences" for veterinary education. The need for permanent institutional cooperation at regional and international levels was highlighted and the numerous cooperation agreements between them were mentioned as well as with other public organisations and private sector bodies.

The FAO - OIE GF-TADs (Global Framework for the Progressive Control of Transboundary Animal Diseases) activities regarding PPR were described. PPR has been included in the Regional 5-year Action Plans for Africa, the Middle East and South Asia. Among other activities of the GF-TADs Working Group on PPR, which include monthly meetings, are the preparation of a Global PPR Control Strategy and the organization of an international conference on PPR control to be held in 2014.

It is recognized that knowledge improvements are needed in various fields such as epidemiology and socio-economics, vaccine delivery systems (private services/public, Vets/CAHWs, cost recovery/public-private good etc.), new vaccines and diagnostic tests. OIE and FAO support this research and will establish a Global Research and Expertise Network with the objectives to offer technical advice and veterinary expertise to Member Countries, exchange scientific data and biological materials between veterinary laboratories, promote development and ensure coordination of PPR research needs with close link and interactions with strategy development.

UNDERSTANDING VIRUS LINEAGE EVOLUTIONS, GAPS AND CHALLENGES, RESEARCH PRIORITIES

Adama Diallo

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Described for the first time in Côte d'Ivoire in 1942, in the early 1970s PPR was thought to be confined to West Africa. Since then, our understanding of the distribution of this disease is that it has steadily evolved in an eastwards manner from West Africa to the Middle East and moved on to Asia. The first PPR observation outside of West Africa was made in Sudan in 1972-1973. In 1983, it appeared in the Arabian Peninsula. As of the late 1980's the disease's endemic regions have expanded into the Middle East and South Asia including China, Bhutan and Vietnam. The process of expansion into new, uninfected territories has dramatically increased in Africa from 2005 to 2012 by spreading both northwards and southwards to cover all regions, extending from North Africa to Tanzania, Democratic Republic of Congo (DRC) and Angola.

PPRV strains that have been identified by different laboratories so far are divided into four phylogenetic lineages designated I to IV according to the sequence data derived from the nucleoprotein or from the fusion protein genes. Lineage number I includes the group of virus strains found in West Africa where the disease was first identified (Côte d'Ivoire) and also where the first virus isolation was made (Senegal). Lineage II consists of a group of viruses that were initially found in Nigeria. Lineage III, which was first identified in East Africa, is shared between Africa and the Middle-East on both sides of the Red Sea. Lineage IV, a unique lineage in Asia, covers a large area from Turkey to Southern Asia through the Arabian Peninsula. Analysis of pathological specimen collected from suspected PPR infected animals in the past 5 years show that recent emergences of PPR are accompanied by profound changes in the previous viral genotype distribution. This questions our knowledge of the distribution of lineages and thus requires a constant updating of virus data, achieved through systematic epidemiological surveys. In an extraordinarily short period of time, lineage IV has become the predominant lineage in a core region of the African continent from Sudan to the Gulf of Guinea and the Mediterranean Sea. Such a scenario is also seen in Senegal and Mauritania, but involves lineage II viruses which were first detected in Nigeria, apparently slowly replacing or coexisting with lineage I viruses that were previously the only group detected in that region, from Senegal to Côte d'Ivoire. We don't know the causes of these changes in the lineage distribution, however, it is clear that the extension of the geographical distribution is a combination of two events: the increase of animal trade and most certainly the availability of specific diagnostic tests that have been developed as of the mid 1980's. Because of the lack of such tools, PPR was overlooked in favour of diseases that have similar symptoms, mainly rinderpest and pasteurellosis, the latter being a complication of PPR virus infection. PPR is now well diagnosed and, considering its wide distribution and its high morbidity and mortality rates, is now considered as the most important infectious disease of sheep and goats in endemic countries. Despite the increased interest in PPR, much has still to be done to understand the epidemiology of the disease e.g. the role of cattle and camels in the epidemiology of the disease, variation in the virulence of virus strains, maintenance of the disease in an enzootic status. There is also a need to make available tools, vaccines and tests, that will enable differentiation between infected and vaccinated animals (DIVA vaccine) as well as tools that will improve the management of controls programs. Another area which deserves

attention in the near future is the development of curative medicines in addition to vaccines as improvements in PPR control.

Although much still needs to be learnt about the epidemiology of PPR and the development of suitable DIVA systems, the tools presently available for PPR control are, nevertheless, adequate to allow the implementation of an eradication program for this important disease similar to what was successfully carried out for rinderpest.

UNDERLYING PRINCIPLES AND KEY ELEMENTS OF PPR PREVENTION AND CONTROL STRATEGIES

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Transboundary Animal Diseases (TADs) continue to give rise to increasing and widespread social and economic impacts in an increasingly globalized world. Peste des petits Ruminants (PPR) is one of them and has shown during the last decades its potential to spread widely across borders, affect new territories and severely impact small ruminant production and livelihood in Africa and Asia.

Stopping the disease is feasible, and tools are currently available to invert the trend and protect assets of smallholder farmers. Indeed, the tools and methods for prevention and control of PPR are well known and can be very efficient when applied appropriately.

Today, PPR is of particular interest to FAO and other development agencies because of the important role small ruminants play in food security and livelihood resilience. Likewise, as observed during the Global Rinderpest Eradication Programme (GREP) Symposium (October 2010) in Rome, marking the end of rinderpest, government ministers and experts raised concerns about the major spread of PPR. Experts there recommended that "*international and regional organizations and all stakeholders should apply the lessons learned from the eradication of rinderpest to other diseases, in particular the progressive control and eventual eradication of PPR*". This recommendation was further stressed during the three regional workshops organized by the GREP Secretariat in Asia, Africa and the Middle East and, again, in the global declaration made in June 2011 by heads of states, heads of governments, ministers, CVOs and other participants at the 37th FAO Conference. As a result, FAO was requested: "*to initiate, in collaboration with global, regional and national partners, appropriate programmes for the control and eradication of* peste des petits ruminants *within the framework of improved ruminant health*".

Finally, fighting against PPR is also in line with the Millennium Development Goals (MDGs) and the renewed commitment of member countries through the "1000 days" campaign, urging countries to move forward towards the common goals to be achieved by the year 2015.

SADC countries have already shown their commitment and been at the forefront of PPR progressive control during the last years. They should be commended for the work already done and steps already taken at regional level to develop a harmonized approach to curb the spread of the disease and protect unaffected at risk countries.

However, the region is still facing significant technical challenges to bring the disease under control. The objective of the meeting should assist in reviewing the current national and regional strategies and establish bridges with ongoing global initiatives such as the FAO/OIE GF-TADs global PPR control strategy under development. It should also provide an opportunity for key stakeholders in the region to exchange on their experiences, successes and challenges as well as on state-of-the art techniques to control the disease and progress along the PPR control pathway.

PPR IN THE SADC REGION: SELECTED COUNTRIES PRESENTATIONS

TANZANIA

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Sheep and goats are kept by the majority of rural households for both subsistence and income generation purposes. Small stock marketing is done in informal and formal markets all over the country. In addition, there are social transactions involving movement of small stock and these include dowry payment, entrustment, donation and barter trade. All these lead to high mobility of small ruminants and hence possible spread of infectious diseases, including PPR. These production system features need to be considered when drawing up a PPR control and elimination strategy.

PPR is an acute, highly contagious viral disease of domestic and wild ruminants caused by a Morbillivirus in the family Paramyxoviridae. The disease presents predominantly with respiratory signs. Peste des petits ruminants in Tanzania was confirmed towards the end of 2008 in northern Tanzania and by the end of 2012 the disease had further spread to eastern and southern parts of the country affecting about 30 districts.

Following confirmation of the disease, control efforts started in 2009. Emergency assistance, mainly in the form of vaccine was received from FAO, VETAid, Ngorongoro Conservation Area Authority (NCCA) and Vaccines for Control of Neglected Diseases in Africa (VACNADA). In addition to vaccination, capacity for PPR diagnosis has been improved in the Central Veterinary Laboratory and Zonal Veterinary centres) and the Sokoine University of Agriculture for example Epaphras *et al.* 2011 carried out an epidemiological investigation into the introduction and factors for spread of Peste des Petits Ruminants, southern Tanzania (prev =31% cELISA , confirmation=RT PCR). Recently, about 3794 serum samples have been collected with the support of FAO TCP/URT/3302E. Analysis of such samples will update the PPR status in Tanzania as well as feeding into the discussion regarding PPR control that will be held towards the end of July 2013.

So far veterinarians and farmers are aware of PPR as indicated by a study carried out in which only 2.9% of farmers interviewed in southern Tanzania were aware of the disease, whilst 45.8 – 95% in northern Tanzania could describe PPR clinical signs.

A socio - economic study was conducted in early 2012 to demonstrate the impact of PPR on the livelihood of small ruminant keepers and the national economy in two districts, Ulanga (Morogoro region) and Tandahimba (Mtwara region). PPR impacts on households include change of the flock size and value, the capacity of the flock to contribute to the livelihood of the household, and loss of potential income. The average value of sheep and goats had dropped by 10% and the overall ability of small ruminants to sustainably support household livelihoods has decreased by about 30% following a PPR outbreak. On average, households lost about TZS 335,420 (155 Euro) per annum due to PPR. At the national level PPR economic losses have been estimated to be more than TZS 200 billion (92 Mill Euro), hence the need to control the disease.

In addition, a “National PPR Progressive Control and Eradication Strategy” has been drafted. The overall objective of the strategy is to progressively control and eradicate PPR in 10 years – in line with the SADC strategy. The specific objectives of the strategy are to prevent introduction and spread of PPR, progressively control PPR virus circulating in the affected zones and eradicate PPR from the country.

A desktop simulation exercise supported by SADC TADs project was carried out in 2012 to test the draft strategy and accompanied contingency plan.

Despite the efforts, there are a number of challenges to be tackled. Effectiveness of surveillance is crucial for timely response. Active surveillance though expensive, has proven efficient in detecting new outbreak foci and thus should be implemented to supplement passive surveillance. Early detection as an integral part of the disease management is possible when livestock farmers, field officers and veterinary officers are fully aware of the disease symptoms. Furthermore livestock movement (cross border, internal movements, trade, social ties, pasture/water) is a challenge that need to be addressed through enforcement of legislations.

So far PPR control has relied on International Development Partners and there is need for the Governments to allocate more funds for PPR. However for this to happen there is a need for evidence such as the findings from the socio-economic study.

In conclusion, PPR control will improve food and nutritional security, income security and livelihood. There is therefore a need for coordinated and collaborative action to address the challenges for effective and sustainable PPR control.

DEMOCRATIC REPUBLIC OF CONGO

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In 2008, samples were collected in some areas around the country such as Central African Republic, Sudan, and Uganda in order to verify if PPR was present. At the time, with the support of the Veterinary Laboratory of Kinshasa, there was evidence that PPR virus had been circulating in some Provinces (Bas Congo, Kinshasa, Ecuador).

But by the end of 2011 and the beginning of 2012, outbreaks occurred in Bandundu Province, around Masiwanineba Territory where 50000 goats and sheep died. DRC's Veterinary Services made a report to the OIE and the Minister of Agriculture informed FAO, which decided to assist to control PPR in Bandundu Province putting in place a TCP/DRC/3403 "Emerging support for PPR Control". Almost 605000 sheep and goats were vaccinated in 3 stages while some sanitary policing measures were put in place in order to control livestock movement inside that territory and to stop the spread of PPR by informing stakeholders and local authorities.

To prevent and control PPR, which seems to become endemic all over the country the Government plans to vaccinate in 4 Provinces as follows:

- Bas Congo: 480 000 doses
- Bandundu: 480 000 doses
- Kasai Occidental: 640 000 doses
- Kasai Oriental: 500 000 doses

The campaign took place during the same period as vaccination against CBPP and FMD. In support to the above TCP/DRC/3403, FAO launched another project OSRO/DRC/302/SWE to face PPR in Bandundu Province and Kasai Occidental. In the meantime, the World Bank through its project PARRSA (projet d'appui à la réhabilitation et à la relance du secteur agricole) is planning to organise a vaccination campaign in Equator Province together with Newcastle disease vaccination campaign. IFAD is ready to take care of Maniema Province with 160 000 doses.

Finally, two coordination meetings brought DRC and Angola together in 2011 and a tripartite meeting with Zambia, DRC and Angola was organised in 2012 in Calinda.

GENERAL DISCUSSION ON SESSION 1

IAEA: replies on the statement that "Rwanda situation is truly lacking information, investigation and surveillance": we cannot present everything we know, because it might not yet be validated and in the public domain declared to the OIE! E.g. in India we found the disease much earlier than it was reported! And if we mentioned it earlier, Indian authorities were very upset.

Statement: how Africa deals with risk of disease. It is only now that we develop strategies, while we know that 37 states are at risk. We need to change our political approaches.

Q. to Dr Libeau: is Rwanda infected or free, as it is surrounded by infected countries

A. Dr Libeau: it is very difficult to have information from the country, but it does not mean that it is free. We have the same example for Libya, which is surrounded by PPR infected countries, but we have no information from Libya

Q. Malawi: we have done surveillance for PPR along the border with Tanzania where massive vaccination is carried out. If we start vaccination while the disease is not present in Malawi, we might miss it when it enters. Up to now we have not come to a conclusion on the strategy!

A. OIE: if you have the capacity to control movement there is no need to vaccinate. If you don't, then you should vaccinate! If you know that the virus is circulating at the border, and that they are vaccinating, but they might still have circulation of virus, you should not rely on their vaccination. If you do your vaccination well, it will stop the virus.

Q. Malawi: we know the high risk areas as we have 2 natural barriers and in between we have our surveillance teams. We have studied the goats' movements. Most goat traders from Malawi take goats to Tanzania. Therefore the risk appears to be low. The other side does vaccination.

Botswana: we discussed this issue at our meeting in SADC. Malawi, Mozambique and Angola were facing the same challenge. And now Angola is infected because they did not have a buffer zone. Therefore we need to do intensive vaccination in the infected countries and increased surveillance in the at risk countries. If we have a project funding vaccination then the campaigns work.

Malawi CVO: we know Tanzania is doing a good job on vaccination. Therefore we believe that we do not need to vaccinate

Q. DRC to PANVAC: our vaccine comes from Jordan. During the Abidjan meeting I met Dr Tounkara (PANVAC), asked him about the vaccine quality and if it contains the 3 lineages. The Government now buys the vaccine from Kenya and I do not know the quality of this vaccine. I did not know that PANVAC is able to test the quality of the vaccine. Angola is in the same situation, they also buy from Jordan and now the African Union says we need to buy from African producers.

A. PANVAC: Jordan also sends their vaccines for quality control when they supply to Africa. PANVAC gives them vaccine strains and gives advice on vaccine production. PANVAC only provides vaccine seeds not vaccine. If there is a need for training of laboratory technicians, we get experts to do that training for Member States' laboratories.

Q. DRC: Is it good to buy vaccines from outside?

A. PANVAC: Your choice, but it would be good to have the vaccine quality tested, so if you buy from outside make sure to get a quality certificate. We at PANVAC assure that the major attributes of an effective vaccine are checked.

Q. Botswana: A map showing areas where vaccination is allowed or prohibited was shown by OIE. It is important for countries to sort the policy issue first rather than on an *ad hoc* basis in case the situation might change and you may be hindered to carry out the control programme. This was discussed at length when developing the SADC strategy but I don't see countries addressing this issue.

A. OIE (still on vaccine): explains tender procedure to purchase vaccine under the OIE vaccine bank scheme, the main issue is quality. Where you buy a vaccine, it is a political and economic decision, as long as the quality control is proven.

Q. South Africa: on diagnostics, we don't have PPR in RSA but appointed a PPR task team to start preparing ourselves. ELISA would be the screening test followed by PCR as confirmation. As a final confirmation we propose the Virus Neutralization Test (VNT). Can we have your comment on this approach and validation of tests? RSA always validates a test under local conditions, even OIE tests. Where have the tests been validated already?

A. Dr Libeau: negativity will only be seen by serology. Serology will give you "background" information and in case the virus enters your country you will see an increase in antibodies.

VNT is difficult to implement and depends on the capacity of a laboratory and requires cell and titrated virus stocks.

PCR – is of no use if the population is free from the virus.

Validation of the commercialised test – no need, as they are already validated! And this validation is accepted by other labs also. If you have capacity you can re-evaluate but you need an internal control in addition to the controls that come with the kit.

A. IAEA: viremia is so short that even with PCR you might miss the virus, so in this sense PCR is not a confirmation test for serum. Take lung or spleen samples for PCR, but confirm by VNT. ELISA and PCR have almost the same sensitivity.

Q. South Africa: our Epidemiology Unit needs to come up with a case definition. What is your definition, (the countries that have the disease)

A. Dr Kock: we can follow similar patterns as rinderpest (RP). Virus replicates in the upper respiratory track and other areas producing respiratory **d**istress, **d**iarrhoea, **d**eath. In RP it was the 3Ds, but for PPR the respiratory aspect is much stronger, so respiratory symptoms need to be included, e.g. R and 3 Ds

A. OIE: case definition has been included in the new chapter on PPR in the Code (For the purpose of the *Terrestrial Code*, PPR is defined as an *infection* of domestic sheep and goats with PPRV).

A. IAEA: PPR is primarily a respiratory disease and therefore the case definition has to include it. However, it is often confused with pasteurellosis.

A. Chenasa, Tanzania: we find plenty of un-vaccinated animals to be sero-positives. When disease hits first time it takes a severe course, with time you see the milder forms of the disease.

Q. Namibia: what is the best screening for suspicious cases?

A. Dr Libeau: in Senegal we are used to confirm outbreaks. Info goes to the CVO and there is a follow up of the population that belongs to the one animal that had the suspicious test. PCR is the best test in this case. Collect all epidemiological data and combine laboratory results and data to judge the situation in the field.

Q. Namibia: what are the costs of screening tests? For a country that does not have the disease, passive surveillance is an option and we have to make a cost benefits based decision!

A. Dr Libeau: ELISA is about 1 Euro per sample

Namibia: Vaccine centred discussion, no examples on control e.g. movement control or strategic vaccination – what are the alternatives?

A. IAEA: vaccination is not the only way and movement control is possible, but is it feasible and efficient in small ruminants in Africa?

A. FAO ECTAD: on cost of movement control between production area and consumption area. If you impose movement restriction you interrupt this move and impact on livelihoods. So their perception is that they suffer more from the control measures than from the disease – the effect is the creation of a black market.

Second aspect is the costs of Veterinary Services to implement these measures in terms of costs of displacement.

Producers have the rational that they want to move animals away from the disease and Veterinary Services want them to stay in the place of disease – there is conflict on this issue.

Q. Zimbabwe: incentives in a production system so that product is still usable?

A. IAEA: there is no virus in the meat.

A. OIE: it is not per se a "safe commodity" but needs veterinary certificate, see the Code provisions

OIE on vaccination: is an excellent tool. Sometimes it appears that vaccination is the "easy" way – but this is not the case and one has to provide the enabling environment for it to succeed.

Q. FAO ECTAD: are there studies on dynamics of infection in wildlife?

A. Dr Kock: yes, detailed studies in wild caprines, and it is similar to domestic small ruminants. Wildlife is under a lot of pressure, so their populations are not big enough to study these dynamics in greater detail. Warning on case definition for wildlife: you see different symptoms in different species of wildlife, therefore be cautious with the definition.

Session 2

Specific issues

PPR AND WILDLIFE

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Infection and disease in wild artiodactyls has been reviewed (Munir 2013) and reported from the Middle East (Frolich *et al.* 2005; Furley *et al.* 1987; Greth *et al.* 1992; Elzein *et al.* 2004; Kinne *et al.* 2010) where the virus spread with livestock imports for the Haj and possibly with wildlife imports and became established. Outbreaks in captivity were reported in a variety of species including hippotragine and gazelline antelopes with high morbidity and mortality. PPR spread to India probably through the Middle East in the 1990s and is now established. Its impact on free-ranging wild artiodactyls in South Asia is now being reported with outbreaks in Sindh Ibex in Pakistan (Abubakar *et al.* 2011), in wild goats in Kurdistan (Hoffmann et al 2012) and in Tibet affecting Bharals (Bao 2011). There is some evidence for captive goitered gazelle infection in Turkey (Gur and Albayrk 2010). A single infection experiment on white-tailed deer (Hamdy 1976) proved that cervids can be infected and suffer disease with PPRV. The majority of reported cases have been from artificial captive conditions.

Wild caprines and sheep with PPR suffer a severe fever, erosive stomatitis, enteritis, pneumonia and death whilst other species reported show similar signs to varying degrees. The pathogenesis is constant but symptoms will reflect species specific anatomical, immunological and physiological factors (as well as management in the context of captive wildlife).

Clinical evidence for PPR disease in wild species in Africa

In Africa no clinical cases of PPR in wild free-ranging artiodactyl species have been confirmed or reported and no antigen was detected or isolated from diseased animals. PPR virus was detected in nasal swabs from healthy African buffalo and other artiodactyls in Côte d'Ivoire (Couacy-Hymann *et al.* 2005). Unlike cattle these species were able to apparently transmit infection. No infection studies have been undertaken in African buffalo so its role as a possible reservoir or vector is unknown.

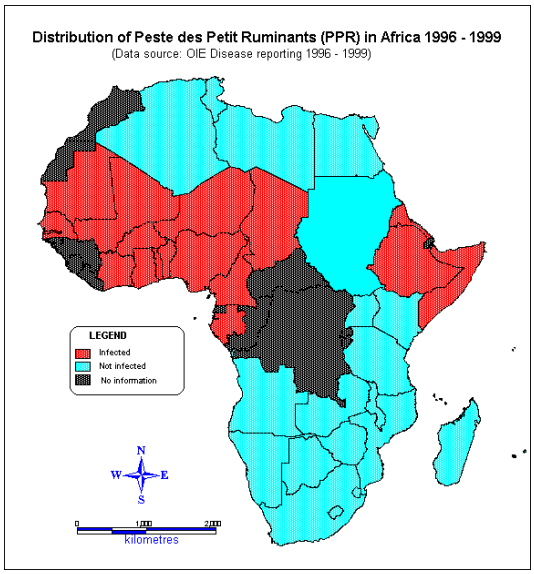
Epidemiological Studies in Africa

Very little is known about the epidemiology of PPR amongst wild artiodactyl populations in Africa and Asia. There have been few studies. To date no clinical disease in African wildlife (free-ranging) has been reported but captive African species in the Middle East have died. The most significant research in Africa on PPR was conducted as part of a major initiative to trace rinderpest infection in wildlife as sentinels for persistent foci of the virus. This took place in the last years of rinderpest virus eradication when the disease became highly cryptic in livestock and involved the capture of over 2000 individual wildlife for sampling up to 2008. At this time of intense surveillance on the OIE pathway for confirming absence of virus it was critical to differentiate between disease and infection due to rinderpest and that due to PPR infection, there is considerable cross reaction in available serological tests (and cross protection). Immunity is life-long if animals survive infection or are vaccinated.

Serosurveillance results from the PARC/PACE project (1998-2005) proved the existence of PPR specific antibodies in sera from wild artiodactyls in West, Central and North East Africa (Ethiopia) based on PPR specific virus neutralisation and ELISA tests. The situation in Kenya was confused as rinderpest virus circulation was present during this period. There was cross-reaction of the RP-PPR tests in a number of cases but in no sera was there unequivocal evidence of PPR antibody. There was an absence of PPR antibody in wildlife sampled in Tanzania and in Uganda until 2004, when a percentage of Ugandan buffalo in repeatedly sampled herds showed positive antibodies indicating seroconversion and by inference recent PPR infection. No virus was isolated. Results from wildlife in Western, Central and the Horn of Africa, where the disease is established in livestock, confirmed the existence of PPR antibodies in sera from hartebeest (lelwel and major), buffalo and Buffon's kob (Kock *et al.* 2006; Kock 2008; AWVP 2001) and from more recent surveillance in Côte d'Ivoire where antigen was also detected by PCR on nasal swabs in buffalo (Couacy-Hymann *et al.* 2005). A study in Nigeria confirmed antibody in grey duiker (Ogunsanmi *et al.* 2003). Further sero-sampling in wildlife was carried out in 2011 in Tanzania PPR infected areas in the North with negative results (Lembo *et al.* 2013).

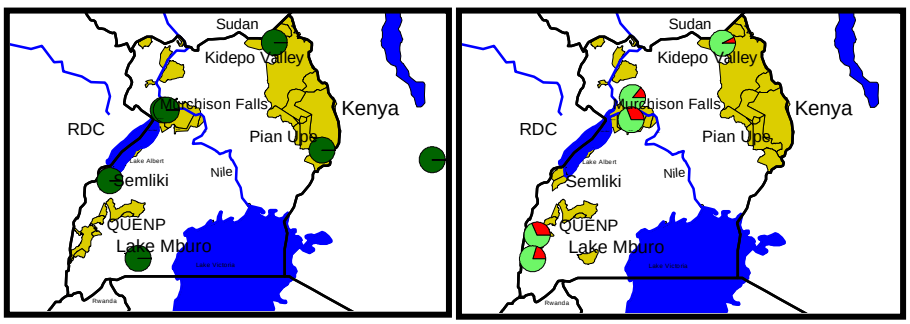
Emergence of PPR in eastern and southern Africa

The status and distribution of PPR up to the turn of the century was relatively stable in Africa since its discovery in 1942 in Côte d'Ivoire. Its distribution up to 1999 is shown in the figure below:



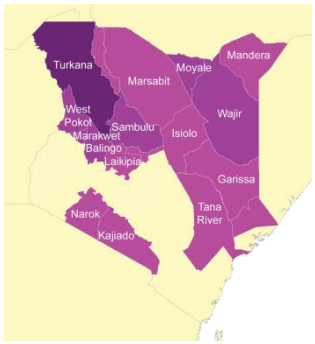
The map of PPR infected countries in Africa in 1999 (at the start of the PACE project where most of the current serological data on PPR in wildlife were collected), showed its distribution was restricted to West, Central and Horn of Africa. The findings in wildlife, therefore, were mostly consistent with the known distribution of the virus in domestic animals at the time.

From this point on the situation changed. Reports suggest that the virus was spreading around about 1998-9 into DRC Congo. In Uganda wildlife sampling showed that between 2002 and 2004 Ugandan buffalo populations seroconverted for PPR, suggesting virus spread at this specific time into this region. There was a single report in the Animal Resources Information System (ARIS) of AU-IBAR in 2004 of PPR in goats in Soroti Uganda, but this was not officially reported to OIE but is highly supportive of the wildlife evidence. The first OIE reports only appear in 2007.



Charts: buffalo serosurveillance results Uganda 2002 and 2004 PPR antibody: green negative and red positive as percentage of animals sampled

By 2004 cases in Kenya were evident in livestock although not officially reported until 2006, when a major epidemic was recorded and serious control measures were instigated. Wildlife sampling (~ 500 sera) continued under Somali Ecosystem Rinderpest Eradication Coordination Unit (SERECU) and GREP over this period until 2008-9 and surprisingly this did not show any pattern of seroconversion in wildlife species, unlike in Uganda and this is not explained as yet.



- 2006 Turkana
- 2007 West Pokot – Marawet – Baringo – Samburu – Moyale – Wajir
- 2008 Marsabit – Mandera – Isiolo – Garissa – Laikipia – Tana River – Narok – Kadjiado

Figure Legend: Infected districts of Kenya – courtesy of Keyyu, Tanzania Wildlife Research Institute

By 2007 the virus was reported in Northern Tanzania and by 2010 had spread to the southern borders with Mozambique and by 2011 to the Zambia and Malawi border (Kivaria et al 2013). Again sampling in wildlife during this period in the Serengeti ecosystem showed no seroconversion in buffalo, gazelles and some other species (Gakuya pers. Comm. 2013l Lembo et al 2013). Again this was a surprise.

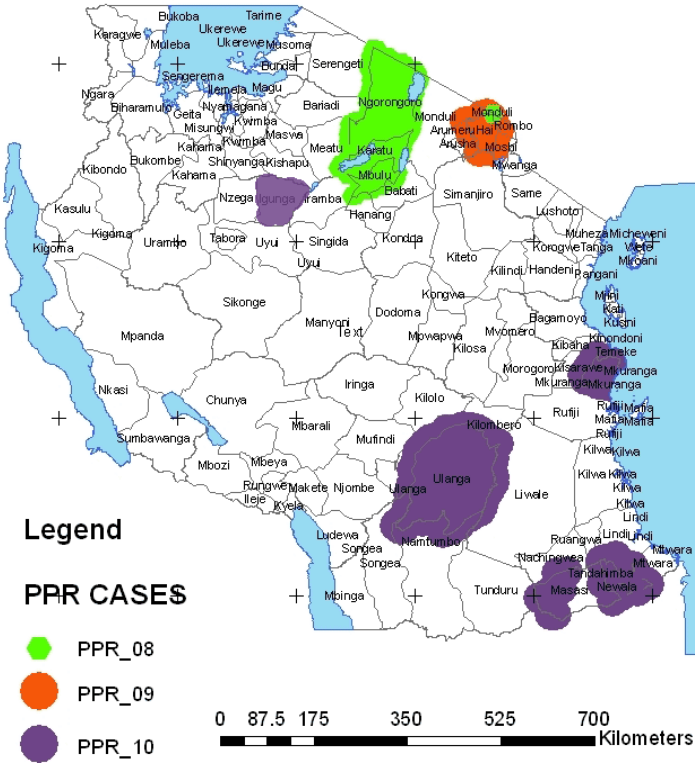


Figure : PPR cases reported in small domestic ruminants in Tanzania 2008-2010 (Courtesy of Keyyu – Tanzania Wildlife Research Institute)

No wildlife data is available from other recently infected countries notably DRC and Angola.

Epidemiologically, the temporal and spatial pattern of spread is very similar in each country irrespective of vaccination campaigns or other interventions. The explanation for this could be lack of understanding of the epidemiology of the disease in these ecosystems e.g. role of cattle and wildlife, failure to identify the drivers or key factors or applied vaccination and movement control effectively.

Hypotheses for factors influencing the initial spread of PPR to the south are varied and include e.g. change in global animal immunity against morbilliviruses with cessation of vaccination of cattle against rinderpest by 2003; the absence of subsidised or free vaccine for rinderpest (sometimes used for control of PPR in small ruminants); changing trade patterns and increasing animal trade over longer distances with road and economic development, human and livestock demographic changes and market forces; introduction and/or spread of new strains of virus (IV and II; Kwiatek, 2011) wildlife populations recovering in some areas, and interface with livestock increasing and thereby vectoring virus etc. These are however, all speculative and research is needed to test these.

Importance of including future studies of PPR virus infection in wildlife

Firstly, the apparent susceptibility of wild artiodactyls, many of which are highly endangered (e.g. Arabian and scimitar oryx, various gazelline antelope, caprine and ovine species), makes a better understanding of the disease of critical importance to conservation.

Secondly, the basic epidemiology of PPR virus infection in wildlife and its possible role in PPR epizootics amongst livestock are unknown with only limited data from a few outbreaks and surveys. There is some evidence that African buffalo can carry and transmit virus, based on PCR data and evidence of seroconversion at the herd level. In general there is low seroprevalence in wildlife and most of these positive samples are related to situations where there is evidence for endemic PPR in sheep and goats and contact between local livestock and wildlife (shared resources), suggesting spillover.

PPR persists and it is likely that studies in wildlife will not only provide some valuable basic science, additionally they will provide information for its control, through understanding the importance of wild species in maintenance and spread of the virus in Africa and Asia and as sentinels of disease.

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LABORATORY DIAGNOSTIC AND MOLECULAR EPIDEMIOLOGY OF PESTE DES PETITS RUMINANTS

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Epidemiological data, clinical and post-mortem diagnosis of PPR cases are considered as tentative and must be confirmed by the laboratory for a specific identification of the pathogen. To allow laboratories to make the diagnosis of this economically important disease, rapid and simple tests have been developed over the past thirty years. They are based either on ELISA, or on genetic amplification (RT-PCR). Use of monoclonal antibodies (Mabs) directed against this pathogen along with the ELISA technique has greatly eased the task for direct detection of antigens (immunocapture ELISAs, sandwich ELISAs) or antibodies (C-ELISAs) in biological samples. Easy to implement and adapted to large scale studies, c-ELISA has replaced the virus neutralization test (VNT), the gold standard, to which it has a high degree of correlation. A panel of ELISAs are available, some of them commercialized worldwide, mainly based on H and N Mabs. Modernized formats allow speeding-up of the processes. In addition, pen-side tests such as Lateral Flow Devices have been developed for PPR and are currently undergoing validation.

For virus identification, some laboratories may use robotized RNA extraction and amplification by real time RT-PCR as a screening method for high throughput surveillance. However, the conventional RT-PCR, now widely implemented in laboratories, allows for direct sequencing and thus the genotyping of strains. Four historically known lineages have been defined according to geographic localization. With the constant reporting and increase of sequence data information mainly from segments of the F and N gene of PPRV, an important finding is that lineages are spreading into new areas. At the regional level, we are now witnessing the extinction of lineage I in West Africa, to the benefit of lineage II, historically prevalent in Central Africa. We are observing the extinction of lineage III in some east African countries to the benefit of lineage IV, the Asiatic lineage. On the basis of these significant results we can assume that PPRV is diffusing east to west in North Africa and in Sub-Saharan African countries, north to south in East Africa and Southern Africa. PPR control strategies must integrate this reality for an effective control. High animal mobility due to national trade, cross-border animal traffic and transhumance is confirmed at the local level, as shown in a study in progress based on data sampled in Senegal for the period 2012-2013.

The very dense mobility network, as observed at the national level and with the neighbouring countries, Mauritania and Mali, confirms the findings that viral strains sampled in these countries during this period are quite similar and phylogenetically closely related in lineage II. None of the viruses analysed belong to lineage I anymore. In conclusion, it is crucial to provide laboratories with efficient tools allowing for the early detection of PPR emergence and re-emergences. In addition, it is recommended to integrate the PPRV molecular knowledge with epidemiological data (animal mobility, transhumance, trade, markets etc.), to allow the clarification of the epidemiological situation of PPR and an understanding of the disease diffusion pathway, and to define and map health risk areas for an improved coordination of prevention and control measures.

THE SOCIO-ECONOMIC ISSUES AROUND PESTE DES PETITS RUMINANTS PREVENTION AND CONTROL

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There are two main categories of socio-economic issues surrounding PPR prevention and control: (i) justification of prevention and control (ii) and other issues beyond cost benefit analysis. PPR prevention and control strategies should include a justification by demonstrating the impacts of the disease as in who is affected and how- the magnitudes of both monetary and non-monetary costs. The impacts of the disease should be compared with impacts of other diseases to justify the case of PPR. Also important to consider is the impact of control measures measured in terms of costs and benefits of each alternate control strategy. Other issues to be considered on justification of control include: perceptions of producers, government and donors on PPR impacts, as they are the earliest indicator of whether any of the three groups consider PPR important enough to intervene. In the absence of willingness to control, advocacy using evidence on impacts of disease and control measures are important. With respect to control, policy makers are interested in supporting strategies that offer the highest returns to investment.

It is important to assess the feasibility of the different control options vis-à-vis response capacity available before recommending a measure for implementation. Small ruminant turnover is quite high and large scale mass vaccination may be difficult to implement when the capacity to deliver animal health measures is weak. In such cases public private partnerships should be considered. The prevention and control strategies should contain adequate financing strategies spelling out who is going to pay and how. The issue of public versus private good must be addressed noting that neither governments nor producer have an unlimited basket of resources. The potential for economies of scale and scope in terms of the costs and benefits of successfully delivering large-scale and integrated interventions (multiple disease approach) and the opportunities for synergizing delivery modes should be explored as strategies are developed.

Besides justification for disease control there are other important issues that need to be considered and they revolve around generating data to better understand the small ruminant subsector in terms of livelihoods, poverty, asset portfolios, products and services by the diverse production systems as diverse systems and roles implies that people have divergent motivations for being involved in small ruminant production and therefore PPR control. The place of small ruminants within livestock policies/strategies/programmes is an important consideration for strategy formulation. In some countries, there is need as a part of the PPR control strategy, to design mechanisms on how to raise the profile of small ruminants in the livestock development agenda at national, regional government and household levels. When small ruminants do not occupy a place at the policy tables, PPR strategies will remain on shelves as governments fail to institutionalize them. Since PPR prevention and control is difficult to implement based on specifics of small ruminant production, it is important to involve communities thereby designing people centered approaches. The people centered approach can be supported by evidence obtained through the value chains, incentives and disincentives analysis. It is critical to develop control options that integrate people as solvers of problems which implies that strategy developers have to identify how to engage people in PPR prevention and control: the opportunities and the limitations.

At the moment, the understanding of the above socio-economic issues is limited to only a few studies on the impact of the disease. Evaluation of control programmes has not been undertaken to a meaningful extent. This is attributed to low capacity Ministries in terms of technical skills in livestock/animal health economics and inadequate epidemiological data (morbidity and mortality and the impact of control on these two parameters).

To make PPR prevention and control more livelihood focused and therefore increasing the chances for buy in by resource allocation planners, economic justification of PPR requires demonstrating how PPR control fits as an integral component of wider livestock development efforts within the agenda of: reducing poverty; building resilience [Horn of Africa (HOA)]; reducing the number of food insecure people and improving the livelihoods of small holder livestock keepers. An increased need to protect this asset from PPR fits within these agendas and makes a case for making people, livelihoods, poverty, and gender rather than pathogens take center stage.

It requires delineation, quantification and monetary valuation of all tangible and intangible products and services as well as how PPR prevention and control options would affect the production of products and services as these are a corner stone of household food security. In pastoral systems of the HOA, livestock products produced and consumed at a household level annually account for as high as 63% of the annual kilocalories based on a 2100 kcal daily requirement.

In newly infected countries, PPR morbidity and mortality rates are high. In Kenya, morbidity and mortality rates in newly introduced areas were 73% and 60% respectively while in Tanzania they were 54% and 39% respectively. In Kenya pastoral systems, PPR incursion leads to depletion of 65% to 100% of small ruminants. Poverty increased in poverty areas by 10%, eroded sustainability of households, while shifts in income and food sources were observed following depletion of small ruminants. An assessment of the socio-economic benefits of control shows that, had the country instituted a PPR prevention programme following immediate detection, the country would have saved Ksh$ 14.1 million showing a Benefit-Cost ratio (BCR) of 1.35 and an Internal rate of return (IRR) of 12%.

In conclusion, data available makes a case for PPR control, however, the understanding of the full economic effect that PPR and its control have on individuals, households, and nations needs to be improved to target interventions more effectively and equitably while all socio-economic issues need to be considered in strategy formulation.

PESTE DES PETITS RUMINANTS (PPR) VACCINE QUALITY CONTROL IN AFRICA

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Peste des petits ruminants (PPR) is an acute contagious and fatal viral disease of mostly sheep and goats caused by a Morbillivirus belonging to the family Paramyxoviridae, and it is considered as one of the major constraints to the productivity of small ruminants in African and Asian countries.

Although generally accepted that the most efficient method of controlling trans-boundary animal diseases such as PPR is the application of the stamping out policy which involves restriction of livestock movement, slaughter of infected and in-contact animals with compensation of stock owners as well as the application of other appropriate zoo-sanitary measures, this method is not feasible in most African countries due to economic and political reasons. Therefore the major tools currently available for the control of PPR are the use of good quality vaccines and effective laboratory diagnosis.

Several strains of natural PPRV have been developed as homologous PPR vaccines and in Africa, the Nigeria 75/1 strain (PPRV 75/1 LK6 BK2 Vero 70), is widely used and recommended by the OIE. This strain is currently available at AU-PANVAC and it is distributed to all AU Member States on request and free of charge. In addition AU-PANVAC provides Vero Cells to AU MS vaccine producing laboratories with the ultimate goal of ensuring the production of good quality vaccines. In order to assure the quality of vaccines produced on the African Continent, AU-PANVAC is presently the organization mandated by the Ministers responsible for Animal Resources in Africa to provide Independent Quality Control for all veterinary vaccines produced or brought into Africa.

The idea of an Independent Quality Control Centre was conceptualized between 1983 and 1986 to ensure quality of all Rinderpest Vaccines batches produced to support the Pan African Rinderpest Campaign (PARC). An FAO TCP (TCP/RAF/6766 & TCP/RAF/6767) awarded to AU-IBAR to ensure Vaccine Quality Control between 1986 and 1993 resulted in the establishment of two Centers, one in Dakar (Senegal) for Central and West Africa and the other in Debre Zeit (Ethiopia) for East and Southern Africa. However, the two centers were eventually merged in 1993 into one site at Debre Zeit (Ethiopia) as the Pan African Veterinary Vaccine Centre.

In April 1994, in recognition of the success of these centers, the 4th Conference of African Ministers responsible for Animal Resources which was held in Addis Ababa recommended the elevation of PANVAC to a technical center of the Organisation of African Unity (OAU) and that recommendation was approved in February 1998 by the 67th Ordinary OAU Council of Ministers. The Centre was officially launched as an AU Regional Office under the Department of Rural Economy and Agriculture of African Union Commission (AUC) in March 2004 with its headquarters at Debre Zeit (Ethiopia).

Presently the mandate of AU-PANVAC is to promote the availability of safe, effective and affordable veterinary vaccines and diagnostic reagents; to facilitate the development and introduction of improved or new vaccine production technology into Africa; and to strengthen Africa's capacity building in veterinary vaccine development, production and quality assurance.

In order to implement its mandate, AU-PANVAC currently conducts QC on Veterinary vaccines against diseases such as Contagious Bovine Pleuropneumonia (CBPP), Contagious Caprine Pleuropneumonia (CCPP), Rift Valley Fever (RVF), Sheep and Goat Pox (SGP), Lumpy Skin Disease (LSD), Newcastle Disease (ND), Infectious Bursal Disease (IBD), Black Leg (BL) and Haemorrhagic Septicaemia (HS) and Peste des Petits Ruminants (PPR). It also maintains a repository of vaccine seeds for all of these vaccines.

Currently AU-PANVAC maintains Bio-safety Levels (BSL) 2 and 3 laboratory facilities, a Molecular Biology Laboratory and a Laboratory Animal Unit for the implementation of its activities. Tests conducted for vaccine Quality Control include identity, test for freedom from bacterial, fungal and viral contamination, potency, stability and safety tests. Tests are conducted free of charge for AU MS and a fee of $700 per batch for all vaccines coming from outside the African continent. Laboratories requesting the Quality Control services are required to contact AU-PANVAC prior to shipment of vaccines, fill and submit all appropriate vaccine shipment documents provided by AU-PANVAC and to adhere to all international regulations on the packaging and transport of biological materials. A quality control report is issued 30 days after submission.

AU-PANVAC recognizes the importance of livestock diseases particularly PPR which threatens small ruminant populations in Africa where the livelihoods of millions of livestock farmers depend on them. AU-PANVAC has continued to collaborate with stakeholders in the implementation of strategies aimed at the control of these diseases and only recently AU-PANVAC received a grant of one million dollars from the OIE to strengthen its capacity for the Quality Control of PPR vaccine on the African continent and this is one of the several initiatives where AU-PANVAC has received support to strengthen its capacity. Other Organizations that have supported AU-PANVAC in the recent past include the FAO, GALVmed and Australian Aid. AU-PANVAC will continue to strengthen its capacity in order to meet with the increasing challenges of the control and eradication of Trans-boundary Animal Diseases such as PPR by supporting the production of good quality vaccines and ensuring the use of good quality vaccines on the African continent.

Session 3

Control strategies

LESSONS LEARNED FROM RINDERSPEST AND FROM PAST AND ON-GOING PPR CONTROL

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Introduction

By 2011**,** detailed evidence was provided by all countries and territories that the world had attained freedom from rinderpest. This information was verified by the World Organisation for Animal Health (OIE) and was conveyed to the Governing Bodies of FAO and OIE by the Joint FAO/OIE Committee on the Global Rinderpest Eradication. During the 37th FAO Conference, members nations declared the globe free of rinderpest and "Encourages FAO to take full advantage of the rinderpest eradication achievement and apply the lessons learned to prevent and control other diseases impacting food security, public health, the sustainability of agriculture systems and rural development". The present document reviews the majors lessons learned that could be used for controlling diseases.

Partnership and coordination

Eradication of rinderpest was considered achievable by the African Rinderpest Conference held in Nairobi, October, 1948. The conference recognised the potential value of the attenuated lapinised rinderpest virus for cattle immunisation and recommended the setting up of a programme of eradication of the disease. The high level of collaboration and synergy among OIE, FAO, IAEA, regional institutions and other bilateral and international donors (EU) demonstrated flexibility in their ability to develop new control mechanisms. The ecosystem approach enabled coordination and harmonization between the veterinary services in the Horn of Africa and Central Asia. The Global Rinderpest Eradication Programme (GREP) was established in Rome to foresee global co-ordination. The "OIE Pathway" gave clear guidance to all countries at each stage of the process.

FAO and OIE are in the early stages of shaping a Global Network on Peste des Petits Ruminants (PPR) through the formulation of the Global PPR control strategy. The Network is a multi-stakeholder initiative, comprising not only the international organizations and their member countries, but also research groups and the private sector, to join forces against PPR and small ruminant diseases (SRD) and assure better coordination of activities. The Network will be an initiative driven by the vision of a progressive control towards a world without PPR. The goal is to promote and initiate an integrated comprehensive approach that capitalizes upon synergies to eliminate the threat posed by small ruminant diseases (with a special focus on PPR) to the livelihoods, food security and health of people nationally, regionally and globally.

Strengthen veterinary services

The period of rinderpest eradication in developing countries witnessed the increased investment in surveillance capacity, early detection and rapid response mechanisms as well as effective donor collaboration. This helped to generally strengthen national animal disease surveillance networks also for other diseases in these countries, while making use of innovative community-based vaccination programmes and participatory surveillance systems based on local knowledge. It also optimized

control strategies that targeted high-risk communities through combination of new service delivery models, participatory epidemiology and epidemiological modelling.

Laboratory and epidemiological networks

The established FAO world and regional reference laboratories were key ingredients towards the eradication. The world reference laboratories would develop the right technology for field use, transfer that technology along with technical backup, and provide standardized diagnostic kits to all laboratories including the regional reference laboratories. The establishment of strong laboratory networks under FAO/IAEA coordinated research programmes with annual co-ordination meetings. These meetings were always linked to training courses and ensured that diagnostic techniques, software programmes or epidemiological strategies were updated. The successful integration of regional efforts into global networks and the setting up of laboratory networks using standardized tests and protocols was crucial to an eradication process. This enhanced the capability of the laboratories linking with the epidemiological network to detect the virus in the field. Thus concerted and coordinated efforts at a global level can lead to the control and eradication of diseases. Networks were an essential forum for the discussion and analysis of disease status data and the exchange of information. Support was provided to national laboratory services for organizing intensive and sustained surveillance programmes and reference laboratories for confirmatory diagnosis and vaccines quality control. In addition, post-vaccination sero-monitoring was to verify the success of the vaccination programme and large batches of antigen and control sera were produced to minimise test variation between laboratories.

Policy

The strategy used for rinderpest eradication, although not applicable to all diseases, could be used as a blueprint for some diseases such as PPR. Key factors other than those mentioned above were the availability of an excellent vaccine, secure long-term funding, the establishment of the GREP Secretariat in FAO Rome as a global co-ordination unit and the evolution of the "OIE Pathway to Freedom from Rinderpest", which gave clear guidance to all countries at each stage of the process. The drive and determination of a few key people was also essential to the remarkable success.

Tools developed

Innovative approaches were developed such as Community Animal Health Workers (CAHWs) and community involvement, Epidemiology (participatory epidemiology techniques, risk-based surveillance and modelling). In addition, rational and strategic vaccination (immuno-sterilisation) based on rigorous epidemiological surveillance and outbreak response assisted in controlling the disease. Technical guidelines and communication strategies were formulated. The ecosystem approach with enhanced coordination and harmonization between the veterinary services of neighbouring countries proved critical for the final eradication of rinderpest.

Models used

Several control models were used for the eradication in several eco-zones. The pioneers Edwards' Myanmar vaccine model (1936 to 1940) was to target a population immunity level of 60% in combination with epidemiology. The Chinese eradication model (1950 to 1957) used the integrated approach that combined epidemiological knowledge with compulsory vaccination and zoosanitary measures based on rigorous stamping out, disinfection and surveillance against reintroduction. The Indian model (1956 to 1996) failed to reach an immunity rate of 15 - 20%. But the creation of a central coordinating unit was crucial for pushing a policy of intensified vaccination targeting an 80% immunity rate. The African model started at the incursion of the disease (1890) in the southern part

of the continent which led to the elimination of the disease by the early 20th century from the southern part of the continent through a mixture of pragmatic zoosanitary controls and the introduction of the serum-virus simultaneous method of immunisation. This was followed by several other regional/continental programmes: Joint Programme-15 (JP 15), Pan-African Rinderpest Campaign (PARC), Pan-African Programme for the Control of Epizootics (PACE), Somali Ecosystem Rinderpest Eradication Coordination Unit (SERECU). In the Middle East, regional programmes combined national zoosanitary control measures with surveillance. In other part of Asia, regional coordination through South Asia Rinderpest Eradication Campaign (SAREC) also combined national zoosanitary control measures and surveillance.

PPR control in selected countries

The 3 yearly mass vaccination campaigns by private veterinarians were undertaken in Morocco from 2008 to 2010. The mean unit cost per animal vaccinated was around 0.42 $. The multi-donor trust fund of Euro 11 million was granted for livestock activities in Somalia. In total, 20 million animals were vaccinated again PPR and 20,000 sera collected for sero-monitoring and 7 million vaccinated again CCPP. The average cost per animal vaccinated was around 0.35$. Although the mass vaccination can control the disease (Morocco), combining with other diseases reduces the costs. Drawing and modifying lessons from rinderpest will reduce the cost as well as improving services in the control of PPR.

Conclusion

The control and prevention of animal diseases like rinderpest and PPR is an international public good and requires long-term investment from Governments, donors, the private and public sectors. Progressive control on a global basis has to be a priority for national veterinary services, and for regional and international organisations. In order to achieve eradication, there is a need to establish an effective surveillance system for the exchange of disease information and for expeditious emergency responses with a solid pool of recognised National/Regional experts (disease managers) to be able to respond to demands from Member States. Capacity building should be assisted by the provision of technical assistance, and a close partnership with other bodies and international organizations. National Policies and programs should be put in place for the control and/or eradication of PPR. Socioeconomic assessment should be strengthened in order to prioritize actions and interventions. There is a need to establish Country/Regional Wildlife Disease Associations for professionals in ministries of agriculture, environment, forestry and health. Regional Diagnostic Centres should be established to provide diagnostic services as well as training continuously to the member countries. The improvement and standardization of laboratory procedures would help. National livestock departments should arrange in-service training courses for field veterinarians (disease managers and epidemiologists) and laboratory technicians. Quality assured and cost effective vaccines should be available in each country/region.

DEVELOPMENT OF A GLOBAL CONTROL STRATEGY: INTRODUCTION

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During the 5th Global Framework for the Progressive Control of Transboundary Animal Diseases (GF TADs) Steering Committee held in Paris, October 2012, two recommendations were adopted:

- Recommendation N° 15 saying that "taking into account the experience gained with the Global GF-TADs Working Group on FMD, the prerogatives and activities of the FMD Working Group (WG) be extended to PPR (same framework and procedures)"
- Recommendation N°17 saying that the "Global GF-TADs Working Group relevant to PPR takes into account existing regional strategies and ongoing programmes and prepares a Global PPR Control Strategy".

The first meeting of the GF TADs WG took place on the 21st- 22nd January 2013 at the OIE headquarters, Paris and the preparation of a Global PPR Control Strategy was considered to be one of the first priorities of the group, in full coherence with the inclusion of PPR within the priority diseases in the Regional 5 year Action Plans of Africa, the Middle East and South Asia. The WG is composed of three experts from FAO and three from OIE.

PPR is a candidate for regional and international control and after RP eradication and progress on FMD control, donor attention to the control and eradication of other major diseases has increased. Donor coordination in some countries started as well as growing technical and political support for progressive control and eradication of major transboundary diseases including PPR.

Positive technical issues that support a progressive PPR control and eradication strategy are particularly the existence of one serotype only, the absence of carrier states after infection and of reservoirs outside domestic small ruminants. Many of the tools required for progressive control are already available such as diagnostic tests, a vaccine with lifelong immunity after a single dose, cheap to produce and a thermo-stable vaccine to become commercially available soon.

Among necessary prerequisites are effective Veterinary Services, surveillance, laboratories, appropriate legislation, sustainable animal health delivery systems including vaccine delivery and involvement of all veterinary actors in the field. Well known important difficulties are the access to all areas and to the small village animal holders. The cost recovery issue is also a key element to be addressed taking into account the dimensions of private or public good and their combination. Strategies will also depend of the PPR epidemiological situation (endemic or free country/zones), the production systems and the socio economic and cultural contexts (attitudes, behaviour, culture, politics and institutions).

The GF TADs WG will work on global PPR control strategies but strategies have also to be developed at regional and national levels. The consultation process for the elaboration of the PPR Global Strategy is similar to the one which was followed for the preparation of the FMD Global Strategy. A workshop with experts, national and regional authorities, policy-makers, development partners and

private industry will be organized. Lessons learned from regions and countries will be used (Middle East, Far East Asia, South Asia, India, SAARC countries, Africa including North, East and Southern Africa). The GF-TADs will provide the governance structure to prepare the Strategy. Inputs will be added from the OIE Scientific Commission and its *ad hoc* Group and the strategy will be peer reviewed.

The overall objective of the Global PPR Control Strategy is to contribute to poverty alleviation and improve the livelihoods in developing countries, and to protect and further develop the global and regional trade in animals and animal products. The specific objectives are to improve PPR and other TADs control in the regions where diseases are endemic and thereby to protect the advanced animal disease control status in other regions of the world.

The PPR control component of the strategy therefore not only aims to reduce the burden of PPR on animal production in developing countries, but also in PPR-free countries. Consequently reducing PPR at source in PPR-endemic countries is a shared interest and should be considered a global public good.

The PPR Strategy will follow risk based approaches and the control in endemic countries or regions will be progressive, with successive steps/phases to be defined, from endemic situations with no control activities to eradication of the virus. It will include several components which will address various issues such as the specific improvement of global PPR control, the strengthening of Veterinary Services and the improvement of the prevention and control of other major diseases of livestock. Which means that the strategy will combine vertical (disease specific) and transversal (horizontal) approaches.

The preparation of control strategies, including the global strategy, needs to develop or strengthen specific and horizontal tools such as national laboratories and regional networks, national epidemiology teams and regional networks, monitoring and assessment tools and a post vaccination monitoring and evaluation tool. A Global research and development network will be established. The new OIE Terrestrial Code articles related to PPR have been adopted by the last OIE General Assembly in May 2013 and they will be used as well as the well-known OIE PVS Pathway tools. Most of these tools are presented by FAO-OIE WG speakers during this meeting.

DEVELOPING NEW TOOLS: LABORATORIES AND EPIDEMIOLOGY TEAMS AND NETWORKING

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As the first step in the control of any disease is the diagnosis, this presentation stressed the need to strengthen laboratory capacities for PPR diagnosis. For the development of a PPR global control strategy, lessons learnt from the Global Rinderpest Eradication Programme (GREP) should be considered. One of these lessons in the case of rinderpest (RP) campaigns in Africa is the laboratory network that was developed by the International Atomic Energy Agency (IAEA) for the transfer of techniques for RP diagnosis and surveillance. Within that network, there were not only the training of scientists involved in the RP diagnosis and surveillance but also annual meetings. In addition to this laboratory network the African Union/Inter-Africa bureau for Animal Resources (AU/IBAR) promoted the development of national epidemiology networks to improve the provisions of samples to be analysed in the laboratory. These tools enabled the establishment of trust between chief veterinary officers (CVOs) and diagnosticians not only at a national level but also at a regional level, one of the key elements for the control of transboundary diseases. For the global control of PPR, it is essential to develop the same tools as for RP:

1) To support and promote test sample supply to laboratories,

2) To harmonize diagnostic methodologies in different laboratories

3) To organise proficiency testing between laboratories with the objective of harmonizing diagnostic tests and improving expertise (proficiency testing initiated 2 years ago for PPR diagnosis)

4) To improve diagnostic capacities of laboratories through training (human capacity building)

5) To improve communication and sharing of information between different players in order to establish trust between them.

ARTICLES OF THE OIE TERRESTRIAL CODE

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OIE plays an important role in transforming sciences into practice and policy making through the publication of standards, guidelines and recommendations which are then translated into tools, methods, strategies and policies, laws & regulations.

The OIE standard setting process is based on responsive, transparent and rapid procedures. Well recognized and independent experts are invited to participate at *Ad hoc* Groups (AHGs) and Working Groups (WGs) which report to the Specialist Commissions. The Specialist Commissions play a central role in the OIE standard setting procedures and the major source of OIE experts are the OIE Reference Centres, comprising Reference Laboratories and Collaborating Centres (277 in 2012). The Specialized Commissions are the Scientific Commission for Animal Diseases, the Code Commission, the Biological Standards Commission and the Aquatic animals Commission. The AHGs involved in the standard setting are numerous e.g. foot and mouth disease (FMD) vaccine quality, FMD status, PPR, porcine respiratory and reproductive syndrome (PRRS), brucellosis, classical swine fever, Rift Valley fever, Epidemiology, trade in animal products, antimicrobial resistance. The WGs are for example on Wildlife or Food Safety. Proposed Standards prepared by the AHGs and WGs are science based and they follow risk analysis approaches. They are commented by the Specialised Commissions and sent by the Code Commission to all OIE Delegates and major partners. After receiving comments, a second round of discussions with the Specialised Commissions takes place if necessary and then the articles are submitted for discussion during the OIE General Session in May and adoption by vote by the OIE Delegates during the World Assembly.

The articles regarding terrestrial animal diseases are published in the OIE web site (www.oie.int): OIE *Terrestrial Animal Health Code* (http://www.oie.int/en/international-standard-setting/terrestrial-code/) and in the OIE *Manual of Diagnostic, Tests and Vaccines for Terrestrial Animals* (http://www.oie.int/en/international-standard-setting/terrestrial-manual/).

Regarding PPR there are relevant horizontal and vertical specific articles in the OIE *Terrestrial Animal Health Code*:

- Horizontal chapters which can be applied to PPR are Chapter 1.1 on Notification of diseases and epidemiological information, Chapter 1.2 on Criteria for the inclusion of diseases, infections and infestations of the OIE list, Chapter 1.4 on Animal Health surveillance, Chapter 1.6 on Procedures for self-declaration and for official declaration by the OIE, Chapter 2.1 on Import risk analysis (and OIE Handbook, 2 Vol.), Chapter 4.3 on Zoning and compartmentalisation, Chapter 4.4 on Application of compartmentalisation, Chapter 3.1 on Veterinary Services (principles and evaluation) and Chapter 3.2 on Evaluation of Veterinary Services. Regarding the new procedures for official declaration by the OIE of the PPR freedom status, Chapter 1.6 describes the questionnaires for countries which apply for recognition of status, under Chapter 14.8. of the *Terrestrial Code* as a PPR-free country or zone. The questionnaires for countries which apply for

the OIE endorsement of its official control programme for PPR are also described in the same Chapter 1.6.

34 specific new articles on PPR of the Chapter 14.8, also adopted at the 81st General Assembly, include 6 articles on country status, 17 articles on recommendations for importing commodities, 7 articles on surveillance and 1 article on endorsed official control programmes.

The articles on surveillance define the principles and provides a guide for the surveillance of PPR in accordance with Chapter 1.4. applicable to Member Countries seeking recognition of country or zonal freedom from PPR or seeking re-establishment of freedom following an outbreak (introduction, general conditions and methods, surveillance strategies, wildlife surveillance where a significant susceptible wildlife population exists).

Endorsement of official control programmes for PPR is a new tool to further progress towards global PPR control. It is not status recognition but an endorsement of the national plan of a Member Country to progressively move towards freedom from PPR (with or without vaccination) in accordance with the requirements of the *Code*. Applicant countries need not to be already free from PPR but must provide evidence that it already has a national plan in operation to move towards freedom. This possibility is a useful tools to help Member Countries to assess compliance with requirements of Article 14.8 and the information required in the Questionnaire in Chapter 1.6 of the *Code* are the ones mentioned in the OIE PVS evaluation reports and possibly the PPR-PCP (to be prepared). The endorsement can be suspended if there is no compliance with *Code* requirements. The application is a voluntary decision by a member country. It is based on the evidence of VS capabilities (PVS assessment), evidence that the plan is applicable to the entire country, that diagnostic access/capabilities, information on epidemiology, disease surveillance and disease reporting are effective as well as control measures to prevent PPR introduction and vaccination. Detailed plans on future timelines and intended milestones/performance indicators are to be provided in the questionnaire.

The PPR articles in the OIE *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* are in the chapter 2.7.11: twelve pages contain sections on introduction, diagnostic techniques, requirements for vaccines and references.

DEVELOPMENT OF A GLOBAL CONTROL STRATEGY: INTRODUCTION

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PPR control strategies, either at national, regional and global levels are risk based and follow progressive phased approaches. Successive steps/phases have to be defined, from endemic situations with no control activities to eradication of the virus.

There is a need to develop or strengthen specific and horizontal tools as described in other presentations during sessions of the meeting. Among the new tools, a monitoring and an evaluation tool have to be prepared and this is what the GF TADs WG on PPR has started to do as a support tool to the Global PPR Control Strategy.

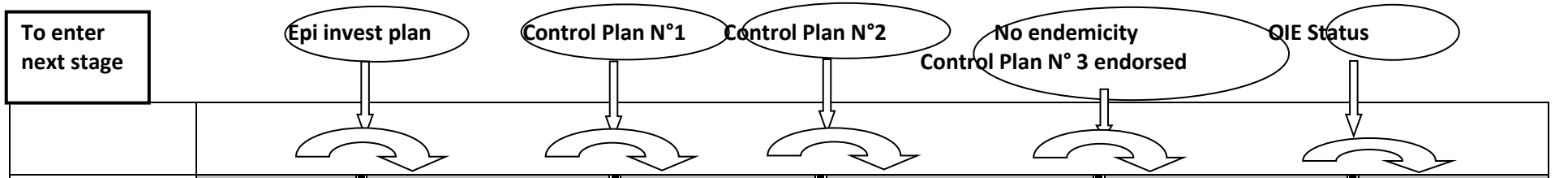
The objective of the monitoring tool is to be able to follow the implementation of the control strategy with a tool which describes the successive steps (stages/phases) with the relevant activities and expected outcomes.

The tool is directly constructed from the global PPR control strategy with its progressive approaches, flexible enough to be applicable to different contexts. Several steps from no epidemiological understanding and no significant activities to eradication of the virus from the country/zone with intermediate steps (targeted control) will be described.

Activities and outcomes combine vertical (disease specific) and transversal (Veterinary Services) approaches. A first draft to be discussed during the meeting is presented in the Figure below.

The Assessment tool is a companion to the Monitoring tool with the objective of assessing the country step rating. The principles will be to define evaluation rules for each criteria (outcome/activity) relevant to each step as described in the Monitoring tool (verifiable indicators) with semi quantitative levels of compliance to the criteria/activity (from 1: insufficient to 5: excellent with intermediate levels e.g. 3: satisfactory). The tool will combine vertical (disease specific) and transversal (Veterinary Services: PVS Critical Competencies) assessment criteria.

PPR Control Strategy Monitoring tool



	Stage 0	Stage 1 xxxx	Stage 2 xxxx	Stage 3 xxxx	Stage 4	Beyond the Pathway
		(VS CCs)	(VS.CCs)	(VS.CCs)		
				OIE endors	OIE free status	
Activities	Prepare epidemiology investigation plan	PVS CCs St 1 Activi epi, Risk Analysis Prepare risk based control Plan N°1 Prepare invest for VC CCs for stage 2	PVS CCs stage 2 Implement control plan N°1 Surveillance (active & pass.) Prepare more aggressive control plan N°2 Prepare invest for VC CCs for stage 3	PVS CCs stage 3 Implement control plan N°2 Surveillance (pass), alert Response to outbreaks Prepare revised control plan N°2: control plan N°3 (eradication plan) Submit Plan N°3 to OIE Prepare VC CCs for implement of control plan N°3	PVS CCs stage 4 Implement c. plan N°3 Pass surv,-alert Emergency response Border surveillance /animal movements Identification Cessation of vaccination 24 months before OIE free status submission Prepare OIE dossier for free status recognition	Maintain free status
Outcomes		Epi understood Risks factors known Hot spots known C/B analysis done Control plan N°1 ready VC CCs ready for implement. of control plan N°1	Progressive control in certain zones or production systems (eg Dairy) (targeted) Control plan N°2 ready VS CCs ready for implement. of control plan N°2	No outbreak in domestic small ruminants or exceptional: no endemicity Control plan N°3 ready and endorsed by OIE VS CCs ready for implement. of control plan N°3	No virus circulation Risk of reintroduction mitigated Free status OIE recognized VS CCs ready for maintenance of free status	
Measurable criteria (for evidence)						

THE IMPORTANCE OF STREGTHENING VETERINARY SERVICES AND THE PVS PATHWAY IN THE CONTEXT OF A GLOBAL PESTE DES PETITS RUMINANTS CONTROL STRATEGY

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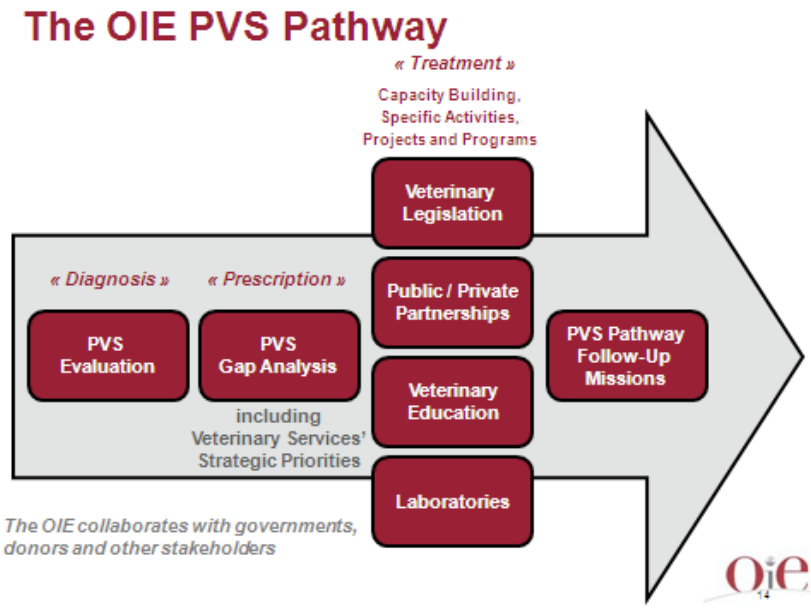
The OIE Tool for the Evaluation of Performance of Veterinary Services or in short, the OIE PVS tool, is a well-established tool within the OIE PVS Pathway. This paper examines how this tool can assist countries to better control PPR.

The OIE PVS Pathway has been developed in order to assist OIE Member Countries to comply with Quality Standards of Veterinary Services as laid out in Section 3 of the OIE *Terrestrial Animal health Code*. The quality of Veterinary Services depends on a set of factors, including fundamental principles of an ethical, organisational and technical nature. The quality standards are applicable to Veterinary Services in all regions, regardless of political, economic or social situations. The Veterinary Services, as defined in the OIE *Code*, comprise public and private sector veterinarians and veterinary para-professionals. Conformance with these quality standards increases the credibility of Veterinary Services, particularly in the international context, e.g. with trading partners.

However, the current situation worldwide reflects a wide variety of shortcomings with respect to OIE standards on quality of Veterinary Services. The OIE PVS Pathway addresses some of these shortcomings with specific "treatment" activities as shown in Graph 1 below.

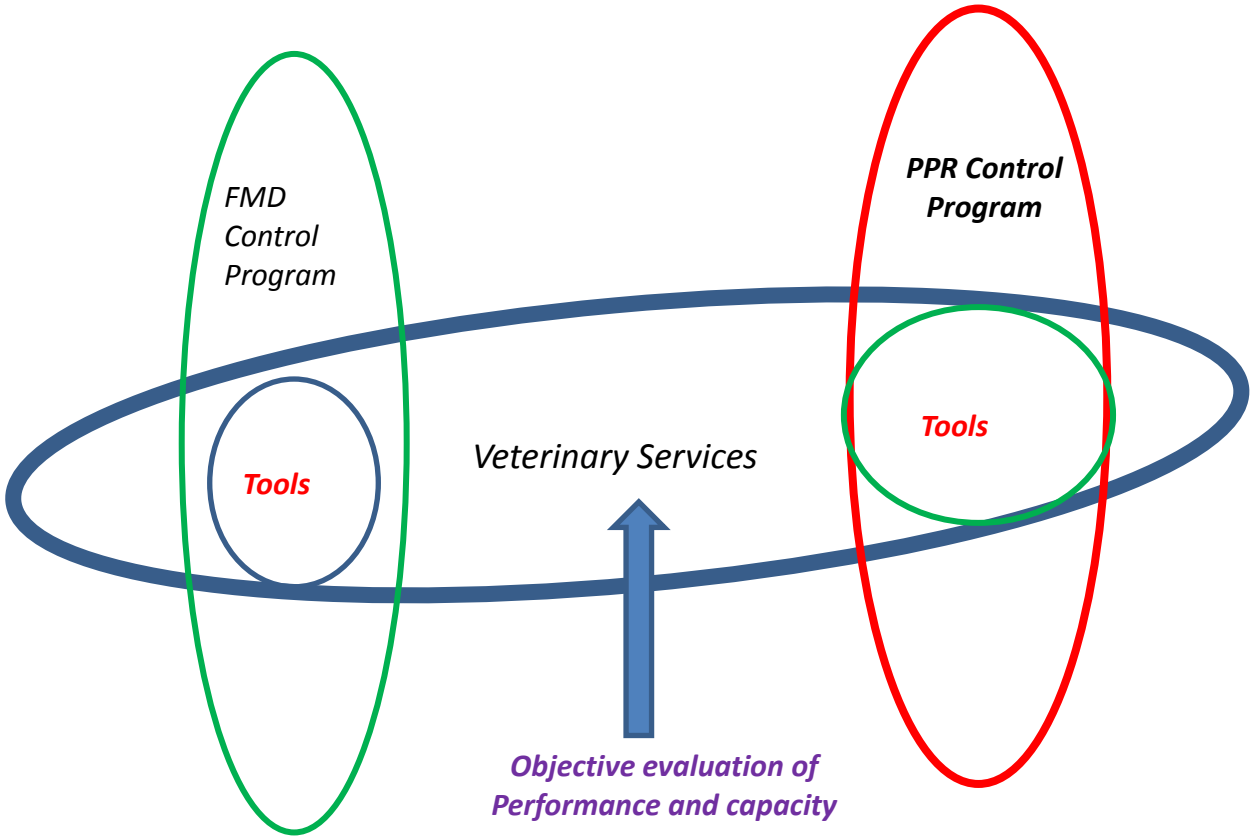


In the context of the Global Control Strategy being developed for PPR by OIE and FAO, the OIE PVS tool provides an objective baseline situation for countries on their capacity to implement the OIE-FAO Strategy, in terms of human, physical and financial resources, particularly in the fields of those

activities that will be elaborated in detail in the Global PPR Control Strategy, namely: (i) laboratory diagnostic techniques, (ii) capacity to deliver vaccination programmes, (iii) surveillance and reporting. Indeed, while the Critical Competences of the OIE PVS tool are not disease specific and provide an indication of the overall capacity of the national Veterinary Services to deal with animal diseases, it is of paramount importance that this 'Enabling Environment' be in place concomitantly or even prior to the implementation of PPR-specific prevention and control activities in order to guarantee their efficacy and sustainability.

Furthermore, some of the "treatment" provisions from the OIE PVS Pathway will assist in reinforcing these fields notably with the OIE PVS legislation support programme, the OIE twinning programmes and the OIE PVS laboratory programme.

Since the tools in the proposed Global Control Strategy for PPR are similar to those in the Global Control Strategy for FMD, and will be similar in other control strategies also at national and regional levels, an objective evaluation of the capacity of Veterinary Services to utilise these tools would cut across several control strategies as shown in Graph 2 below. This objective assessment would assist countries in addressing capacity and quality deficiencies **prior** to embarking on implementing such strategies and therefore optimising investment in disease control.



An overview on OIE PVS, PVS Gap analysis, Veterinary Legislation and PVS Pathway follow up missions was given in the oral presentation.

In conclusion, countries embarking on implementing the proposed OIE-FAO Global PPR Control Strategy should make use of the support provided by the OIE PVS Pathway, particularly the OIE PVS tool, selected "treatment" option, thereby increasing the Veterinary Service's credibility particularly in the context of trade. The PVS reports can be used for advocacy for donor support to the PPR country control programme.

DEVELOPMENT OF A GLOBAL CONTROL STRATEGY: POST VACCINATION MONITORING TOOL

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Vaccination is one of the key strategies to control PPR and has been used on a large scale to combat the disease in those countries of the SADC region that have been affected by it.

In order to monitor the effectiveness of these vaccination campaigns, it is being proposed to include *post vaccination monitoring* (PVM) as a tool among other tools into the Global PPR Control Strategy. With this tool Veterinary Services can test the effectiveness of the delivery system used to reach the target small ruminant population, which in certain production systems can be a real challenge. Furthermore the tool can be applied to test the vaccination coverage and the de facto reduction of the incidence of the disease. In an indirect way, the tool can be used to evaluate the effectiveness of the Veterinary Services and their capacity to respond to the particularities of small ruminant production systems. Additionally, the tool can provide information to define movement patterns of vaccinated animals.

Unlike in cattle, where the method of choice for PVM is serology, in small ruminants which are not often clearly identified, a range of methods should be applied in order to evaluate the vaccination effectiveness.

While serology will provide the most direct information, when animals are clearly identifiable and paired samples can be taken, sampling strategies can be devised that cater for the situation of unidentified animals. The sampling strategy must consider the production system, movement and trading patterns.

Additional methodologies that can contribute valuable information are (i) participatory appraisal of farmers' perception on vaccination success, (ii) mobile phone surveys and questionnaires with farmers and (iii) an appraisal of the delivery system. The proposed approach to PVM can be summarised as follows:

- Know the socio-ethnic aspects of the small stock production system
- Use serology and additional methods if feasible
- For serology, devise a sampling frame that takes these aspects into consideration
- Sample 30 days after vaccination for serology

For the PVM tool to produce good results, it should be applied in an enabling environment in which livestock owners have been sensitised about the importance to check on the effectiveness of the vaccination campaign. Veterinary Services willing to use the PVM tool should consider providing incentives such as antiparasitic treatments or extension services. Furthermore, training of veterinary field staff and auxiliaries in effective blood sampling, preservation and shipment of samples should

be assured. Laboratory staff receiving the samples should be adequately trained and the laboratory should assure the shortest possible turn-around time for test results.

If results from PVM serology confirm low levels of sero-conversion, the interpretation should consider the following aspects:

- Technical failure along the vaccination delivery system (e.g. cool chain, syringes, training of staff etc.);
- Administrative failures (not enough vaccine delivered to certain areas etc.)
- Not all animals were shown for vaccination
- New animals were introduced into the flock between vaccination and PVM
- Vaccinated animals have migrated and new ones have been introduced (unvaccinated)

In conclusion, the PVM tool is considered important in gathering information on vaccination success, however, unlike in rinderpest and foot and mouth disease campaigns, serology should be used together with other methodologies.

A practical example from a large scale vaccination campaign carried out by FAO in Somalia was used to demonstrate the use of serology, participatory appraisal and farmers' interviews:

As the result of the drought in the Horn of Africa, FAO with donor support undertook a vaccination campaign in Somalia. A total of 20,000,0000 small ruminants (62% of the overall population) were vaccinated in 2012. The PPR vaccination was combined with a Contagious Caprine Pleuropneumonia (CCPP) vaccination and free treatment as incentive. Before the campaign, appraisal was undertaken to discuss and agree on how emergency funds could be used in a strategic manner and how to start a longer-term programme. During the appraisal, factors influencing progressive control in different production systems (indigenous, trade etc) were identified. This led to the establishment of a cold chain, staff training and refining the strategy.

The Central Veterinary authority (where it existed), was to undertake the monitoring during and after the vaccination. The Somali Veterinary professionals were requested to keep all empty vials as a means to check vaccination efficacy, one of the alternative ways to do PVM. A questionnaire was distributed to livestock owners to record their telephone number as well as other important information. A participatory appraisal was used to assess the behaviour of the pastoralists and performance of the field staff during the vaccination campaign.

A total of 1% (20,000 of the vaccinated animal) serum samples, 10,000 pre-vaccination and 10,000 post-vaccination, were collected. Samples were split in 2 aliquots. The laboratory findings (pre- and post-vaccination sampling) will be compared with the 2010/11 sero-prevalence.

GENERAL DISCUSSION ON SESSION 3

Lessons from rinderpest control.

- The SADC representative highlighted that the Regional Economic Community had set up epidemiology and laboratory networks for information sharing. The networks meet and discuss issues at hand and therefore would be appropriate models to discuss PPR issues in the region.

- The rinderpest eradication costs could be much higher than the US$ 5 billion when national government contributions in monetary, staff and housing and other costs are included.

- Two dissimilarities between PPR and rinderpest could make PPR control more difficult in terms of resource mobilization and socio-economic importance. One is the comparatively lower value of sheep and goats compared to cattle and the second is the nature of the rinderpest virus causing huge epidemics and in some cases killing up to one million cattle in a single country which does not happen in PPR outbreaks.

- Due to the difficulties of global PPR eradication it is envisaged that regional eradication and zonation can be applied.

- The matter of virus sequestration arose and participants were informed that the issue to be allowed to keep rinderpest virus material did not depend on the biosecurity levels of the labs but the decision to keep them with AU-PANVAC was driven by a safe-keep laboratory supported by rights of ownership agreements. However countries could access the materials but AU-PANVAC would be required to notify OIE and FAO.

- The issues of compensation in the global strategy were raised as it was seen to be missing. It was clarified that compensation would be considered where stamping out is envisaged and that this is likely to be in the final phases of eradication from a region or zone since eradication is a public good while progressive control should be considered as a mixed public-private good.

Developing new tools for the strategy

- While regional networks (laboratory and epidemiology) are foreseen as important tools in PPR control, in the SADC region, they face financial challenges and therefore are not able to fully implement their planned activities. It was requested that they be supported with resources through the PPR projects.

- The issue of cooperation and trust between the CVOs and laboratory directors appeared to a real issue in some countries and needs to be addressed.

Global Alliance

- The meeting was informed that SADC has established a Centre for Agricultural Research which will also cover animal production and health research. It will source experts from the region and some staff are already on board. While suggestions were made that the global PPR Alliance can liaise with the center, there were also strong feelings that the regional Livestock Technical Committee should be the entry point for the alliance.

- The purpose of widening the research network was discussed and it could be modelled on OFFLU but by extending membership as OIE reference laboratories and collaborating centers are few. The Alliance will include research centers and policy makers.

- CIRAD has networks with other laboratories working on PPR and will therefore assist in identifying potential collaborators for the alliance.

OIE Articles on PPR

- It was clarified that an OIE pathway similar to rinderpest will not be developed but a progressive control pathway will be developed and Code chapter articles are clear on how countries can become free of PPR. Based on these articles countries can now prepare dossiers to have OIE recognize their control strategies.

PPR monitoring tool

- The tool mentioned cost-benefits analysis in stage 1 and this raised the issue of cost-benefit analysis guidelines which need to be prepared as small ruminants have multiple products and services which need to be captured and valued. Excel based CBA frameworks can be developed.

- The issue of OIE freedom without vaccination was raised and it was suggested that this stage may not be necessary, but needs to be discussed further

Post Vaccination monitoring tool

- The issue of a cross sectional and longitudinal approach to PVM was raised as the latter has been applied to FMD in Malawi. The purpose of the longitudinal approach was to identify the period when the highest sero-conversion is achieved as a basis for further PVM tasks. However in the case of PPR it was confirmed (CIRAD and IAEA) that highest sero-conversion for PPR is achieved at 3-4 weeks and therefore sero-monitoring during the period is appropriate and therefore the need for a longitudinal approach was not envisaged.

- CIRAD raised the issue of monitoring the impacts of disease on flocks such as mortality, morbidity and fertility indexes.

- It was highlighted that cattle can act as sentinels for PPR as a significant proportion of cattle sero-convert during PPR outbreaks.

CREATION OF WORKING GROUPS

WG 1: Improving PPR surveillance and diagnosis

Peste des petits ruminants is currently confirmed in three SADC member states (Angola, DRC, and Tanzania), and its threat of spilling over to the rest of the region has never been greater. This threat has caused great anxiety in the region, especially considering the relatively high population of small ruminants at risk, the potentially devastating socio-economic effect of the disease if it were to spread further, and the state of porous borders between most SADC member states. The recent confirmation of the disease in Angola is clear evidence that PPR is spreading.

In response to this imminent threat the authorities of each country have resolved to conduct disease surveillance, using both their veterinary laboratories and epidemiological services, as part of the strategies envisaged to control the disease in the region. Countries which have not started collecting the samples are either busy preparing or finalizing their surveillance plan. The surveillance involves targeted collection of blood samples from defined sampling points, usually along the borders within the free countries. Diagnostic Serology (cELISA) is currently used to screen the samples. PCR which is ideal for disease confirmation, especially in cases of outbreak, is currently functional only in a few national laboratories. However, other countries are considering expanding their diagnostic capacity to include PCR. Meanwhile, the collaboration between national laboratories and OIE reference laboratories should be strengthened as it is adding great value to the surveys through performance and/or confirmation of laboratory test results. Similarly, the collaboration that developed between veterinary services and the wildlife sector through buffalo sampling for FMD should be maintained and replicated for PPR surveillance.

The efforts and good intention to conduct the surveillance could be severely hampered if the huge number of challenges facing the region were not promptly addressed. They include but are not limited to the following issues: an historic low sample throughput, long test turnaround time, understaffing, inadequate staff training in PPR, lack of quality assurance programmes in general and proficiency testing schemes and calibration of analytical equipment in particular, lack of a DIVA vaccine, budget constraints and a lack of critical analytical equipments in some laboratories, inaccessibility of certain remote areas/sampling points, lack of cold chain and transport for field workers, lack of cooperation/compliance by certain farmers, and uncontrolled movements of small ruminants across borders and internally.

WG 2: PPR Control Strategies in Front of Different Epidemiological Situations

Overview

PPR is rapidly spreading within the region. Members felt the need for countries to be classified into three groups; (1) infected, (ii) free but at high risk and (3) free.

Discussions revolved around our main goals as a country and as a region. Depending on the situation some countries choose to vaccinate to reduce impact of the disease where infection is present. Some non-infected countries choose to reinforce on border controls, namely animal movement. Other countries choose to vaccinate to prevent entry of the disease. And in some situations stamping out is also an option.

But globally as a region the countries' objective as a long term goal is to eradicate the disease.

COUNTRY SITUATION

Tanzania is a country which is infected with PPR. The country is currently practicing vaccination and surveillance. One of the major challenges that they are facing is Post Vaccination Monitoring. They feel that they do not have a base line sampling to which to measure the efficiency of the vaccinations as they do not have the resources to do so. They feel that their government could be doing more to support them in their fight against PPR and that they should not rely too much on donor funding. Another challenge is lack of timely control. It takes them too long to gather up resources to react in outbreak situations especially at local government levels as they need to report to central government before reacting. A national strategy is being drafted for the country which hopes to have a budget for PPR control, once accepted.

Malawi is at the moment not infected with PPR but a country at risk of infection. They have a preparedness programme in place. At the moment they are focusing on surveillance and awareness. They have put border guards on their vulnerable borders and they try to regulate animal movement.

Mozambique is also considered free of PPR. Their major strategy currently is movement control. They have 3 villages bordering Tanzania and a river as a natural barrier. There is currently no animal movement in the area. Nevertheless, they are preparing for the next step. They wish to prevent entry of the disease into their country and will soon start vaccinating animals at the border with the idea of creating a vaccination buffer zone. Animals will be vaccinated on an annual basis. Challenges being faced in the country are lack of funding, poor road conditions, lack of means of transportation and lack of technicians at the borders.

Namibia is considered as free as well but they are at risk at the borders with Angola. They feel that they need to carry out sero-surveillance and to draft a contingency plan for PPR. Currently they do not allow any livestock movement from the northern part of the country into other parts. They do feel that technicians need training to recognize PPR.

Swaziland, currently PPR free, is practicing animal movement controls and is aiming to draft a contingency plan for the disease.

Lesotho has a very strong regional farmers association and the farmers have the understanding of the disease and take it seriously. They are currently PPR free and feel they need some consultancy to strengthen their existing capacity.

Seychelles has no clinical evidence of PPR as of yet. The country needs to work on a contingency plan as the disease is present in the region. Training for technicians to recognize PPR would be very helpful. Major emphasis is on import controls as that is the main entry gate. Population needs more awareness on biosecurity as there are illegal entries into the country.

GENERAL GAPS

- Human resources at field level
- Cost sharing for vaccination programmes – governments? Projects?
- Understanding of trade flows
- Line of command in de-centralised Government structures with centralised Veterinary Services?
- Policy on cross border controls
- Lack of understanding of the ecology of PPR

- Lack of socio- economic impact studies
- Gap in capacity
- Lack of understanding of Risk Analysis
- Lack of a regional vaccine bank
- Lack of a proper road map

RECOMMENDATIONS

Policy

- To develop a proper roadmap for PPR
  - Should link to progressive control pathway (PCP) for PPR
  - Have a timeline for different PCP steps
  - Should have an inventory of existing national strategies
    - Be descriptive as to which stage a country belongs
- Mainstream PPR through SADC Livestock Technical Committee and its Sub committees
- Develop a regional animal health cross border framework/policy

Technical

- Post Vaccination Monitoring needs to be looked at through different angles as it includes multiple tools and not only sero-surveillance.

Capacity Building

- Adapt existing guidelines to small ruminants for
  - Value chain analysis
  - Sector reviews
- Develop a socio- economic sub network at continental level
  - Eg. Estimate cost of vaccinations
- Training on risk analysis

Research issues

- Understanding the ecology of the virus
  - Research/studies (South African Centre for Infectious Disease Surveillance)
  - Networking
    - linking of local, international agencies

WG3: PPR Monitoring and Assessment Tools

The facilitator of the Working Group presented the principles of the tools to complement what was explained during the presentation made during session 3 (development of a global PPR strategy).

1. Monitoring tool for the PPR control strategy

Questions:

1- Introduction (by the facilitator):
- Objectives of the WG N°3
- Objectives of the Monitoring tool

- Principles of the Monitoring tool
- Chart (see page 54): comments on the possible steps, activities, outcomes, measurable indicators…

2- Issues to be discussed:
- Are the concept and principles understandable enough? If not, to be clarified
- Choice of the number of steps
- Outcomes and activities
- Particular attention:
    - To the criteria for entering the next step
    - To the combination of disease specific (PPR) and horizontal (Veterinary Services: PVS Critical Competencies) criteria

Discussion:

The concept of the monitoring tool was discussed. The WG participants agreed that this concept is valid, understandable and implementable. Therefore the WG fully supported what was presented.

The chart (see page 54) summarizing the 4 stages of the control progressive pathway was shown again (see the chart presented in the summary of the PPT "Peste des Petits Ruminants: development of PPR Monitoring and Assessment tools") and discussed. The stages are defined as well as, for each stage, the activities to be undertaken and the expected outcomes.

The criteria to be fulfilled to enter the stage are given:

- To enter stage 2: an epidemiology investigation plan must be defined
- To enter stage 3: a first plan for targeted control must be defined
- To enter stage 3: a second more aggressive control plan must be defined with a vision of future eradication of the disease
- To enter stage 4: evidence that there is no endemicity must be provided and, by the end of stage 3, a national control plan must be endorsed by the OIE.

By the end of stage N°4, a dossier is prepared and submitted to the OIE for free status recognition. When the free status is officially recognized the country is beyond the control pathway.

The measurable criteria / measurable indicators (for evidence)/were not elaborated.

The participants asked many questions for clarification and commented on the chart. The number of stages were found to be reasonable and the criteria were considered to be understandable and appropriate.

Regarding the enabling environment for an effective implementation of the PPR control activities, the compliance of the veterinary services with the OIE standards are indispensable and the critical competencies (CCs) of the PVS evaluation tool (OIE PVS Pathway) are to be used in the monitoring tool. The participants reviewed each one of the stages of the monitoring tool and dwelt much on activities, outcomes, criteria for progressing to the next stage and the mode of combining the PPR specific criteria and the PVS CCs. The number of CCs are, according to each stage, 7 CCs for stage 1, 14 for stage 2 and 15 for stage 3. The total number of CC remains 36 for stage 4.

The participants confirmed the need to identify the three groups of countries with reference to PPR as follows:

- Endemic countries which have to go through the whole pathway
- Free but at risk countries which can enter the pathway at stage 4 but must furnish evidence for means of mitigating the risk, means for early detection and early response.
- Free countries which can apply for historical freedom, hence they can go straight to stage 4. These countries are from regions which are not infected with PPR.

The WG participants concluded the session by indicating that the monitoring tool is very appropriate and hence applicable to a country, zone or compartment.

2. Assessment tool for the PPR strategy

Questions:

1- Introduction (by the facilitator):

- Objectives of the Assessment tool
- Principles of the Assessment tool
- Example of FMD

2- Issues to be discussed:

- Are the concept and principles understandable enough? If not, to be clarified
- Choice of the number of levels:
    - Semi-quantitative:
    - e.g. 1: insufficient , 2: low, 3: satisfactory/good, 4 : very good, 5: excellent
- Which level seems most appropriate for compliance?

Discussion

Due to a lack of time, the Assessment tool could not be discussed during the WG session. Nevertheless, the participants considered that the principle of defining a specific assessment tool to recognise to which PPR stage a country belongs was necessary.

Concluding remarks

IAEA: IAEA recognizes the 3 organizations organizing the meeting and the host country Tanzania and the presence of its CVO and the SADC Secretariat. It recalls the objectives of the meeting, acknowledges the existing strategy of SADC but recommends improving it in line with the conclusions of this meeting.

FAO: FAO thanks all participants. The meeting was inspiring and we hope that we brought something to the region and we have also learnt from you, as we have learnt from other regions and we appreciate the difference in the various strategies. It was important for us under GF-TADs to get inspiration in order to integrate regional initiatives. We wanted to strengthen the link between global strategy and this region.

OIE: we had good discussions. We are grateful that the participants shared their experience and listened to us. We now know the issues and they are contained in the conclusions. SADC has outlined the next steps and that is important for me (Dr Mapitse) being in the region, to know. The participants made this workshop very successful. Thanks to the colleagues from OIE Headquarters for their input. Thanks to the host country. They are at the end of their financial year so for them to be here with us shows their commitment.

SADC: is happy to be here in Tanzania together with the other Member States. On behalf of all of us thanks to FAO, OIE and IAEA for taking interest in the region and for being with us all the time. You have seen our commitment to livestock development in the region and the interest of the SADC Secretariat. We rely on our partners for this development. We take those issues to the highest level in the region to get buy-in by our politicians. I commended already the Ministry in Tanzania for their action and commitment. On behalf of the SADC Secretariat I thank you all.

Tanzania: thanks to all and SADC member states for coming to Tanzania as one of the PPR infected countries and to discuss the issues. When I saw the group presentations, I was pleased about the good work done. My plea is on behalf of Tanzania, Angola and Democratic Republic of Congo. We look forward to receiving support not only from SADC, but also from international partners. PPR is an issue of food security and income generation. When you look into the contribution of small ruminants to meet the demand for more meat, if we were to import this meat from outside the SADC area, the bill would be very high. Please have consolidated efforts for this meat to be available from within the region. Projects take long before they are launched and I am worried that when the current project stops that we end up in the dark and we need a stop gap measure before the new projects are launched. So our partners should help us during this period until we might have new projects. My fear is that there will be a gap that would cost the region dearly!

CONCLUSIONS

CONCLUSIONS OF THE MEETING

The objectives of the workshop included the review of the global PPR situation and that in the SADC region and to exchange information on PPR control strategies at global, regional and national levels.

The workshop was attended by OIE Delegates, CVOs, laboratory heads, and epidemiologists from SADC member countries as well as representatives of the SADC Secretariat, AU-PANVAC, IAEA, FAO, OIE, CIRAD and RVC.

The presentations during the 3 sessions addressed several issues regarding PPR spread, lineage evolution and research priorities, the present SADC situation as well as the key principles of control strategies, lessons learned from rinderpest eradication and various PPR control programmes and the SADC regional strategy. Specific thematic presentations were on wildlife, laboratory diagnostics and epidemiology, socio-economics and vaccines. Experts from the three organizing international institutions (IAEA, FAO, and OIE) explained how the Global Control Strategy will be prepared, which accompanying instruments will be used and which tools should be developed or strengthened, including the new OIE Terrestrial Code articles, monitoring and evaluation tools, laboratory and epidemiology networks, post vaccination monitoring tools and a global research and development network.

In this way, the participants from the SADC region were able to receive information from international and regional experts enriching the debates through extensive discussions.

Thanks to this exchange of information the following conclusions of the meeting can be drawn which should contribute to further strengthening the prevention and control of PPR in the region:

- Due to the variety of contexts and PPR status within the SADC Member States, there is a need to consider different approaches according to the epidemiological situations which prevail in countries free from the disease, free but at high risk or endemic.

- Socio-economic studies should be carried out in order to provide appropriate evidence to decision makers supporting the fact that increased investment in preventing and controlling PPR in the SADC region is cost effective.

- Diagnostic laboratories and epidemiology teams are among the major indispensable tools to prevent and control PPR. Collaboration between laboratories and epidemiology teams is crucial in addition to strengthening regional networks.

- With regard to diagnostic laboratories, several gaps and challenges have been highlighted such as quality assurance which will have to be addressed.

- With regard to capacity building, training in epidemiology and risk analysis is needed and training should be provided.

- Vaccination is one of the principal methods for the control of PPR. Compliance with the OIE standards and quality control mechanisms need to be ensured by the veterinary authorities.

- Currently there is no evidence that wildlife plays a significant role in PPR epidemiology and the relevant OIE standards have been prepared taking into account this lack of clear published evidence. However, there is a need to undertake field and research activities on wildlife issues to better understand how wildlife can be affected by PPR and what role (if any) they play in disease spread and transmission particularly in the SADC region where wildlife is important. There is also a need to better sensitize stakeholders for the threat to endangered species and to include wildlife in PPR diagnostic protocols during outbreak investigations.

- Research priorities have been discussed. Like in many other regions of the world the following themes were mentioned: socio-economics, diagnostic tools improvement (e.g. penside tests), epidemiology including the role of wildlife, new vaccines (e.g. DIVA, thermostable vaccines) and vaccine delivery systems.

- Regarding the FAO - OIE GF-TADs Global Control Strategy the participants provided interesting feedback on some of the underlying principles as they were presented. There is a strong willingness from the representatives of the SADC countries to contribute to the preparation of this global strategy.

- Regarding national, regional or global control strategies, it was agreed that the control of PPR control is not seen as a 'stand-alone activity'. To progress with PPR control, strengthening the Veterinary Services (VS) in a sustainable manner is necessary. This in turn will create better possibilities to control other priority diseases and pursue sensible and cost-effective combinations of activities. The activities to strengthen VS are not PPR-specific and therefore are expected to have spill-over effects on the control of all major TADs.

- The recently adopted (May 2013) articles of the OIE Terrestrial Code related to PPR establishing a new official country status and open the possibility to present national PPR control to OIE for official endorsement are considered to be important steps allowing countries to engage in PPR control and eradication programmes.

- The PPR control in endemic countries is to be progressive and risk based according to the different country contexts, PPR prevalence and socio-economic impact and according to the economic capabilities of individual countries. Such a progressive risk based approach should be a phased approach with successive steps from an endemic situation with no control activities to eradication of the infection. This implies that a tool should be developed to monitor the implementation of PPR control strategies together with an accompanying assessment tool. The meeting supports the monitoring methodology proposed by the GF TADs group of experts which includes the definition of four steps with relevant activities, expected outcomes and precise criteria for entering the next step. The combination of PPR specific activities/outcomes and Veterinary Services critical competencies (according to the OIE PVS Evaluation tool) within the monitoring tool was well understood and is to be put into practice.

- Capacity building and training in several fields in addition to communication are key components of the national and regional strategies. The workshop participants were informed about the training course that will take place after the meeting (June 13 to 21) at the Tanzania Veterinary Laboratory Agency organized by the IAEA. The participants welcomed this course and have called for more such courses to contribute to building human capacities for PPR diagnosis and control.

The SADC PPR control strategy was presented by the SADC Secretariat. It was prepared by the SADC Working Group on Control and Eradication of PPR and the SADC TADs project in collaboration with the Epidemiology and Informatics and Laboratory and Diagnostic Sub-Committees of the Livestock Technical Committee. This strategy describes a comprehensive list of key components such as policy and legislation, early warning and preparedness, control options, diagnosis and quality control, regional coordination and communication, post vaccination monitoring and research. Such a document is intended to be an evolving document according to the evolution of the PPR situation within the region and in neighbouring or distant regions. Regular updating or revision of the strategy may take place in the future and it will be important to consider its coherence with the GF TADs Global PPR Control Strategy.

One of the major conclusions of the meeting is that the participants consider the need to further develop a road map and plan of action for implementing the strategy at a national and regional level in the SADC region. A vision of the SADC roadmap for PPR control should be prepared together with an action plan, a timeline with milestones and an evaluation of the costs of such national and regional strategies.

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PROGRAMME

DAY 1

MONDAY
10 June 2013

8.30-9.00	Opening and Welcome address	*AU/IBAR, OIE, FAO, IAEA, SADC, Host organization*
	SESSION 1: SETTING THE SCENE	
9.00-9.20	PPR situation worldwide	*J. Domenech, OIE*
9.20-9.40	Understanding virus lineage evolutions, gaps and challenges, research priorities	*A. Diallo, IAEA*
9.40-10.00	Underlying principles and key elements of PPR prevention and control strategies	*V. Martin, FAO*
10.00-10.30	**Break**	
10.30-11.30	PPR in the SADC region (15 min each)	
	• Overview of the situation in the region with PPR • Tanzania • DRC	*SADC* *Lab Director* *CVO*
11.30-12.30	General discussion on session 1 presentations	*All*
12.30-14.00	**Lunch**	
	SESSION 2: SPECIFIC ISSUES	
14.00-14.20	PPR and wildlife	*R. Kock, RVC; N. Gaidet, CIRAD*
14.20-14.40	Laboratory diagnostic and molecular epidemiology of PPR	*G. Libeau, CIRAD*
14.40-15.00	The socio-economic issues around PPR prevention and control	*T. Kimani, FAO*
15.00-15.20	Vaccines and quality control of vaccines in Africa	*AU-PANVAC*
15.20-16.10	**Break**	
16.10-17.30	General discussion on session 2 presentations	*All*
17.30	Close	

DAY 2

TUESDAY
11 June 2013

SESSION 3: CONTROL STRATEGIES

8.30-8.50	Lessons learned from Rinderpest and from past and on-going PPR control	*F. Njeumi*
8.50-9.00	Development of a global control strategy:	
	• Introduction	*J. Domenech*
9.00-10.30	• Developing new tool *(15 min each)*:	
	- Laboratories and epidemiology teams and networking	*A. Diallo*
	- Articles of the OIE terrestrial Code	*J. Domenech*
	- Global Research and Development network	*V. Martin*
	- PPR monitoring and assessment tools	*J. Domenech*
	- Strengthening Veterinary services and the PVs Pathway	*S. Munstermann*
	- Post vaccination monitoring tool	*S. Munstermann and F. Njeumi*
10.30-11.00	**Break**	
11.00-11.15	A continental strategy for Africa	*AU-IBAR (not present)*
11.15-11.35	SADC Regional strategy	*SADC*
11.35-11.45	Creation of Working groups	
11.45-13.00	WG1: Improving PPR surveillance and diagnosis (identifying good practices in epidemiology and laboratory diagnostic) WG2: PPR control strategies in front of different epidemiological situations WG3: PPR monitoring and assessment tools	
13.00-14.15	**Lunch**	
14.15-17.00	Working Groups (continued)	
17.00	Close	

DAY 3

WEDNESDAY
12 June 2013

8.30-10.00	Working Groups presentations *(30 min each)* • WG 1: Improving PPR surveillance and diagnosis • WG2: PPR control strategies in front of different epidemiological situations • WG3: PPR monitoring and assessment tools • Discussion	*Rapporteur WG1* *Rapporteur WG2* *Rapporteur WG3* *All*
10.00-10.30	**Break**	
10.30-11.00	Discussion	*All*
11.00-12.00	Conclusions	*All*
12.00	Close	

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