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PAN-AFRICAN PROGRAMME FOR THE CONTROL OF EPIZOOTICS

PACE EPIDEMIOLOGY UNIT (PEU) Final Report

1999 – 2007



The PACE programme is funded by the European Union



Executive summary and recommendations

Built on the success of the Pan-African Rinderpest Campaign (PARC), the Pan African Programme for the Control of Epizootics (PACE) was launched by the AOU-IBAR in November 1999. The Programme covered 32 countries in sub-Saharan Africa not including Southern Africa. Because of the war situation in Liberia and Sierra Leone, out of these 32 countries only 30 implemented really the programme. The total EC contribution is EUR 77 million (72 million for the first phase starting from November 1999 to October 2004 and EUR 5 million for the extension phase from November 2004 to February 2007).

The original overall objective of the PACE Programme was to relieve the poverty of those involved in the livestock-farming sector (producers, service providers and consumers) in Africa by improving animal productivity, trade and food security.

The specific objectives (purpose) of the programme from November 1999 to October 2004, and from 1st November 2004 to 28th February 2007 aimed to:

- Strengthen national and regional capacities to assess the technical and economical aspects of animal diseases, and to generate appropriate programmes for their control;
- Safeguard animal health in Africa against the principal epizootic diseases.
- Strengthening of surveillance to support policy formulation for the control of major epizootics and better access to global livestock markets.

During the two phases of implementation of the programme the expected results were:

- In each participating country animal epidemiology services (information, diagnostic and follow-up) and services for the control of major diseases will be reinforced;
- Privatisation will be better organised and epidemiology capacities will be strengthened to the direct benefit of livestock farmers;
- Rinderpest will be eradicated from Africa and there will be greater control over other epizootic diseases, in particular contagious bovine pleuro-pneumonia (CBPP);
- A sustainable system will be set up at pan-African level to coordinate animal health systems and the fight against epizootic disease.
- Progress made towards the eradication of Rinderpest from the Somali ecosystem and funds secured to finalize the eradication of lineage II type of mild Rinderpest from the Somali ecosystem (SES), which includes northeastern Kenya, Central and south parts of Somalia and southeastern Ethiopia (Region V).
- Verification of Rinderpest eradication in the PACE member countries, which are not concerned by SES.
- Information management and sharing capacity fully developed and passive surveillance strengthened.
- National policies and economically sound strategies for the control of priority animal diseases developed.
- Strategies developed for gaining greater access to livestock commodity markets for PACE countries.

Although PACE started in November 1999, the majority of the PACE staff, including PEU took up their posts in June and July 2000. Therefore, there was a need to define initial strategies for assisting national PACE programme in a coordinated manner.

The major activities of the PEU during this period of six and half years were focused mainly on the following results.

- Enhancement of national capacities for epidemiological surveillance;
- Facilitation of the eradication of Rinderpest from Africa (Eradication of Rinderpest from the Somali ecosystem; Verification of Rinderpest eradication in the PACE member countries, which are not concerned by SES.
- Assistance to member countries in the control of other major epizootic diseases;
- National policies and economically sound strategies for the control of priority animal diseases developed;

Strategies developed for gaining greater access to livestock commodity markets for PACE countries

Main achievements

Since the beginning of the activities of PACE Program, 29 member countries out of 30 have set up or revitalized their national ESS (96,7% of them are operational) and declared the whole country or a zone of the country provisionally free from Rinderpest. By May 2006, Twenty-one (66.6%) PACE member countries of were recognized by the OIE free from disease, 2 of them on a zonal basis. Twelve (42.86%) of which, were recognized free from infection, and 5 on historical basis.

In 2006, Côte d'Ivoire, Ghana, Mauritania, Niger (reapplication), Tanzania and The Gambia applied for recognition of Rinderpest free from infection. At the same time Cameroon, Central Africa Republic (CAR), Gabon and Ethiopia (countrywide) applied for recognition of freedom from disease. The OIE Rinderpest Ad hoc group considered all these dossiers in September 2006.

To date, Out of 29 countries, which have drafted and sent their emergency preparedness plans to PEU for comments, the Director of AU/IBAR has approved 27.

In almost all countries the National teams made up from the wildlife and veterinary authorities, were established and steering committees set up to facilitate cooperation between often different Ministries responsible for wildlife and livestock. Wildlife surveillance has been integrated into the National disease monitoring strategy, specifically for Rinderpest eradication and verification of absence according to the OIE pathway.

A network for epidemio-surveillance of wildlife was maintained, with staff trained in both veterinary and wildlife governmental agencies in the region. Proper functioning of the network relied heavily on input from the regional co-ordination units. Due to the weak capacity for wildlife interventions in many countries, the TA's had to organize and manage at all levels; administration, wildlife capture, sample collection, processing and dispatch, training and laboratory follow-up.

Three (3) laboratories have been chosen as PACE regional laboratories: National Veterinary Research Center Muguga (Kenya); Laboratoire National D'Elevage et de Recherches Veterinaires (LNERV Dakar Senegal) et Laboratoire Central de Pathologies animales de Bingerville (Cote d'Ivoire). A Memorandum of Understanding between AU-IBAR and Directors of Regional laboratories has been agreed and signed.

The laboratories Rinderpest-testing network was re-activated and the first annual meeting for regular updates on specific laboratory techniques and external quality assurance program in the serological testing for Rinderpest was held in Accra (Ghana) in September 2004; the last

two workshops were held in Entebbe (Uganda) and IN Bamako (Mali) in 2005 and 2006 respectively.

The protocols for detecting antibody in livestock and wildlife sera using virus neutralization tests (VNT) for Rinderpest and PPR in addition to c-ELISA H (OIE standard) was developed and adopted. For wildlife c-ELISA N tests are useful in the absence of VNT as the results obtained are consistent with previously reported insensitivity of c ELISA H test to antibody produced by the current lineage II strain of Rinderpest that is circulating.

Recommendations

➤ *Epidemio- surveillance systems*

In line with the current status of implementation and operation of the surveillance systems established in PACE member countries, it is recommended that the external evaluation methods of the surveillance systems promoted, and extended its use to all AU member States.

All PACE countries should implement the recommended optimisation measures, including the proposed list of common indicators, and/or those adapted for their country from those developed in Dakar 2004, and which correspond to their own major constraints. Countries should identify for each of the indicators, which data to collect, the expected thresholds, the frequency of analysis and they will communicate the results of work to the PEU routinely, etc. The PEU will assist the countries in putting the performance indicators in place.

AU/IBAR should apply the recommendations made at workshop held in Addis Ababa in March 2004 and to make the information on the case studies on cost-benefit analyses of the national ESS, available to the PACE national co-ordinations, in order to convince political decision makers of the interest and of the economic benefits for the countries to invest consistently more in the animal health sector. Further to this the recommendation, which was adopted at the African Union's Heads of States summit held in Maputo in July 2003, with regard to the commitment of allocating 10% of the national budget to agriculture should be implemented, and the recommendations adopted at the PACE Cotonou meeting in June 2002, as well as at the Addis-Ababa meeting in March 2004 (endorsed by the PACE Annual Coordination Meeting in Yaoundé, June 2004).

➤ *Wildlife component*

Considering:

- The need to ensure that the surveillance system continues to integrate wildlife surveillance and as it is a requirement according to the OIE Pathway,
- Epidemio-surveillance system is providing support to delineating remaining Rinderpest foci, but considering that there are limited financial and human resources,

It is recommended that a regional and ecosystem system wildlife surveillance approach is extended, to include West and Central Africa, with pooling of national resources regionally to achieve specific outputs in support to applications for the freedom of Rinderpest infection. In West and Central Africa opportunistic sampling (hunting) continues and a few ecosystems with significant wildlife are in addition, purposively sampled using a regional team. A regional fund for wildlife surveillance to support delineation of Rinderpest virus circulation in the Somali ecosystem is included in the AU/IBAR Somali Ecosystem Coordination Unit.

The wildlife activities should be coordinated and funded on a regional (ecosystem) basis to ensure the necessary flexibility for disease monitoring. Epidemic disease is inherently unpredictable and sporadic, which makes detailed planning difficult so the focus should be on preparedness with appropriate financial and practical instruments to be able to act anywhere in a reasonable period of time. Consequently, AU-IBAR should continue to support wildlife disease surveillance activities through the established African Wildlife Health Expert Groups (AWAEG).

➤ *Laboratories issues*

In order to sustain the PACE Regional Reference Laboratories AU-IBAR should source and provide funds to carry out the External Quality Assurance.

1. Introduction

In 1999 the Organization of African Unity Bureau for Animal Resources (OAU/IBAR) and the Commission of the European Communities (ECC) signed a financing agreement for the Pan-African Programme for the Control of Epizootics (PACE). PACE was built on the success of the Pan-African Rinderpest Campaign (PARC). The Programme started officially in November 1999 and covered 32 countries in sub-Saharan Africa not including Southern Africa. Because of the war situation in Liberia and Sierra Leone, out these 32 countries only 30 implemented really the programme. The total EC contribution is EUR 77 million (72 million for the first phase starting from November 1999 to October 2004 and EUR 5 million for the extension phase from November 2004 to February 2007).

The original (in the Financing Agreement- FA) overall objective of the PACE Programme was to relieve the poverty of those involved in the livestock-farming sector (producers, service providers and consumers) in Africa by improving animal productivity, trade and food security.

The specific objectives of the programme from November 1999 to October 2004 aimed to:

- Strengthen national and regional capacities to assess the technical and economical aspects of animal diseases, and to generate appropriate programmes for their control;
- Safeguard animal health in Africa against the principal epizootic diseases.

While the specific objectives of the Programme Extension from 1st November 2004 to 28th February 2007 are:

- Eradication of Rinderpest, and control of other epizootic diseases.
- Strengthening of surveillance to support policy formulation for the control of major epizootics and better access to global livestock markets.

As stipulated in the financing agreement (from November 1999 to October 2004) the expected results were:

- In each participating country animal epidemiology services (information, diagnostic and follow-up) and services for the control of major diseases will be reinforced;
- Privatisation will be better organised and epidemiology capacities will be strengthened to the direct benefit of livestock farmers;
- Rinderpest will be eradicated from Africa and there will be greater control over other epizootic diseases, in particular contagious bovine pleuro-pneumonia (CBPP);
- A sustainable system will be set up at pan-African level to coordinate animal health systems and the fight against epizootic disease.

Under the two prioritized objectives of PACE during the extension phase, there was five outputs listed below.

- Progress made towards the eradication of Rinderpest from the Somali ecosystem and funds secured to finalize the eradication of lineage II type of mild Rinderpest from the Somali ecosystem (SES), which includes northeastern Kenya, Central and south parts of Somalia and southeastern Ethiopia (Region V).
- Verification of Rinderpest eradication in the PACE member countries, which are not concerned by SES.
- Information management and sharing capacity fully developed and passive surveillance strengthened.

- National policies and economically sound strategies for the control of priority animal diseases developed.
- Strategies developed for gaining greater access to livestock commodity markets for PACE countries.

Although PACE started in November 1999, the majority of the PACE staff, including PEU took up their posts in June and July 2000. Therefore there was a need to define initial strategies for assisting national PACE programme in a coordinated manner. To achieve this, the first PACE Advisory Committee recommended a facilitated workshop to develop a better understanding of the vision and strategic framework under which PACE activities are to be undertaken. Consequently, a workshop was held in Machakos (Kenya) in October 2000 to formulate a strategy for the PACE programme. Together with other PACE technical experts and counterparts of the Common services from Central, Eastern and Western Africa, most of the technical staff of the PACE Coordination Units in Bamako and Nairobi, and representatives of the OAU/IBAR and the European Commission participated actively in this workshop.

During the Machakos workshop it was developed a new logical framework for common services and coordination Units and examined in detail their responsibilities for the implementation of the main activities. Therefore, the activities of individual common services would be described in their work programmes and should include those actions identified during the workshop.. It was noted that the logical frame defined at Machakos workshop was considered as a working logical frame only and that it complements, but does not replace the original one. Thus, whereas the financing agreement identified four results, the Machakos logical frame listed six results with a total of 65 separate activities. These results included:

- Capabilities of OAU/IBAR to fulfil its mandate as a Centre of Excellence in the management of animal resources are strengthened.
- Opportunities have been created to increase the capabilities of livestock owners, public and private animal health workers to work in synergy at national levels.
- Pan-African network for epidemio-surveillance is effectively functioning.
- Increased availability of quality assured vaccines, drugs and other inputs at grassroots level is promoted effectively.
- Total eradication Rinderpest from the region has been facilitated.
- Development of strategies for participatory control of other priority epizootics has been initiated.

Out of these six outputs, three required major inputs from PEU for successful implementation of the Programme, *viz*:

- Enhancement of national capacities in respect of delivery of epidemiological services;
- Facilitation of the eradication of rinderpest from Africa by assisting in the elimination of the virus from the remaining foci of infection and verification that eradication has been achieved;
- Assistance to member countries in the control of other major epizootic diseases.

Following the recommendations of the PACE Mid-term Review and those of previous last three advisory committee meetings (ACM), the Economics Unit will be part of the PEU during the extension period. To this effect, a combined global work plan and cost estimate has been prepared for the extension period. The PEU comprising of former epidemiology

and economic unit was responsible for providing guidance and coordinating activities associated with achieving the above mentioned objectives in the 30 participating countries working in collaboration with the Communication, the Data Management, Livestock Economics and Privatisation and Legislation components. Activities undertaken by organisations outside PACE, e.g. other international organisations such as FAO, OIE and NGOs were also likely to contribute to the success or otherwise of PACE.

In addition to those results identified during the Machakos' workshop held in October 2000 PEU was implementing four out five results defined during the extension period. This included:

- Progress made towards the eradication of Rinderpest from the Somali ecosystem and funds secured to finalize the eradication of lineage II type of mild Rinderpest from the Somali ecosystem (SES), which includes northeastern Kenya, Central and south parts of Somalia and southeastern Ethiopia (Region V).
- Verification of Rinderpest eradication in the PACE member countries, which are not concerned by SES.
- National policies and economically sound strategies for the control of priority animal diseases developed.
- Strategies developed for gaining greater access to livestock commodity markets for PACE countries.

The current report prepared by the Head of epidemiology Unit outlined the main achievements of the said unit for the period from July 2000 to February 2007 inclusively. The information compiled here was gathered from reports prepared by each expert, excepted the report from SERECU, which is subject of separated report.

2. Organization of the personnel within the PEU and PACE management decisions

The PEU was established in the first year of the program. Staff were recruited and offices were equipped at OAU/IBAR (now AU/IBAR) in Nairobi, at the PACE Regional Co-ordination Unit in Bamako (Mali), and in N'djamena (Chad). The Epidemiologist for Western Africa was funded by French Cooperation and he was in post from the start of the PACE Program (10). The Epidemiologist for Eastern Africa and the wildlife specialists for Eastern and Western/Central Africa were in place by August 2000 (22; H. Risto final report). The Counterpart and Main Epidemiologists joined the PACE team in the middle of July and December 2000 respectively (37). The laboratory expert seconded to PACE by the International Atomic Energy Agency (IAEA) joined the PEU team in June 2001.

Based on a recommendation made by the PEU, the epidemiologist (13) for the *cordon sanitaire* was relocated to Bamako from N'djamena, and within the first half of year 3 assumed responsibility for all countries within Central Africa as well as 3 countries in Western Africa (Mauritania, Senegal and The Gambia). The reason for this change was:

- The discontinuation of the *cordon sanitaire*
- The present inequitable distribution of the workload between the epidemiologists based in Bamako and N'djamena
- The need to achieve a critical mass within the Bamako component of the PEU.

Although the *cordon sanitaire* as such has been abolished, the area concerned continues to be of great importance and the planned active surveillance there needed to be continued at least

for two years. Due to the favourable rinderpest situation in the sub-region the planned recruitment of a veterinary assistant with equipment (vehicle, office and furniture, etc.) to be stationed in Abéché (Chad) was discontinued.

In concert with the decision concerning the epidemiologist for Central Africa, it was simultaneously agreed that the wildlife expert, previously based in Bamako, should be posted to N'djamena. This physical placement of the wildlife specialist for Western/Central Africa would not alter his responsibilities and in fact enhanced performance as most of the critical zones for surveillance were in that region. This arrangement was intended, among other things, to ensure that the epidemiology unit for Central Africa continues to exist according to the PACE financial agreement.

At the PEU meeting held in Abidjan in February 2002 the reporting lines for the regional and wildlife epidemiologists based in Bamako, Nairobi and N'djamena to the regional co-ordination in Bamako and the main and counterpart epidemiologists in Nairobi were agreed. This was formalized in the PEU Manual of Procedures. It was also agreed that in future at least 3 co-ordination meetings of the PEU would be held per year.

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Departure from the Program of the Epidemiologists for Western Africa and the Wildlife Expert based in Bamako/N'djamena in 2002 and 2003 respectively, was compensated for by the arrival and settling in of replacements the last period of first phase of PACE. The short duration of contracts and delays in renewal of the wildlife experts has caused interruption of their services, lowered morale and was a constraint to addressing the Rinderpest situation in the region effectively.

In accordance of AU recruitment procedures senior economist and laboratory Expert left PEU in March 2006 and joined their new position within AU structure (26; 27).

Within the frame work of the PACE programme, the staff of the PEU formed a group of technically sound people, enjoying good working relations and respect for each other's opinion. Within the PACE programme, the epidemiologists have enjoyed an excellent team spirit. The PEU also enjoyed a frequent and productive working relationship with the Data Management Unit (DMU). This collaboration was reflected by the fact that certain activities were implemented together. For example, together with Data management Officer the Counterpart Epidemiologist prepared a questionnaire regarding the epidemiological surveillance networks, diagnostics capacities of labs and the reporting systems in the PACE members countries. The PEU team actively participated in the development of French version of PID.

3. Overall strategy for the PEU

The PEU developed a strategy and presented it at the 3rd PACE Advisory Committee (ACM) held in January 2001 in Addis Ababa, Ethiopia. As outlined in the strategy document the PEU would concentrate in the first year on Rinderpest eradication, development of epidemiology-surveillance systems/networks within PACE countries and identifying ways to control other major epizootic diseases, principally contagious bovine pleuro-pneumonia (CBPP), Rift Valley fever (RVF) and African swine fever (ASF). The strategy adopted by the PEU took into account a variety factors as well as the capacities and requirements of individual countries that are part of PACE to ensure useful outputs. These factors included:

- An accurate understanding of the existing epidemiological capacities (including quantity and quality of personnel, infrastructure and budgetary allocations) within participating countries;
- An appreciation of the disease threats that face the various agro-ecological regions within the area covered by PACE;
- Practical possibilities for animal disease control in the PACE countries bearing in mind technological, financial, logistical and social limitations;
- Initiation and promotion of regional co-operation and mutual-assistance in the area of disease surveillance and control/eradication;
- Promotion of epidemiological, diagnostic and disease-control networks and programmes for neighbouring countries;
- Promotion of the necessity for and acceptance of quality assurance for laboratory services and disease surveillance and control activities;
- Initiation of research that will improve surveillance and control of important animal diseases in the area covered by PACE.

4. Progress made by PEU during the implementation of PACE

The initial activities were largely preparatory in character, in order to establish the functional integration of the PEU. This included a number of planning meetings to solve immediate requirements, including data processing and communication. The PEU staff assisted PACE member countries to compile their global plans and first year work programmes, necessitating many country visits and exchanges by e-mail.

The major activities of the PEU during this period of six and half years were focused mainly on the following results.

- Enhancement of national capacities for epidemiological surveillance;
- Facilitation of the eradication of Rinderpest from Africa (Eradication of Rinderpest from the Somali ecosystem; Verification of Rinderpest eradication in the PACE member countries, which are not concerned by SES.
- Assistance to member countries in the control of other major epizootic diseases;
- National policies and economically sound strategies for the control of priority animal diseases developed;
- Strategies developed for gaining greater access to livestock commodity markets for PACE countries.

4.1. Enhancement of national capacities for epidemiological surveillance

After cessation of vaccination against Rinderpest countries are required to verify absence of the disease and ultimately the non-circulation of Rinderpest virus in their territory. Those activities can only be done if an effective epidemio-surveillance system (ESS) exists in the country. To ensure unanimity of purpose and approach a meeting of the PEU was held in Ouagadougou (Burkina Faso) in June 2001. The meeting demonstrated that further consultation within the group was, necessary to develop an integrated approach and common understanding of the problems that confront the PEU. To carry the process forward a consultant (Dr Pascal Hendrixx) from CIRAD/EMVT (Montpellier, France) was appointed to assist in the drafting of a concept document outlining the principles and definitions by which the PEU would operate in future. The document (1) was endorsed by the members of the PEU present at the second meeting of the Unit held in Abidjan (Côte d'Ivoire) in February

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2002, and missions were undertaken with this as reference point to assist national epidemiology units establishing the ESS,

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Since the beginning of the activities of PACE Program, 100% of member countries have established or revitalized their national ESS and to date all diseases surveillance systems are operational excepted in Equatorial Guinea.

To enable assessment of the improvements made to ESS, PACE has to develop performance indicators, enabling countries to assess and monitor their surveillance systems including the laboratory capacity. The quality of surveillance and information systems as well as outputs of laboratories is vital to ensure efficient disease detection and control. Furthermore, institution of such measures will have limited impact unless they are sustainable in the longer term. For that reason mechanisms that take sustainability into account need to be taken into consideration during the extension period. To this end it was important to provide national governments with economic data for informed decision-making as well as sensitise them on the need for adequate financing to ensure that the ESS are sustainable.

Finally, the animal disease problems and threats that confront sub-Saharan Africa are complex and sometimes unique. Therefore considerable research is still required to develop effective monitoring and control/eradication strategies appropriate to the subcontinent. Consequently in order to achieve the enhancement of national epidemio-surveillance systems and ensure their sustainability, the following activities were undertaken,

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➤ *Development of mechanism enabling an assessment of surveillance systems (e. g. performance indicators) in PACE members countries*

To ensure that the established or revitalized ESSs in PACE member countries are functional the PEU has to develop a mechanism enabling their assessment. Consequently, a document (2) dealing with the evaluation of surveillance systems based on identified criteria and the opinions of the regional epidemiologists had previously been finalized and presented at second annual PACE coordination meeting held in Cotonou (Benin) in June 2002. Using some of these criteria and an incomplete document that had been prepared by the Regional Epidemiologist for Western Africa, the Counterpart Epidemiologist developed guidelines on performance indicators that can be used by both PACE countries for self-assessment and also by the PACE Coordination Unit (PCU). The said guidelines enabling countries to develop their own verifiable indicators of performance in the assessment of surveillance systems was made available to countries for self-assessment. These are also used by the PEU for appraisal of country performances (3). Using this document a semi quantitative method of evaluation (based on PEU and GTZ TAs mission reports to countries and information gathering from countries quarterly reports, an appraisal of surveillance systems was conducted in West, Central and East Africa. The results of assessment dependent on factors, such as: length of activities, geographical constraints, political context, and availability of funds. The objective of this dynamic process was to examine the capacity of selected countries to ensure that the ratings of country surveillance systems are accurate. The assessment was based on 67 evaluation criteria related to 11 following elements/headings:

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- National Policy
- Establishment, organization and functionality of ESS
- Animation of ESS (central and regional levels)
- Analysis and data management
- Communication (intra-extra) and flow of information
- Laboratory support (central and regional)

- Involvement of private veterinarians, livestock owners, NGOs, ...
- Monitoring of ESS activities (Performance indicators- PIs)
- Extension of surveillance to other major epizootics
- Wildlife surveillance

Every heading was comprised of 4 to 9 criteria (questions) and answers obtained were translated into scores from 1 to 4 according to well-defined rank. The comparison of the average country scores enables to establish a general classification of the various national surveillance systems and countries themselves according to the status of the PACE activities implementation in PACE member countries. The average of scores by sub/region and by headings was therefore calculated (mean/4), as it is shown in table 1.

Analysis of ESS status in PACE members countries showed a certain discrepancy between regions as well as in the implementation of ESS activities and the level of achievements in countries.

Table 1. Comparison of score coverage by region and by headings

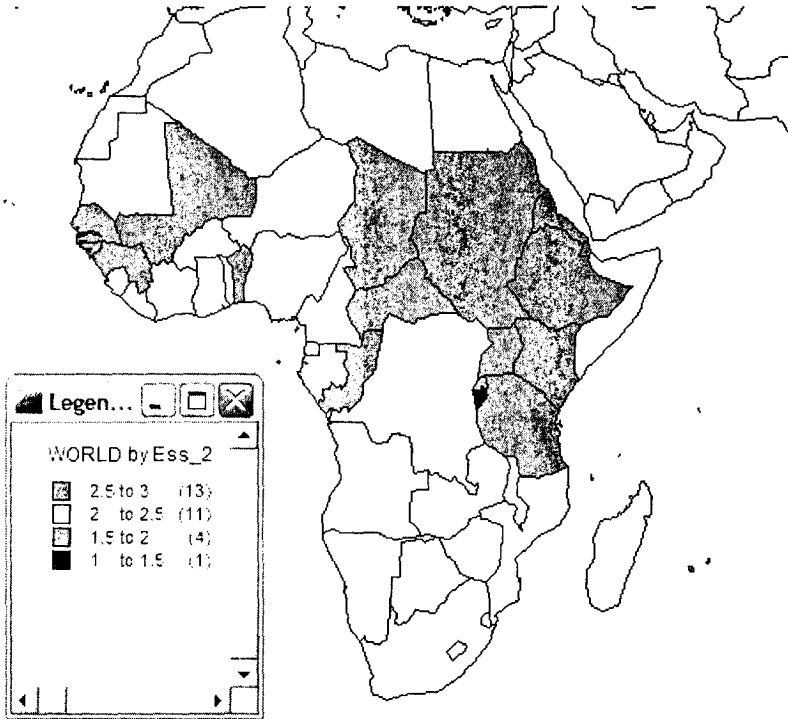
| Headings | Regions | | |
|---|-------------|-------------|-------------|
| | Western | Central | Eastern |
| National Policy | 2.47 | 2.09 | 2.52 |
| Establishment of ESS | 2.74 | 2.75 | 2.47 |
| Organization of ESS | 2.39 | 2.30 | 2.08 |
| Animation of ESS | 2.60 | 2.42 | 2.51 |
| Data management | 2.64 | 2.44 | 2.75 |
| Communication | 2.40 | 2.74 | 2.34 |
| Laboratory support | 2.77 | 2.19 | 2.80 |
| Involvement of private vet, livestock owners, NGOs, ... | 2.37 | 2.20 | 2.26 |
| Monitoring of ESS activities (PIs) | 1.23 | 1.70 | 1.28 |
| Extension of surveillance to other major epizootics | 2.74 | 2.20 | 2.79 |
| Wildlife surveillance | 2.01 | 1.80 | 1.99 |
| Mean | 2.40 | 2.25 | 2.34 |

The first results of the appraisal conducted in West and Central Africa were presented at a workshop on ESS optimization held in Dakar, August 2004 (4). Since that date these data were updated and extended to East Africa, and were presented then at the 11th and 13th ACM held in October 2005 and 2006 in Nairobi (4; paper presented at 13th ACM). The results of the evaluation showed that out of 29 PACE member countries (without Equatorial Guinea) 76% of them have got a score varied between 2.0 and 2.75, which is satisfactory (map 1). Only 7% were under the limit, which is unsatisfactory, and this concerned 4 countries. The results of this appraisal showed also that there is a correlation between the status of PACE implementation in countries and the functionality of ESS (coef. of correlation is 0.85), which means that countries having carried out major activities of the PACE program are also those having the most efficient ESS and vice-versa.

In conclusion all PACE member countries (excepted Equatorial Guinea) have set up a surveillance system with common elements viz. legal regulatory authority (steering and technical committees in West and Central Africa), central and field units.

- 13/29 assessed countries > 2,5
- 5 countries < 2 (1 < 1,5)
- 24 ESS are considered functioning
- 80% countries / score = 3/4 (satisfactory)

Map 1. Global classification of ESSs in PACE member countries by June 2005



In order to develop a synthesis of opinion on where and how surveillance systems can be optimised, The PEU organised a workshop in August 2004 in Dakar (Senegal), involving all PACE member countries and TAs appointed by GTZ. The report of this workshop as well as the reports on the assessment of national surveillance systems is available (4).

Generally it was agreed at the workshop that established surveillance systems vary between countries, due to different administrative structures, state of infrastructure development. There is a marked difference in set-up of surveillance systems between East Africa on the one hand and West and Central Africa on the other hand. In East Africa PACE strengthened the government structures in place and thus include all veterinary field staff and generally cover the total country, while West and central Africa have established a network of selected field staff and improved their mobility, capacity to collect samples and motivated them by providing financial incentives. The latter has a more limited geographical coverage. In any circumstances all systems include:

- Managerial, coordination and technical support from the CVO and Central Epidemiology Unit (with mobile teams and communication unit).
- Laboratories provide the diagnostic capacity
- Field staff based on various field agents (e.g. veterinary departmental staff responsible for surveillance under conventional administrative structures (East) or in specifically selected posts (West & Central), private sector, abattoir/market surveillance posts (West & Central) and livestock owners.

During the workshop it was identified the following constraints and solutions that are grouped into three main categories, i.e. coordination, laboratory support and field level. One cause of insufficient reporting was identified as a lack of beneficial actions in response to reports, or other incentives, which discouraged stakeholders even within the system from being proactive or efficient. The laboratory problems were complex but also suffered from a lack of funding. Constraints regarding the central coordination unit of the surveillance systems included, poorly defined terms of reference of the different actors in the system, absence of surveillance protocols for certain diseases, data processing and management, integration of livestock owners in the system. The laboratory problems were complex but also suffered from a lack of funding.

Consideration was given to broad actions, which would optimize the surveillance system in countries including. These include:

- Supportive legislation, regulations and a veterinary code (if absent) for e.g. quarantine and inspection, privatization, registration of Animal Health personnel and re-organization of Animal Health systems.
- Establishing budgetary support from Gov. for surveillance.
- Strengthening disease information systems (PID/ARIS) and reporting.
- Creation of “free zones” for specific trade sensitive diseases based on establishment of a demarcated area, with effective vaccination, quarantine, active and passive surveillance.
- Commodity based trade involving the processing of livestock products to ensure food safety, which circumvents some of the export constraints currently experienced in Africa associated with the very real difficulties in achieving effective control of some diseases.

➤ ***Development of mechanism enabling a sustainability of established surveillance systems in countries***

A fundamental requirement for adequately controlling or eradicating animal diseases and thereby gaining access to export markets is, for each country in the region, to possess an adequate veterinary service. A key component to this is an effective surveillance system for important animal diseases, particularly those that affect trade in livestock and livestock products, human health or economics of animal production, without which, veterinary service will not be considered reliable. Consequently, in the context of globalization, the development of ESS has become a priority for veterinary services in countries with a need or desire to participate in international trade of animals and animal products.

Most governments unfortunately are facing major economic and financial problems and are finding it difficult to adequately fund veterinary services, and most veterinary services do not have a fund-raising strategy in place to correct this situation and hence either have no formalised plan or have ones that are unrealistic. The challenge for the region collectively is to identify alternative ways of funding animal health systems on a sustainable basis. As

stipulated in the Financing Agreement, the first step is that countries have to increase gradually their financial contribution to the PACE programme so that after the end of programme (October 2006) they will take over full funding of all the epidemio-surveillance activities on a sustainable basis.

Based on fundamental elements of ESS given by PEU, the Economics Unit has evaluated the cost of some national surveillance systems and has established guidelines on-funding levels needed to sustain them. This was presented at a workshop jointly organised by the Economics Unit and PEU in Addis Ababa (Ethiopia) under the auspices of African Union (AU). The main objectives of this workshop was to present economic justifications for adequate funding of animal health programme; examine alternative fund raising strategies for financing of national surveillance systems and veterinary services in general; and examine the possibility of export-driven initiatives to promote investments in livestock production. The report of this workshop is available (5).

In an effort to make the surveillance systems more sustainable and provide an incentive to improve and adapt existing surveillance systems the PEU developed ideas, which would increase the justification of ESS. The focus was on developing export systems adaptable to African conditions. An external consultant appointed through the FAO contract of PACE assisted with the process and the final report is completed and is available (6). The PEU has advanced these concepts developed during the consultancy and has developed proposals around the issue of commodity-based trade that are being considered by the OIE. An article was published in the Veterinary Record on this subject and it attracted immediate editorial and related debate (7).

Sustainability of a wildlife surveillance network has been a concern at the country level for a number of reasons and this was debated at workshop held in Dakar in August 2004. The participating countries took a decision there that this issue should be addressed through consolidation of regional teams and working at an ecosystem level, pooling resources and sharing data of a transboundary nature. This had both scientific and practical benefits and would facilitate such matters as preparation of OIE pathway dossiers for applications on freedom from disease or infection. This request from countries will be implemented during the extension phase.

➤ *Training for improvement of ESS*

A difficulty that confronted the PEU was that training funds within PACE were allocated directly to individual countries that usually have fixed plans, sometimes unrealistic, for the funds allocated. Therefore, organization of training centrally at the level of the PEU was constrained. Added to this was the problem of language preference in different countries. However, a training program was developed by the Bamako component of the PCU in year 2 in association with consultants from the International Trypanotolerance Centre in Banjul and CIRAD-EMVT. In accordance with this program, a training workshop was implemented in December 2002 in Banjul (Gambia) on management information systems. Another workshop was organised in Dakar (Senegal) in May 2003 on epidemiology. The report of this training workshop is available on CD-ROM and was distributed to PACE member countries (8). Unfortunately, training on risk assessment/analysis was not conducted in time as planned and was finally organized in January 2006 in Dakar (Senegal) in association with independent consultants from CIRAD.

Under the auspices of AU/IBAR, IAEA jointly with the PEU organised a regional training workshop on rinderpest indirect ELISA in Dakar (Senegal) in November 2001, coordination meeting of TCP RAF/5/053 in Nairobi (Kenya), April 2002, and the Third Research Co-ordination Meeting of the FAO/IAEA Co-ordination Research Programme (CRP) on the Diagnosis and Control of CBPP in Africa held in Nairobi in June 2001, and on the Use of Molecular Techniques in the diagnosis of animal diseases in 2004 in Bamako (Mali). The minutes and recommendations of these training workshops are available. In addition at the request of the country, the laboratory expert conducted a training workshop on quality assurance in Vom (Nigeria) in January 2003.

Wildlife epidemio-surveillance is a new field of activities launched by PACE Programme in Africa. That why, it was necessary to precise the concept before bringing it to the field. This was done through training workshops. Therefore, it was decided by the Regional Co-ordination for West and Central Africa to launch its own training workshop. From January 2000 to April 2003 the following training workshops were organised by Wildlife expert for West and central Africa based in Bamako (Mali) on:

Wildlife epidemio-surveillance

- Training workshop training held in Niokolo Koba National Park (Senegal) in January 2001;
- Training workshop training held in Lopé National Reserve (Gabon) in July 2001;
- Training workshop training held in Bénoué –Garoua National (Cameroon) in January 2003;
- Training workshop training held in Shaï Hills National Reserve (Accra, Ghana) in July/August 2001;
- Training workshop training held in Natitingou and Pendjari Parks Pendjari (Bénin) in December 2001.
- Training workshop training held in Yankari National Yankari Park (Nigeria) in January 2002.

During this period a total of 89 officers from 18 countries were trained, and the field results were satisfactory with 73 % of the trained countries training themselves later on their own field agents (290), and doing suspicions on wildlife.

Wildlife game captures techniques

- Training workshop training held in Shange (Zimbabwe) in September 2002;
- Training workshop training held in Bénoué –Garoua National (Cameroon) in January 2003;
- Training workshop training held in Kainji Lake National Park (Nigeria) in February 2003.

Out of the 24 officers (from 11 countries) trained, 9 have got good marks at the final test. Furthermore, they did participate to 72 days of capture in the field (using only sustainable techniques) gaining more experience by catching 164 animals, including 85 buffaloes.

Following these training workshops knowledge in wildlife pathology and epidemio-surveillance has been significantly improved in West and Central Africa, and a document on wildlife training was drafted both in French and English and circulated in PACE member countries. The proceedings of the training workshops are available on CD-ROM and were distributed in PACE member countries (9; 46; 47; 48; 49; 50; 51).

After the training Workshops in wildlife game captures, the regional Co-ordination Unit for West and Central Africa has selected 9 officers, who are able to continue the work beyond the PACE programme. Unfortunately PEU realised that most of these well-trained officers were posted to another positions by the end of December 2003. This kind of situation is not helpful for the sustainability of the Programme itself.

For Eastern African countries a training workshop on epidemio-surveillance in wildlife populations was organized in Arusha (Tanzania) in November/December 2002 (11). The Wildlife and Laboratory Experts represented PEU at this workshop with assistance from PACE coordinator. Participants from Ethiopia, Eritrea, Sudan, Somalia, Uganda, Kenya and Tanzania attended it. The main focus was to increase awareness relating to key transboundary disease and veterinary issues affecting wildlife. A particular issue presented was the African Lineage II Rinderpest virus currently circulating in the region and the differential relationship with PPR virus. The workshop fostered the establishment of the wildlife disease epidemiology network under PACE and established the Wildlife Disease Association Africa and Middle East Section in support of regional wildlife disease work and research.

A regional consolidation and training workshop for national wildlife experts was held in Mole National park (Ghana) in July 2005 (25). The objectives of the workshop was to review the current capacity for this work and discuss the way forward for wildlife disease surveillance in Africa under PACE and beyond using the principles agreed in Dakar 2004 for a regional and ecosystem approach. Based on regional approach it established during the workshop an "AFRICAN WILDLIFE HEALTH EXPERT GROUP" (AWHEG), which is managed out of IBAR and functions for surveillance activities as two field entities; an East and a West-Central African grouping. This approach needs the endorsement of IBAR and member states to function. A major objective of the PACE-AWHEG will be to coordinate and ensure the feedback of wildlife information to the ARIS database. It is therefore important for sound scientific analysis to have standardized National data, which can be interpreted and analysed regionally.

4.2. Facilitation of the eradication of Rinderpest from Africa

4.2.1. Progress along the OIE Pathway for Rinderpest (Rinderpest freedom status)

➤ *Situation in West and Central Africa*

The eradication of Rinderpest from Africa and the verification of the absence of the infection remains the principal task of the PACE program in general and PEU particular. Consequently, The PACE Epidemiology Unit was assisting in the improvement of epidemiological surveillance systems and in the preparation of the dossiers for the application of freedom from Rinderpest.

The OIE Pathway offers a number of alternatives for countries to progress toward the goal of freedom from Rinderpest infection. Therefore, the selection of the most appropriate strategy is important. Since most countries of West Africa have been free from Rinderpest for 10 years or more, the activities were focused on assisting countries to fulfill conditions required by the OIE pathway to verify the absence of Rinderpest disease and infection. Most of these countries focused their disease surveillance on pursuing the OIE pathway for the declaration of freedom from Rinderpest.

Countries in Central Africa are not as far along the pathway and the focus is to verify the absence of disease, where it is now believed to be absent and this will be followed within a few years by verification of the absence of infection. The current situation of PACE countries in the sub-region with regard to the OIE Pathway is summarized in Table 2. A complication for Central African countries is their proximity to the seemingly last focus of rinderpest virus infection in the world, *viz.* the Somali Ecosystem. This needs to be borne in mind when Central African countries, especially those to the east of the region, make application to the OIE for freedom from rinderpest. For this reason their needs to be close collaboration and coordination between countries such as Chad, CAR, DRC, Sudan and Uganda.

Because of the “permeable” National borders in Africa and recognizing that animals within the region are under similar epidemiological conditions and risk of disease, countries in the region accepted the importance of a regional approach to the eradication of Rinderpest to facilitate progress along the OIE Pathway. In line with this a workshop was held in Abidjan, Côte d’Ivoire in February 2002 (12). Following the recommendations of this workshop it was proposed that Guinea Bissau, Gambia, Congo/Brazzaville, DR Congo Burundi, Rwanda and Equatorial Guinea should apply to the OIE for recognition of historical freedom from Rinderpest infection as defined in appendix 3.8.1 of the Terrestrial Animal Health Code (2004). This is based on the 10 years rule for declarations of freedom from infection.

In order to assist countries in the preparation of their dossiers for recognition of freedom from Rinderpest disease, missions were undertaken to countries in West, Central and East Africa. As achievements of this since in May 2003 to date, 12 were declared by the OIE free from Rinderpest infection and 9 from disease.

Table 2. Progress made towards the OIE pathway in West and Central African Countries

| Countries | Rinderpest status | | |
|-------------------|--------------------|----------------------|------------------------|
| | Provisionally free | Freedom from disease | Freedom from infection |
| Benin | 1999 | 2003 | 2005 |
| Burkina Faso | 1998 | 2003 | 2006 |
| Cameroon | 1999 | Applied in 2006 | |
| CAR | 2004 | Applied in 2006 | |
| Congo/Brazzaville | | | 2006 |
| Chad | 2002 | 2006 | |
| DR Congo | 2003 (ZB) | | 2006 |
| Côte d’Ivoire | 1997 | 2004 | Applied in 2006 |
| Gambia | 1990 | | Applied in 2006 |
| Gabon | 2005 | Applied in 2006 | |
| Ghana | 1997 | 2003 | Applied in 2006 |
| Guinea Conakry | 1996 | 2003 | 2006 |
| Guinea Bissau | 2003 | | 2006 |
| Mali | 1997 | 2003 | 2006 |
| Mauritania | 1999 | 2003 | Applied in 2006 |
| Niger | 1999 | 2003 | Reapplied in 2006 |
| Nigeria | 1998 | 2004 | |
| Senegal | 1997 | 2003 | 2005 |
| Togo | 1996 | 2003 | 2005 |

➤ *Situation in the cordon sanitaire*

The PACE Epidemiologist for Central Africa opened an office in N'djamena and, together with his Bamako-based colleagues, established contacts with livestock and wildlife authorities in Chad and the Central African Republic (13). In February 2001, the PEU started extensive reconnaissance of the *cordon sanitaire* in Western Sudan, CAR and Chad, in order to assess the cordon's effectiveness as a strategic buffer and to re-evaluate the effect it has on the ability of the countries concerned to move towards Rinderpest eradication. As a result of this assessment, a Tripartite Meeting on the *cordon sanitaire* involving Sudan, CAR and Chad as well as PACE was held in Khartoum (Sudan) over the period 27-29th November 2001. The objectives of the meeting was to evaluate the recommendations of the last meeting held in N'djamena, and to define the updated strategy for verification of final Rinderpest eradication in Central Africa. The report of the meeting is available (14). Based on the fact that vaccine coverage in the *cordon sanitaire* has never exceeded 30%, wildlife data were negative for recent infection and that the infected zone in Sudan had moved eastwards, a consensus be reached that the *cordon* is no longer viable and appropriate. In consequence vaccination against rinderpest ceased in Chad at the end of March 2002. It was agreed that all vaccination in southern Sudan would cease in June 2002. When the *cordon sanitaire* ceases to function as such, the epidemiologist devoted to the *cordon* will lose many of his responsibilities. Therefore, the PEU proposed that the epidemiologist devoted to the *cordon* be redeployed and take on responsibility for other countries in Central Africa in addition to those in Chad and CAR.

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Because of the apparent confinement of the infection to the Somalia Eco-system, the *cordon sanitaire* is officially discontinued. Consequently, the OIE delegate of Chad declared his country to be provisionally free from rinderpest, and Sudan declared an extension to the zone that is provisionally free from the disease in November and March 2002 respectively (OIE, 2003). Although CAR has enlarged the declared provisionally free zone free from Rinderpest, there was still vaccination in certain parts until December 2003. CAR has now stopped vaccination and declared itself provisionally free from Rinderpest in 2004.

➤ *Situation in East Africa*

Although East Africa is considered as a zone of active infection there was considerable progress made along the OIE pathway by some countries. In this zone the infection is believed to be absent from Burundi, DR Congo, Djibouti, Eritrea, Rwanda, Tanzania, Uganda and most probably Ethiopia. Considerable progress has been made in the elimination of the last lineage I rinderpest virus reservoir in southern Sudan where no disease outbreak has been reported since 1998. In line with the recommendations of the 1st Regional Co-ordination Meeting for Eastern Africa held in Entebbe (Uganda) in August 2001, countries in the region accepted the importance of a regional approach to eradication of Rinderpest and progress along the OIE Pathway. It was decided that countries in the region should cease vaccination against rinderpest by the end of December 2001 and declare themselves provisionally free from rinderpest countrywide or on a zonal basis during 2002.

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Due to the fact that Djibouti was not OIE member and Rwanda and Burundi with civil war situation, these countries declared themselves provisionally free from Rinderpest only in July, October and November 2003 respectively. The status of Rinderpest in East Africa with regard to the OIE pathway is summarized in table 3 below.

Table3. Rinderpest status with regard to the OIE Pathway in East Africa, excluding Somali ecosystem (SES)

| Countries | Rinderpest status | | |
|-----------|--------------------|----------------------|------------------------|
| | Provisionally free | Freedom from disease | Freedom from infection |
| Burundi | 2003 | | 2006 |
| Eritrea | 1999 | 2004 | 2005 |
| Djibouti | 2003 | | |
| Rwanda | 2003 | | 2006 |
| Tanzania | 1998 | 2005 | Applied in 2006 |
| Sudan | 2004 | 2006 | |
| Uganda | 2002 | 2006 | |
| Ethiopia | 1999(ZB) | 2005(ZB) | |
| Kenya | 2004(ZB) | 2006(ZB) | |

➤ **Situation of Rinderpest in Somali ecosystem (SES)**

To date there is a single zone of critical importance to the final eradication of Rinderpest from Africa, viz. the Somali Ecosystem (covering north-east Kenya, Southern Somalia and the Ogaden of Ethiopia) in which strains of lineage II virus that produce mild or no disease in cattle are presumed to be circulated. In this area eradication remained the priority but this can only be tackled effectively once the behaviour of the persisting virus is adequately understood. Activities of the PEU were therefore being directed primarily at supporting and monitoring activities in this region. For that reason the most challenging task for the PEU during this period was to assist in strengthening surveillance systems in the Somali ecosystem and the associated border areas of Ethiopia, Kenya, Uganda and Tanzania (15;16). At the PEU level this was achieved by close liaison with groups operating in Somalia (PACE Somalia, CAPE and the NGOs).

Based on the belief that Rinderpest virus was circulating in the nomadic cattle population of southern Somalia and North Eastern Kenya, the participants of the “Mbagathi workshop” that was organised in June 2002 (17), adopted a strategy for the eradication of mild Rinderpest virus from the Somali Ecosystem and for the protection of at-risk areas e.g. Maasailand. The basis for this strategy was an effective, comprehensive and harmonized regional surveillance system that utilizes a complimentary set of participatory, laboratory-based and analytical epidemiological tools to identify cattle (and wildlife) populations with *active virus transmission*. Targeted vaccination (immuno-sterilisation) of these cattle populations was identified, as the most appropriate strategy to counter the problem, as the current thinking is wildlife alone cannot harbour the virus for more than 2-3 years. The adopted strategy is referred to as the “*seek, confirm and eliminate*” strategy. This strategy was based on the presumption, that mild Rinderpest is clinically detectable, especially if disease intelligence gathering techniques were improved by providing training in participatory techniques. To this end, the CAPE unit of PACE has developed Participatory Disease Searching (PDS) as a surveillance tool. By detecting infected herds and immuno-sterilising these herds and contact herds, we would be able to eliminate the virus from the ecosystem, without having to conduct mass vaccination in a wide area, with all its logistical problems.

The recommendations of the mild Rinderpest workshop mentioned above included the use of Participatory Disease Searching (PDS) as an integral part of comprehensive surveillance system. It was proposed that the PACE Common Services and national programmes endeavour to train veterinary professional in participatory disease searching in Somalia,

Kenya and Ethiopia, followed by a coordinated application through frequent follow-up workshops and coordination meetings in key border locations. Consequently, in November 2002, jointly with PEU the CAPE unit organised training in Griftu to provide selected veterinarians from the three countries basic skills in PRA and PDS and to develop harmonised action plan. This training session was followed by a training of trainers (TOT) on PDS organised by CAPE, in February 2003. These trainers, funded by the national PACE programmes, would in turn train selected veterinarians at country level and followed by implementation of PDS in identified high risk areas. In country PDS training was conducted in Kenya (August 2003) and Ethiopia (January 2004). CAPE further organised a workshop to assess the implementation of PDS in the Somali ecosystem in December 2003. In all countries, shortly after implementation, mild Rinderpest-compatible events were detected and investigated as a result of active disease search in Somalia (February 2003) and PDS in Kenya (September 2003) and Ethiopia (February 2004). It maybe concluded that PDS has increased the sensitivity of surveillance programs in the Somali ecosystems. Despite and active disease searching in Kenya, Ethiopia and Somalia, review of all the available data currently available must lead to the conclusion that the presence of infection in cattle, caused by Rinderpest virus in the Somali Ecosystem is presently uncertain. This is supported by an absence of laboratory confirmation.

Since the last confirmed case of Rinderpest infection occurred in wildlife at Meru Park in September 2001, mild Rinderpest-compatible syndromes were observed in cattle within SES but in all cases there is reason, in retrospect, to doubt the accuracy of the diagnosis. These incidents occurred at Ruga Garissa district in September 2003, Dobley in Afmadow district in March 2004, at El Wak in Gedo District in March 2004 and at Elquran, Dolo Bay district in Ethiopia, near the Somali border in May 2004. In all instances a national or regional reference laboratory made a positive diagnosis. However, subsequent follow up at international reference laboratories failed to confirm the diagnosis.

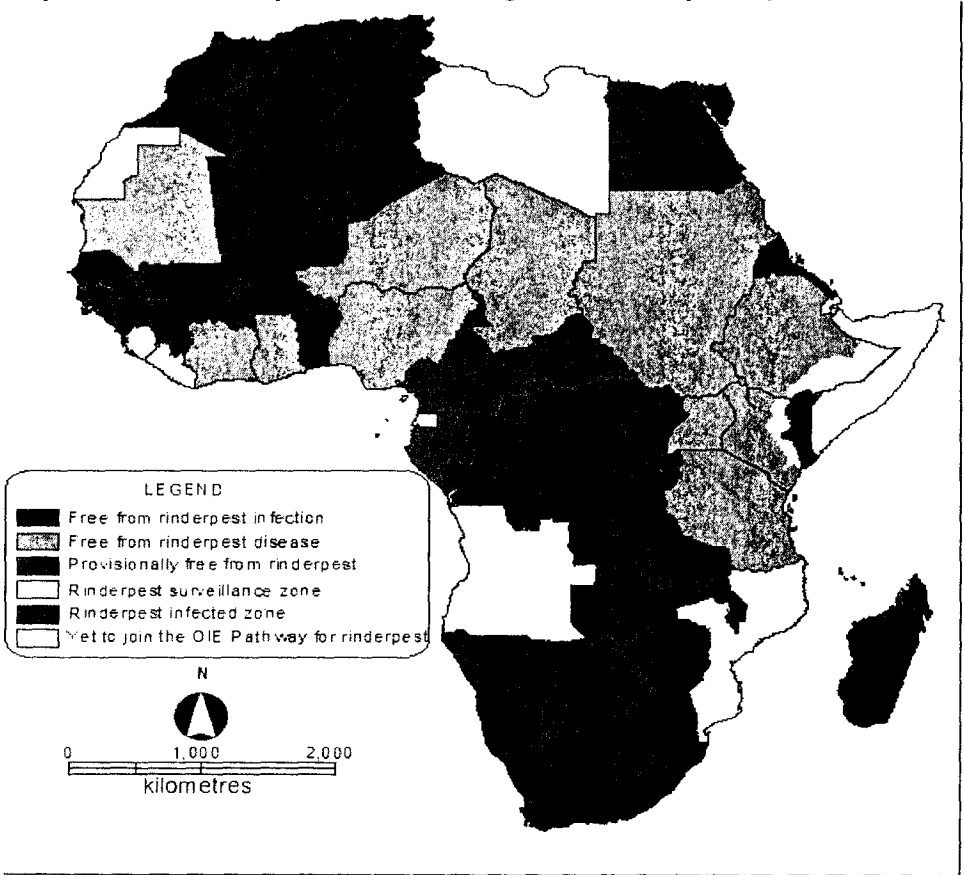
It is still not conclusively known whether Rinderpest virus causes the clinical syndrome detected in the field in cattle and if so by which lineage. Once again it is let down by diagnostic laboratories producing equivocal results. Improving specificity will require improving disease investigation skills, sample collection and preservation and improving linkages between the laboratory and PDS teams to assure a timely laboratory confirmation. Consequently, it is suggested to establish a “disease search team” within PEU that is properly equipped, financed and authorized to act on behalf of AU-IBAR and the Veterinary Services of Ethiopia, Kenya and Somalia. This disease search team called ”Somali Ecosystem Rinderpest Eradication Coordination Unit (SERECU). The mandate of this structure is to coordinate and monitor activities agreed upon by the three countries concerned (Ethiopia, Kenya and Somalia) to assure dynamic management of the eradication of mild Rinderpest from the ecosystem.

In accordance with the strategy adopted at a workshop held in Nairobi in February 2004, which is “delineation and mass vaccination applicable with a preparative phase” (18) the PEU drafted a work program for SES to be implemented during the extension of PACE taking into account the integrated (regional) approach. To discuss the issues, a meeting was called on 7-8th October 2004 with all stakeholders. At this meeting an agreement was reached on the denomination, composition and terms of reference of SERECU.

In addition to the critical efforts towards eradication of the last likely foci of virus, verification of absence of disease and virus in SES was a priority of the PEU. To this end

PEU liaised with OIE, IAEA and FAO/GREP to harmonize and integrate the OIE Pathways for rinderpest. It was pointed out at the meeting held in Vienna in November 2003 that the present OIE Pathway for recognition of freedom from rinderpest does not accord with the epidemiological problem posed by mild rinderpest. In this line, the PEU made recommendations for amendments to the rinderpest chapter of the Code and OIE pathway. Also the recommendations for amendments the OIE rinderpest questionnaire to be filed for application was proposed by PEU in 2004.

Map 2. Status of Rinderpest freedom with regard to the OIE pathway



Overall by end of May 2006, Twenty-one (66.6%) PACE member countries are recognized by the OIE free from disease, 2 of them on zonal basis. Twelve (42.86%) of which, were recognized free from infection, and 5 on historical basis (see map 2).

In 2006, Côte d'Ivoire, Ghana, Mauritania, Niger (reapplication), Tanzania and The Gambia applied for recognition of Rinderpest free from infection. At the same time Cameroon, Central Africa Republic (CAR), Gabon and Ethiopia (countrywide) applied for recognition of freedom from disease. The OIE Rinderpest Ad hoc group considered all these dossiers in September 2006. It is anticipated that by May 2007, 18 countries will be free from infection and 9 free from disease.

➤ *Emergency preparedness plans (EPP)*

One of the conditionality to access to Rinderpest emergency funds per financing agreement is that country should have an updated and approved by the Director of AU/IBAR emergency preparedness plan. To assist countries in development of contingency plans mission was undertaken by the OIE regional representative for Africa and the PACE Counterpart Epidemiologist in few countries from Western Africa for assessment of the current situation. Following this mission, a practical guideline for emergency preparedness planning (21) was sent to countries in the region. From 11 to 15 February 2002 the workshop jointly organised by OAU/ IBAR/ PACE and IAEA on the emergency preparedness plan (EPP) and OIE pathway was held in Abidjan (Côte d'Ivoire). As a follow up of this workshop, all countries were requested to finalize their emergency preparedness documents and submit to OAU-IBAR for approval by March 2002.

In order to allow the PEU team to have a common opinion on an appraisal, an agreed document on criteria used by the PEU staff for appraisal of countries EPP was developed. This includes the following components:

- A legislative framework exists for enabling emergency responses outlined in the plan submitted
- The document contains a coherent strategy (national policy) for dealing with the occurrence of Rinderpest and its eradication;
- At least a qualitative assessment of risk of Rinderpest incursion is contained in the document. This should be updated according to the new situation within the country or in the bordering countries
- A national disease emergency committee with the authority to act quickly and effectively is in place
- Rinderpest control expert team is trained and in place (available)
- An adequate plan for examination of Rinderpest suspect specimens and for serology is in place (capacity of national laboratory)
- A resource inventory (human, material and financial resources) is included in the document and is adequate for the strategies outlined
- There is provision for financing the strategies and actions outlined in the emergency plan including cost estimates of the scenarios envisaged incorporating the national and the regional (OAU/IBAR/PACE) funds available
- Means of communication are available between the principle role players involved in the emergency plan including plans for informing the general public
- A clear chain of command demonstrated between field operatives and central units exists (field, Director of veterinary service or other veterinary authority and laboratories)
- The emergency preparedness plan for Rinderpest should be approved by relevant national authority or should be submitted to the relevant national authority for approval)
- Realistic plans for access to a vaccine bank need to be included in the emergency plan
- Chronology of actions, which will be undertaken within the emergency situations (action plan)

To date, out of 30 PACE member countries 27 have their Plans approved by the Director of AU/IBAR.

➤ **Emergency Rinderpest vaccine stock**

In order to prevent an eventual spread of Rinderpest in countries that have been declared provisionally free from the disease and to subsequently control any outbreak in the eastern African countries at risk and eventually where the disease is present, a strategy has been developed to establish a Rinderpest emergency vaccine bank. Therefore, the PACE Epidemiology Unit in relation with the PACE Coordination Unit (PCU) have initiated an advertisement in order to request all veterinary vaccine producing laboratories to present their bid for the supply of 500,000 doses of thermostable Rinderpest vaccines with the ultimate objective of establishing an emergency Rinderpest vaccine stock. Applications were received only from Botswana Vaccine Institute (Pty) Ltd (BVI), *Laboratoire National Vétérinaire* (LANAVET) in Cameroon, Kenya Veterinary Vaccines Production Institute (KEVEVAPI) and *Laboratoire Central Vétérinaire* in Mali (LCV). The PEU and the PCU have developed then some criteria to evaluate the bids received so far. The criteria and evaluations are presented in table 4 below.

Table 4: Criteria and evaluation

| Supplier | Quotation received in time | Vaccine Supplied immediately | Conditioning, storage and period of delivery | External QC assessment | Price for dose (US \$) |
|----------|----------------------------|------------------------------|--|-------------------------------|--------------------------------|
| BVI | Yes | Yes | Delivery time: 48 hours- Storage free of charge | PANVAC 's accepted control | 0.045 |
| LANAVET | Yes | No (6 months) | Delivery time: 1 month | Batches do not always comply | 0.0553 (Approx., quote in FRF) |
| KEVEVAPI | No | Yes | Delivery time: 2 weeks | Batches do not comply oftenly | 0.0641 (Approx., quote in KSH) |
| LCV | No | Not stated | Delivery time: less than 10 days | Batches do not always comply | 0.0346 (Approx., quote in CFA) |

In view of the above, it has been recommended that the Botswana Veterinary Institute (BVI) is the best suitable laboratory to supply the 500,000 doses of the thermostable Rinderpest vaccine to PACE. Therefore the PCU has been given the mandate to conclude the agreement for establishing a Rinderpest emergency vaccine stock with BVI. Consequently, this laboratory has been awarded the tender to produce and supply the thermostable Rinderpest vaccines to PACE when required. From January 2001, the emergency vaccine stock of 500,000 doses of thermostable Rinderpest vaccine was in place at the Botswana Veterinary Institute (BVI). The initial agreement in force was that, the BVI would store the vaccine and dispatch it to any destination in Africa on the request of the Director of AU-IBAR within 48 hours.

Within the PACE Work Programme and Cost Estimates (WP&CE) for Year 3, approval was granted to PACE to utilise USD 49,566.00 from the contingency provision of the budget for the purchase of 500,000 doses of Rinderpest vaccine. The PACE WP&CE for year 4 had a provision for vaccine renewal. Consequently, PEU drafted a MoU to translate the previous arrangement into a formal agreement between the two institutions. A follow-up mission to extend the previous arrangement was made to Botswana in June 2003, during which a general agreement was reached. The MOU aimed to ensure the following:

- The availability and dispatch of a nominated quantity of the stored TCRV (up to a maximum of 500 000 doses) within 48 hours of written instruction from the Director of AU-IBAR reaching the BVI.
- Storage of the vials containing the freeze-dried vaccine at -20°C until 31 October 2004 (after this date an extension or amendment to this agreement will need to be made between AU-IBAR and BVI because PACE is due to end on that date).
- Ensure that representative samples of the vaccine supplied are tested prior to their use and found to comply with the requirements of such vaccine specified in Chapter 2.1.4 of the OIE Manual of Standards (2004).

➤ *Emergency funds*

An emergency fund of 0.5 million Euro is established under PACE and entrusted to the Office International des Epizooties (OIE) in Paris. According to the financing agreement the maximum amount of funds committed for one-time emergency in a country would be euro 100,000. This money in this fund would be used for the control of Rinderpest emergencies outbreaks in countries that satisfy the conditions listed below:

- Existence in the country of an updated national Rinderpest emergency preparedness plan approved by AU/IBAR
- Progress along the OIE pathway (cessation of vaccination against Rinderpest)
- To be adjacent to one of the known infected country

In terms of Section 1.2 of the agreement between the EC and the OIE relating to “the emergency fund for Rinderpest outbreaks”, the OIE is obliged to assume responsibility for implementing and managing an emergency fund following the objectives and procedures as specified in the terms of reference, and in the specified budget breakdown (see Terms of Reference in annex) through its own resources or by subcontracting labour or an NGO.

- Investigation of the emergency
- Planning of control measures with overall responsibility for implementation and co-ordination
- Organisation of post-control surveillance.

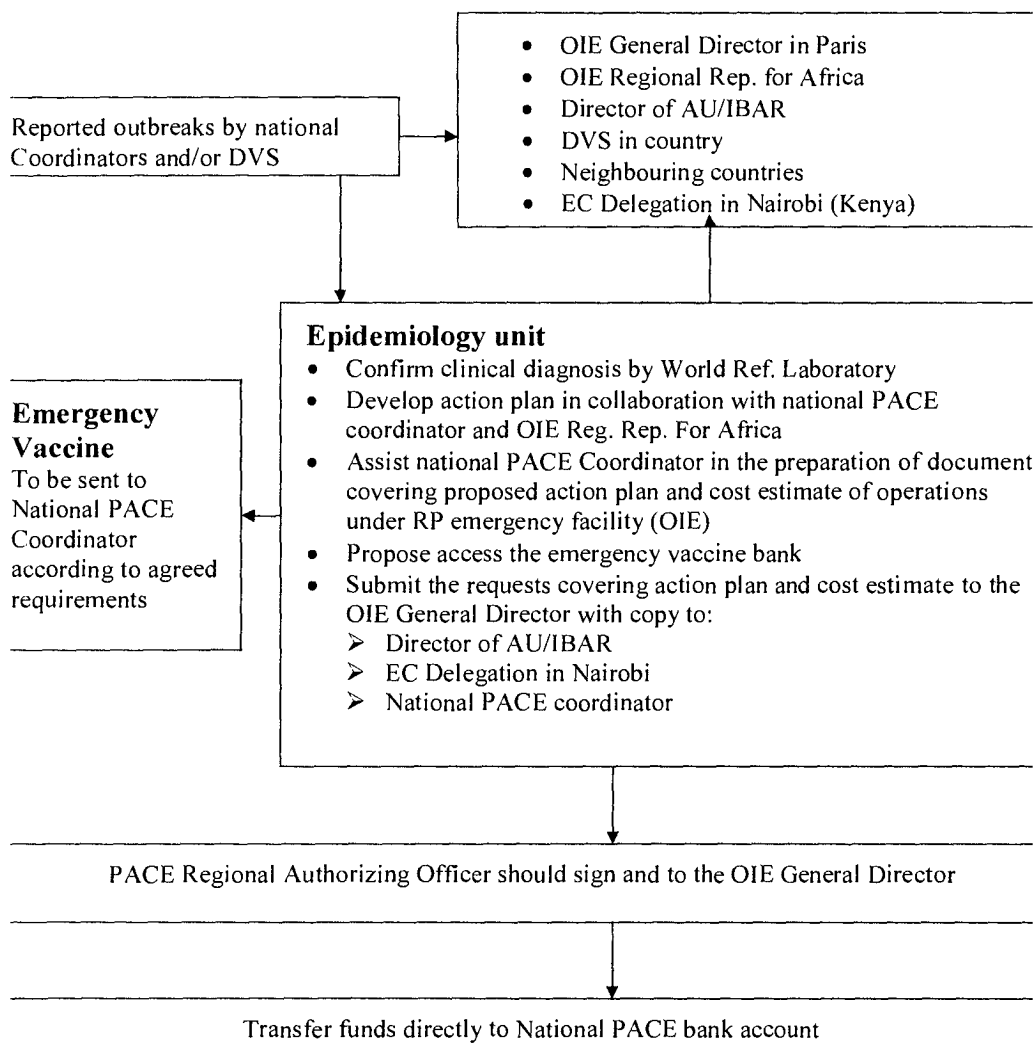
Given the fact that the OIE does not have the resources or expertise within the organisation to implement and co-ordinate the responsibilities described in Annex 1 of the Agreement it will therefore be obliged to subcontract outside consultants or an NGO, this will have at least three results:

- Cause delay in the process of implementation;
- Divert funds from direct assistance to the country concerned;
- Cause confusion over the co-ordinating role and mandate of OAU-IBAR.

It was by PEU a possible way to address the problem outlined above, which would be for the OIE and AU-IBAR to reach an agreement whereby all the responsibilities for investigating reported emergencies and planning and co-ordinating interventions would be delegated without financial implication to AU-IBAR. The plans and cost estimates developed by AU-

IBAR through PACE would, however, need to be approved by the OIE prior to implementation. Once this approval is obtained funds would be released by the OIE. The envisaged process is outlined in the diagram 1 as follows.

Diagram 1. Rinderpest Emergency Response



➤ **Wildlife component**

A specific and targeted surveillance of wildlife disease was considered necessary for the PACE programme and for progress towards eradication of Rinderpest virus based on expert opinion. Consequently, from July 2000 the wildlife component was organized within the Epidemiology Unit, with two TAs. One for West and Central Africa based in Bamako (Mali), and another one for Eastern African based in Nairobi (22; 23). The wildlife contract was held by CIRAD with technical assistance provided through a sub-contract with the Zoological Society of London to implement the activities in East Africa. CIRAD was responsible for

logistics, accounting and management of the TA's. The activities in Eastern Africa were carried out for the period up to 2004 under the authority of AU/IBAR-PACE, which provided full political and administrative support. The TA for West Central Africa was moved to Nairobi in 2004 to focus activities on the remaining areas of concern for Rinderpest eradication (Central and Eastern Africa) based on decisions, which were taken in consultation with AU/IBAR HQ, Regional Coordinators and respective National Authorities (24).

One of the purposes of the creation of the wildlife component within PEU was to develop the national capacities, either to create national expertise in the field of wildlife veterinary medicine or to improve the already existing national expertise. In this line evaluation of training needs and capacity confirmed that wildlife veterinary teams were unlikely to be established in all countries and that a regional (team) approach to wildlife disease surveillance was the appropriate strategy.

The most valuable professional training for the National collaborators was in the field aspects of the work. The activities of the veterinarians require knowledge and experience of the target animals, their ecology and ethnology. Competent "bush craft" is essential for successful and safe working practices with the sometimes-dangerous species sampled. Successful immobilisation depends on this and competence in the application of appropriate veterinary techniques. Consequently, in most countries the National teams made up from the wildlife and veterinary authorities, were established and steering committees set up to facilitate cooperation between often different Ministries responsible for wildlife and livestock.

Wildlife surveillance has been integrated into the National disease monitoring strategy, specifically for Rinderpest eradication and verification of absence according to the OIE pathway.

Since PACE has a major thrust for network development the creation of associations will ensure some sustainability outside of donor funded projects. The proceedings of the training workshop are available (11). A CD ROM produced and disseminated to all PACE countries and relevant professional bodies.

Results of serological surveys in wildlife revealed that Rinderpest virus had circulated in buffalo herds in the Tsavo East/Galana ecosystem and Tana, Lamu, Garissa districts Kenya, as late as in 1998/1999. On the advice of the PACE Advisory Committee, an expert panel reviewed the results of the extensive sero-surveillance that had been undertaken in wildlife populations of seven countries during the African Wildlife Veterinary Project. In December 2000, at a meeting in Nairobi, deliberations on the findings were concluded and the results and conclusions were submitted to the countries concerned (appendix 26). This work provided guidance for future activities on Rinderpest eradication in the region. At the same meeting, the general needs related to Rinderpest research were defined. These were subsequently refined and accepted by the PACE Advisory Committee in January 2001.

Related surveys revealed the large-scale, extensive movement of trade cattle from the Somali ecosystem towards Tanzania and the Maasai ecosystem. The finding demonstrated the potential for rapid, widespread dispersal of Rinderpest virus and the need for continuous and effective surveillance.

In Eastern Africa, Rinderpest continued as a major threat as demonstrated by the re-occurrence of the infection in wildlife in Meru National Park, Kenya during July-November 2001. Discovery of this infection was a direct result of surveillance in wildlife conducted under PEU by the wildlife specialist for Eastern Africa and the Kenya Wildlife Service. As far as is known this is the first occasion on which routine surveillance rather than a disease report has resulted in the detection of Rinderpest infection in Africa. It should therefore be considered a singular success for the PACE Program.

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There is compelling circumstantial evidence to suggest that rinderpest virus was introduced into the isolated buffalo population of Meru National Park by cattle influx from the east.

Upon confirmation of Rinderpest infection among buffalo in Meru, the Kenyan Department of Veterinary Services with assistance from the PEU prepared a protocol for Rinderpest search in selected parts of Eastern, North-eastern and Central Provinces. The focus was on pastoral communities around Meru and Kora NPs and Bisanadi and Rahole NRs. The search was extended to the Somalia border in the east and to Laikipia and Samburu districts in the west. Clinical disease resembling rinderpest was not detected by any of the 12 survey teams during the field operations. Nine thousand eight hundred serum samples were collected for testing. The search was planned to continue in Ijara, Garissa, wajir and Mandera districts of North-eastern Province and Tana, Lamu districts of the Coast Province of Kenya.

In summary the wildlife component has significantly contributed to the completion of necessary surveillance work for countries on the OIE pathway, including clarification of anomalous serological results from Mauritania in warthog, Benin and Chad in buffalo and other species. Data from recently infected or risk zones; in Chad, CAR, Sudan, Ethiopia, Uganda and Tanzania, clearly showed that there was no circulation of rinderpest amongst wildlife in these countries since the end of PARC. Work in Kenya confirmed re-emergence of rinderpest virus in buffalo, both in Tsavo (1998-9) and Meru National Parks (2001). Recent surveys in one of the possible hotspots (area of endemic maintenance) for the remaining rinderpest virus in 4 districts of north-eastern Kenya were completed for selected wildlife species and the data shows no evidence of rinderpest antibody in animals born since 1998. This is very encouraging and suggests that the virus circulation that remains might be very confined and possibly only in Somalia. This suggests the need for an intensive effort to isolate and destroy any remaining virus there, should it in fact exist, before there is any chance of recurrence and further spread. It is feasible that the final eradication of rinderpest could indeed be achieved within the lifetime of PACE even if verification takes a few years longer.

Data have also shown the probable involvement of wildlife species in the epidemiology of *peste des petits ruminants* (PPR).

Assessment by the wildlife component of PEU indicates that the wildlife surveillance teams of Kenya, Uganda and Tanzania are functioning independently but that of West and Central Africa countries are still problematic although considerable progress has been made.

Sustainability of the network has been a concern at the country level for a number of reasons and this was debated at the PEU workshop on optimisation of ESS held in Dakar (Senegal), in August 2004. The countries took a decision there that this issue should be addressed through consolidation of regional teams and working at an ecosystem level, pooling resources and sharing data of a transboundary nature. This had both scientific and practical

benefits and would facilitate such matters as preparation of OIE pathway dossiers for applications on freedom from disease or infection.

In addition to the disease focus support was given throughout this period on the preparation and execution of the PDFA for a new project (Dry lands Wildlife, Livestock and Environment Interface Project) to be executed under IBAR through the UNEP GEF facility in Kenya and Burkina Faso. The PDFA was concluded by May 2004 and the final application for the main funding was completed by October 2004. The project, amongst a number of objectives, will be looking at the wildlife livestock disease interface in dry lands and its impact on livestock and livestock trade. There will be pilot initiatives to reduce the associated conflict issues and explore means to improve livelihoods through better and more sustainable use of natural and livestock resources.

➤ **Laboratory activities (see also final report of regional laboratory expert)**

The International Atomic Energy Agency (IAEA) and the Inter-African Bureau of Animal Resources (IBAR) of the African Union (AU) signed a collaborative agreement in 1999 on a strategy for an active partnership in the field of animal health and production. In recognition of IAEA's expertise in the diagnosis and monitoring of major epizootics, it was proposed to extend the partnership in animal disease diagnosis and to provide the necessary technical assistance to the PACE programme with particular reference to:

- Establishing and consolidating the diagnostic capacity for the major epizootics (Rinderpest, *Peste des Petits Ruminants*, Contagious Bovine Pleuropneumonia and Foot and Mouth Disease) based on nuclear and related techniques;
- Assisting with the monitoring of the national and regional control programmes for these epizootics;
- Establishing a diagnostic capability for the differential diagnosis of Rinderpest,
- Providing assistance to regional reference laboratories for the confirmatory and differential diagnosis of Rinderpest;
- Strengthening the cooperation between national and regional reference/service laboratories;
- Establishing a regional capability for the supply of reagents and disease diagnostic kits;
- Strengthening the cooperation and information exchange between AU/IBAR, IAEA and the national veterinary laboratories.

In this respect the International Atomic Energy Agency launched the Regional Project RAF/5/053 -- Assistance to OAU/IBAR/PACE Programme for the Control and Eradication of Major Diseases affecting Livestock. For the implementation of the project and the day-to-day technical assistance to PACE, IAEA seconded to AU-IBAR in June 2001 a Regional Laboratory Expert.

The main areas where tangible achievements have been made are: capacity building, technology transfer and technical support to PEU. The final report summarized the main achievements of the Regional Expert, as details can be found in the full report (27).

Capacity building

The issues regarding training workshops organised during the period from 2001 to 2004 are outlined in training section of this document.

Together with the Counterpart Epidemiologist the laboratory expert assessed the diagnostic capacities of seven national veterinary laboratories (Ethiopia, Côte d'Ivoire, Senegal, Chad, Muguga, Mali & Cameroon) and made recommendations on what might

be considered as regional laboratories/centres for AU/IBAR. The following laboratories Bingerville (Côte d'Ivoire), Dakar-Hann (Senegal) and Muguga-Karie (Kenya) were recognized as regional laboratories/centers for AU/IBAR for rinderpest and *peste des petits ruminants* (28). Consequently A link has been established between PACE national veterinary laboratories and the PACE regional reference laboratories for rinderpest and PPR, and several staff from PACE National laboratories have been trained in various techniques of diagnosis of animal disease.

Technology transfer

The transfer of technology comprised of provision of training in relevant biotechnology techniques for African Scientists at ILBM/UCA (1 from Mali, 2 from Senegal, 1 from Nigeria, 1 from Cote d'Ivoire), provision of experts to assist the technology transfer and through the provision of funds for the procurement of appropriate equipment.

The PEU coordinated the validation exercise for the indirect ELISA for Rinderpest developed by University of California Davis (USA) in collaboration with *Institut Sénégalais de Recherche Agronomique (ISRA)*. The assay has been accepted by OIE in February 2004.

Technical support

Technical assistance in the field of laboratory diagnosis of animal diseases was given to PEU and PCU. In line with this several missions were undertaken to PACE countries to provide assistance in site; guidance were given through exchange of messages with PACE national laboratories counterparts and PACE regional reference laboratories for Rinderpest and PPR. Based on information gathered from countries a document called "update on PACE national laboratories" was produced. The document is available (29).

All laboratories in PACE member countries were visited and assisted in establishing the required capacity for diagnosis of identified epizootic diseases. All countries, which have been recognized free from Rinderpest disease and those that have sent to OIE their dossier for recognition of freedom from Rinderpest, were assisted in the serological surveillance required for obtaining this status. Consequently, the laboratories Rinderpest-testing network was re-activated and the first annual meeting for regular updates on specific laboratory techniques and external quality assurance program in the serological testing for Rinderpest was held in Accra (Ghana) in September 2004; the last two workshops were held in Entebbe (Uganda) and IN Bamako (Mali) in 2005 and 2006 respectively. The reports of these meetings are available (30; 55; 56).

Regarding the implementation of actions designed to performance of identified laboratories so as to facilitate effective surveillance for rinderpest, CBPP, ASF and RVF, laboratories in PACE countries (only IAEA members) were assisted with procurement of diagnostic kits and laboratory reagents.

Jointly with FAO/GREP PEU has updated the existing guidelines for the laboratory confirmation of Rinderpest and this document was distributed to PACE member countries (appendix 30).

4.3. Assistance to member countries in the control of other major epizootic diseases

CBPP

Contagious bovine pleuro-pneumonia (CBPP) is a focus of PACE because it is generally perceived to be the most serious animal disease problem facing the tropical regions of Africa

now that the effects of Rinderpest have largely been overcome. Given the efforts made by PACE countries to control CBPP, the disease is more and more reported in most of them. To date the control strategies developed in countries have not yet allowed the eradication of disease, except in a few southern African countries.

In an effort to develop more effective strategies against CBPP and to promote development of practical and directed policies towards this disease, and so enable active surveillance programs to be sustainable, information on epidemiological data and the disease's impact must continue to be collected through the general surveillance system for diseases, as well as through active investigation, including participatory surveillance for the disease and laboratory diagnosis. It is with this in mind that the following attempts were made by the AU/IBAR-PACE and the joint FAO/IAEA Division to improve the understanding of the epidemiology of the disease as well as initiatives directed towards capacity building and reliable and practical strategies for control of CBPP.

► Since the beginning of the programme, PACE Coordination Unit organised two workshops on CBPP control strategies. One held in Addis Ababa (Ethiopia) in November 2001 (31) and the second held in Accra (Ghana) in February 2003 (32). The objective of the two workshops was to update countries delegates on recent development around CBPP, analyse the problems related to the disease and evaluate practical options for effective approaches to its control. Finally the aim of the workshops was to develop, in close collaboration with veterinary services representatives, a rational and integrated policy and reliable, practical and applicable strategies against CBPP in PACE countries that are based on a regional approach

These first two workshops did not, however, reach clear conclusions, which can be implemented. In order to scientifically support the findings and recommendations made at both workshops, another workshop was organised therefore in Nairobi in May 2003 (33). At this workshop only technical aspects were evaluated through recent modelling and simulation activities conducted in Southern Sudan, Tanzania (34) and Ethiopia (Lesnoff, 2003). This technical workshop aimed at building on the outcomes of the two first workshops and, in particular, to consider technical issues that have been highlighted by two modelling studies that have either recently been concluded or are still on-going but which have provided valuable interim results.

Recognizing the fact that there is indiscriminate and uncontrolled use of antibiotics in the field for treatment of CBPP, and accepting that there is insufficient scientific knowledge on the effectiveness of antibiotics in the treatment of this disease, it was formulate an urgent need for more information and research on the efficacy of drugs on the treatment of CBPP and other related issues. In addition to the recommendations of this workshop AU/IBAR-PACE commissioned a study of CBPP epidemiology that accessed indigenous knowledge of pastoral communities to construct mathematical models. Sufficient understanding has accrued from this study to suggest that new paradigm for CBPP control using antibiotics should be investigated (report attached). Consequently, a strategy was developed aimed at generating scientifically valid data on the issue of antibiotic treatment of cases of CBPP and the problem this may create by increasing the proportion of carriers (lungers) among recovered animals. This process of implementation of this study is ongoing under support of CBPP research contract (CIRAD/EMVT) and three PACE National laboratories, such as Bingerville (Côte d'Ivoire, laboratoire Central Vétérinaire de Bamako (Mali), NVRI, Vom

(Nigeria) and Sebeta (Ethiopia). It was agreed that this study should be funded by PACE national components (report of these studies is pending).

As a result of the recommendations and action plans emanating from those three above mentioned workshops, countries were asked to prepare a draft document on national policy and strategies for control CBPP based on updated epidemiological data and to forward it to PACE the Epidemiology Unit. Based on this information, the PEU aimed at analysis of strategies for control the disease in PACE member countries (document attached in appendix 35) and to formulate a draft Regional strategy Programme for control of CBPP to be presented for discussion, validation and adoption at workshop held in Conakry (Guinea) in February 2004. Based on a regional approach and taking into account epidemiological situation, socio-economic conditions as well as husbandry systems, the proposed strategies aim at the reduction of the incidence of CBPP in the endemic zones and the protection of zones where the disease is not currently reported. Apart from the adopted strategies in Conakry, the PEU strongly suggested that prior implementation adopted strategies for the most countries participating in PACE, the most appropriate policy would be to establish a policy aimed at measuring the impact of CBPP in country as a whole or especially for larger countries, the impact of the disease in different eco-zones using participatory rural techniques (36). This is a field of study, which AU/IBAR-PACE has been instrumental in introducing to sub-Saharan Africa in relation to animal health issues.

Efforts to improve the control of CBPP in the PACE countries continued and culminated in the recommendations of the final PACE workshop on this disease held in Conakry (Guinea) in February 2004. The results of this workshop included an agreed strategy and other recommendations. However, it remains problematic whether the resources exist to effectively carry out the recommendations but this is a matter under investigation by the PEU. The report of this workshop is available (37). The PEU has been producing therefore a CD-ROM containing the recommendations from all PACE workshops on CBPP and also major presentations made at those workshops by various experts.

► Under the auspices of OAU/IBAR IAEA organised the third Research Coordination meeting on the “diagnosis and control of CBPP in Africa” in Nairobi (Kenya) in June 2001 (38). This meeting strongly recommended to improve the performance of c-ELISA kits and to develop a sampling frame by a designated expert(s) to study the prevalence of the disease. This should be undertaken by the PACE programme. Following this meeting another meeting was organised in Bamako (Mali) February 2003 in connection with the final Research Coordination Meeting on CBPP monitoring in Africa (39). The objective of this workshop was to validate the results of CBPP diagnosis tools: c-ELISA and the Latex Agglutination Test (LAT) and to develop adequate strategies for diagnostic tests. It was agreed at this meeting that c-ELISA is easy to use and regarded as highly practical test under the prevailing laboratory conditions. It can be used as a diagnostic tool for CBPP and be adopted by the OIE at the same level of recognition as the CFT. It was also concluded that the overall sensitivity of CFT and c-ELISA appears to be similar, but the number of animals identified depends on the stage of the disease. The CFT detects antibody to *MmmSC* earlier in infection whereas the c-ELISA detects antibodies for a longer period. The reports and recommendations of these two meetings are available.

In line with the recommendations of the third research coordination meeting held in Nairobi in 2001, a guideline for CBPP surveillance, including sampling frame for prevalence study

has been completed by PEU and distributed to PACE member countries (40; 44; 45) during a workshop held in Conakry (Guinea) in February 2004.

Efforts were made to establish additional studies to elucidate the epidemiology of CBPP in particular ecosystems, such as Kagera, Lake Chad region and Delta of Niger. Consequently, PEU together with the CAPE and Economics Units developed protocols, for impact assessment of CBPP using participatory methods in the identified areas. Unfortunately, these efforts have so far failed (mainly due to lack of finance, time and infrastructure in the proposed sites) this effort was discontinued.

ASF

African swine fever (ASF) is a lethal disease of domestic pigs caused by a unique virus indigenous to Africa that evolved in a cycle requiring infection of wild suids (mainly warthogs) and argasid ticks (Plowright *et al.*, 1994). The ASF virus population is heterogeneous, comprising lineages that are, generally, distributed in distinct geographic locations.

Control or eradication of ASF is hampered by the lack of a vaccine against the disease, although recently, prospects for the development of a vaccine have improved appreciably (D. Rock, 2002). Nevertheless, a vaccine cannot be counted on within the next 3-5 years. The other problem with the control of ASF in Africa is that in most regions where the disease is currently a problem, effective movement control in respect of pigs and pork is very difficult, if not impossible, to achieve. Traditional pig-keeping in Africa is perceived as an important constraint for the control of African swine fever (ASF). Free-ranging, scavenging pigs are at greater risk of infection for various reasons. In areas where the sylvatic cycle of ASF occurs between argasid ticks and warthogs (and possibly other wild suids), the risk of contact with the natural vectors of the virus is increased. The combination of these two factors renders effective management of ASF extremely problematic.

From the above it is clear that a simple solution to the question of effective control or eradication of ASF from the coastal belt of West/Central Africa is not available. Conversely, means whereby the effects of ASF can be limited are urgently required if food security and a source of cheap and acceptable animal protein for the region is to be secured. In order to assist PACE concerned countries to address the issues a workshop was jointly organised by OAU/IBAR-PACE and FAO on ASF in Lomé (Togo) in October 2001 (41). At this workshop it was concluded that the problem needed to be addressed at the regional level because the countries of the region are afflicted by a common problem that circulates among them. Any country in the region that fails to control ASF effectively exposes pork producers in the country concerned to unacceptable financial risk and also provides a source of infection for neighbouring countries.

The workshop was followed up by a development of a strategic document prepared by the PEU in collaboration with a FAO consultant (42). The proposed strategy document underlined the following activities that could be considered to assist with the future control/eradication of ASF in western Africa.

1. Pig production

Free-range pig production systems are incompatible with effective ASF control in western Africa. Therefore, one way of limiting the effect of this disease in the region would be development of regional and national programmes that encourage commercialisation of

production within enclosed systems. Once pigs are confined on a continuous basis, control of ASF becomes relatively simple.

2. Short-term measures to improve surveillance and control

In the coastal countries of West/Central Africa that are currently free of the disease, rapid detection of ASF when it occurs needs to be the cornerstone of any strategy against the disease. This is vital because all these countries are at high risk of having the infection introduced across their borders from infected countries in the region. Rapid detection is dependent upon:

- an effective epidemio-surveillance system or network;
- a competent diagnostic laboratory;
- co-operation of the pig farmers/owners.

These aspects are part of the current PACE Programme, supported by the IAEA for the laboratory component. All countries have been provided with finance to affect the first two measures (in some cases with inputs provided by the FAO).

If ASF is detected soon after introduction, it should be possible for the infection to be “stamped out” because the number of animals involved would be small. Conversely, once the infection has spread, “stamping out” becomes difficult and, usually, unaffordable.

3. Epidemiological investigations

There are two obvious lines of investigation that are likely to bear fruit, viz. (i) basic studies into the transmission parameters of the infection where domestic pigs are involved and (ii) those aimed at understanding how the infection remains endemic in specific localities in Africa. These localities include adjacent areas of Malawi, Mozambique and eastern Zambia, Angola, parts of Uganda and DRC, and adjacent areas of Senegal and Guinea Bissau.

In August and September 2003, an outbreak of ASF occurred in the Arusha district of Tanzania killing 400 pigs and putting 8000 of them at epidemiological risk. Following this PEU undertaken mission to Tanzania to investigate the situation early in May 2004.

The epidemiological information from meetings and interviews detailed below:

- Following this outbreak, around 300 sera from pigs have been collected in the farms surrounding the area where the pigs have died or have been destroyed. The prevalence of ASF was of 7% with a range of 0-80% between herds/farms (average herd is 27 pigs more or less 3.9) and 0-17.4% between districts. Interesting epidemiological facts (mainly following a Multiple regression model done by the VIC of Arusha):
 - Males have been more infected than females by 2-4 times.
 - Free-ranging pigs had low sera prevalence.
 - In house pigs had high sera prevalence.
 - Near Kenyan border farms were 10 times more infected.
 - The strain involved in the outbreak could not be linked with Kenyan or Malawi strains through molecular genotyping.
 - Distribution of infected farms inside the infected areas is patchy.
- The 2 farms visited have been depopulated after high pig mortality (75-100%). The first farmer saw the first symptoms shortly after introducing 2 pigs from the surrounding area; the second one is in close proximity (20-40 meters) of an infected farm feeding pigs with Hotels left-over, with dogs free-ranging between the 2 farms and with the risk of bringing contaminated tissue from one farm to another.

- The visit of Arusha National Park as well as the meeting with the main ecologist of the park permitted to see a healthy and increasing warthog population (last census 222 warthogs in the park through Line transect method). A population of bush pigs (around 60) is also present in the park. Local communities around the park as in peri-urban areas of Arusha (the park is located 30 kms from Arusha) crop pigs by keeping them inside closed areas with no chance of having contacts with wild suids.

It was concluded that the hypotheses to explain the ASF outbreak of September 2003 seem to be:

- o Movements of pigs between farms inside and outside the region explaining the epizootic trend of the outbreak.
- o Potential risk of feeding pigs through hotel leftover.

The risk of the disease becoming endemic in the region is important (considering the 7% prevalence one month after the outbreak). The wildlife role for this particular outbreak of ASF seems low considering the pig farming system in the area.

As the way forward the PEU staff recommended to Tanzania Veterinary Authority to collect ticks from warthog burrows inside Arusha National Park and in areas where warthogs could be in close contact with pig farms. This tick collection will allow to isolate if present the ASF virus and genotype it to assess if there is a potential connection with the virus strain responsible of the 2003 outbreak in the pig farms of the region.

RVF

Rift Valley fever (RVF) remains an impediment to livestock exports from the Horn of Africa to the Arabian Peninsula but AU-IBAR and a number of international and regional organizations have developed initiatives to address the problem. The PEU has therefore concentrated on a supporting role and has persuaded the OIE that the recommendations contained in the current chapter on RVF in the International Animal Health Code are out of date. Consequently, the OIE appointed an *ad hoc* committee to redraft the chapter with the Main Epidemiologist as chairman. These recommendations were adopted at the OIE General Session in Paris in May 2003.

A successful workshop to develop an integrated approach to control and emergency responses against RVF was held in Dakar (Senegal) in January 2004 (43). This resulted in advancement of plans for the deployment of existing vaccines in emergency situations while continuing with the development of new generation, i.e. safer, vaccines. The report on this workshop is available and was distributed to the concerned countries.

FMD

In Eastern and Western Africa it is clear from information gathered by the PEU in PACE countries that FMD is a growing problem for both livestock producers on the ground (even in some extensive systems) and for trade. In particular, there is concern and lack of understanding about the role of wildlife in propagating outbreaks in cattle. To this end, sera from the PACE activities in wildlife were to be sent for FMD serology to Pirbright IAH for testing. Once the results are received the likely sero-type distribution in wildlife in the East, West and Central African region will be mapped and association with known cattle sero-types completed. This will assist countries in development of their FMD control strategy.

As a result of widespread reports of severe foot and mouth disease (FMD) having major impact on cattle populations in various locations within Western Upper Nile (April – June 2004) and lately also Bahr el Ghazal in August 2004, Vétérinaires Sans Frontières (VSF)

Switzerland in cooperation with Vétérinaires Sans Frontières (VSF) Germany and Vétérinaires Sans Frontières (VSF) Belgium, AU-IBAR and FAO, appointed two staff members to undertake a special investigation into the problem.

The investigation took place at three locations within Bahr el Ghazal, viz. Tulareï (Twic County), Lunyaker (Gogrial East County) and Marial-Lou (Tonj County). Various cattle camps were visited and interviews were held with local veterinarians, community-based animal health workers and owners of affected herds. Where diseased animals were found, appropriate samples were collected and processed for later laboratory examination at recognized international reference laboratories, including the World Reference Laboratory at Pirbright, UK. Sera from two goats that were part of a small flock kept in the cattle camp at Puolbar mentioned above were also collected. Owners were adamant that sheep and goats showed no signs of FMD during the time of this outbreak and are not normally affected during FMD outbreaks in southern Sudan. Results from these materials will be necessary to establish the viral characteristics of the virus (possibly viruses) involved in this outbreak.

According to the Minutes of the 24th Livestock Co-ordination Meeting held in Lokichoggio, October 2003, in the last 5 years 45 different outbreaks were recorded in southern Sudan. In 9 of these outbreaks the virus involved is recorded as having been identified. This data shows that sero-types A, O, C, SAT1 & SAT2 are prevalent in the region. However, it seems that this information is based largely on serology that is unreliable for establishing prevalence of viral types where two or more occur together in a locality¹ and the data should therefore be interpreted with caution. Nevertheless, these are the same sero-types prevalent in other regions of Eastern Africa where findings of the PEU have recently shown that FMD is an escalating problem. Therefore, the situation current in southern Sudan seems to be part of a clear trend in Eastern Africa.

Highly pathogenic avian influenza (HPAI)

HPAI is an infection caused by an influenza virus of various types including the influenza type A virus, which is divided into sub-types namely, the H5 and H7 strains. AI affects almost all bird species, be they domestic or wild. It can be highly contagious, especially among chicken and turkeys, and may result in high mortality rates, particularly in the commercial breeding sector. Domestic ducks, among which infection is very often asymptomatic, could play an important role in spreading the virus, as they are silent reservoirs of infection. To date, wild birds, particularly swans and ducks, have been found to be carriers of the type A virus. The HPAI virus sometimes affects other animal species, especially pigs and *felidae* such as tigers and cats, pigs and dogs when used in experiments and of course human beings.

Since 2003, cases of the disease were reported 56 countries in Asia, Indonesia, Europe, the Middle East and Africa. The disease caused death and/or the destruction of more than 150 million chickens, resulting in unprecedented devastation among poultry farmers and a drastic drop in the consumption of poultry and its by-products, as well as trade restriction measures in commerce with affected countries. Since January 2006, the disease has affected 8 countries in Africa, namely Nigeria, Egypt, Niger, Cameroon, Burkina Faso Sudan, Côte d'Ivoire and Djibouti. This disease caused death and/or the destruction of more than 33 million poultry in Africa. So far the control measures applied were restriction of animal movement, Stamping out involving the destruction of affected and in-contact birds in all

affected locations by incineration followed by compensation of breeders, quarantine of suspected farms and vaccination (Egypt and Côte d'Ivoire). All these measures were followed by active surveillance.

To date, WHO has recorded a total of 259 human cases of bird flu (H5N1) that have led to 1158 deaths in 10 countries since 2003. In all these cases the origin of infection is contact with sick or dead animals, or with their excreta. However, the possibility of human contamination following close and repeated contacts within family groups was cited in approximately twenty episodes in Azerbaijan, Cambodia, Indonesia, Thailand, Turkey and Vietnam. Nevertheless, this possible inter-human transmission remains limited and has not resulted in a secondary community transmission. In Africa, Egypt declared 18 human cases with 10 deaths and Djibouti declared one case with no death. They comprise the first human H5N1 cases on the African continent.

Ever since its appearance in Asia and spread to Europe, the HPAI caused by the H5N1 virus is invading the rest of the world. Consequently, right from the beginning of this epizootic, the African Union's Inter-African Bureau on Animal Resources (AU-IBAR) mobilized itself to prepare African countries for possible disease outbreaks by providing a coordinated response. The mobilization was concretized through organizing a symposium, which aimed at defining a control strategy adapted to the continent. This strategy was improved following recommendations of successive meetings of the 11th Advisory Committee of the PACE Program and the 5th Executive Committee of the Alive Platform (October 2005, Nairobi) and was later adopted by the 7th Conference of African Ministers of Livestock held in Kigali, Rwanda. The strategy still needs to be adjusted and adapted to poultry farming conditions and systems in various sub- regions, while taking into account the new epidemiological situation created after the occurrence of outbreaks of the disease in the African countries.

Given the possibility of the generalized establishment of the disease in poultry, and the fact that the main factor contributing to the propagation of the virus in African countries seems more linked to the movements of populations and trade rather than migratory birds, in view of these circumstances, the generalized outbreaks are a prelude to the endemic situation of the H5N1 virus on the continent. This irrefutable fact calls for a revision of the current control strategy focusing on the prompt identification of the virus, its confinement in the outbreak and its eradication so as to curb its spread to individual countries. Consequently, AU-IBAR in consultation with other international organizations (OIE and FAO), has proposed a control strategy for African countries to fight against the HPAI.

- Modified Stamping-out with vaccination (newly infected countries)
- Mass immunization throughout the already infected countries
- Targeted vaccination in high-risk countries (vaccination in a well-defined zone/territory in a country)
- Preventive De-stocking of Poultry in Disease-Free Countries

Africa, which is the key destination for migratory birds during winter, was considered to be at high risk ever since the role of migratory birds in the transmission of the disease in Lake Qinghai (China) in Mongolia and Siberia (Russia) was highlighted. Hence, with the confirmation of disease outbreaks due to the H5N1 viral strain in 8 African countries, the idea of a threat to the continent announced in the past has now become a reality and not just a simple hypothesis formulated by researchers. Given this worrying situation, it is therefore necessary to define concrete, targeted and concerted actions. In order to facilitate this, numerous meetings were organized with a view to reaching consensual conclusions for a

coordinated international management of the crisis caused by the disease. The most important meetings, which were organized by PACE or with the participation of PACE are as follows:

- Donors' conference on HPAI and pandemic preparedness held in Geneva, Switzerland from November 7th to 9th, 2005;
- International conference on the risks of HPAI pandemic held in Beijing, China, January 2006;
- Conference on the prevention and preparedness for HPAI Pandemic organized by WHO, Regional office for Africa from the 12th to 13th January, 2006 in Brazzaville (Congo);
- Workshop on preparedness for avian influenza pandemic in the IGAD sub-region, held in Djibouti from 21st to 22nd December 2005;
- Libreville Declaration on Avian Influenza and the human threat in Africa, organized by the United Nations Agencies from 20th to 22nd March 2006;
- Inception workshops for launching the 2 FAO TCPs for West/Central Africa and East Africa, which are based respectively in PACE regional coordination premises in Bamako and the UA-IBAR premises in Nairobi;
- Ministerial Meeting of the member countries of CEDEAO and the Islamic Republic of Mauritania initiated by President Abdoulaye Wade, on the GAHP held in Dakar (Senegal) from the 22nd to February 23rd, 2006;
- Regional Workshop on the HPAI preparedness organized by the SADC in Pretoria (South Africa), from 6th to March 11th 2006;
- Meeting of the group of experts on mechanism of Coordination of the Prevention and the Response against the HPAI in West Africa held in Bamako (Mali) from 16th to March 17th, 2006;
- Seminar of harmonization of the plans of prevention and control of the HPAI organized by the UA-BIRA/PACE from the 18 to March 19, 2006 in Bamako (Mali)
- International scientific Conference on HPAI and avifauna organized by FAO and OIE in Rome (Italy) from the 30th to May 31st, 2006;
- Meeting of the Regional Community of the East Africa on the HPAI held from 12th to June 16th, 2006 in Arusha (Tanzania).

In addition, in order to provide technical support to infected countries to contain outbreaks of HPAI and to avoid their extension on one hand, and on the other hand, to assist the still uninfected countries in preventing the crisis and in preparation of national emergency preparedness plans and their harmonization at the regional and continental levels in collaboration with international organizations (OIE, FAO, BM), the technical staff of the PACE undertook a series of missions on the ground. Thus, since January 2006, 28 missions have been carried out by PACE experts in the infected countries (Nigeria, Egypt, Niger, Cameroon, Burkina, Cote d'Ivoire), countries under direct threat of disease (Chad, Cameroon, Benin, Togo, Ghana, Mali, RCA, Equatorial Guinea) or with strong suspicion of the disease (Ethiopia, Kenya, Eritrea). These different missions made it possible to:

- Evaluate the surveillance systems and control measures on the ground in the infected zones and those under surveillance;
- Assess the control measures already undertaken by the State (application of sanitary measures, movement control, modality of bio security, information dissemination...) to contain the confirmed outbreaks of the disease;
- Identify the needs to be mobilized immediately;

- Study the evolution of the epidemiological situation of the disease in the infected countries;
- Identify difficulties national constraints encountered in facing the emergency;
- Undertake a study on the economic impact of the avian influenza in two PACE countries;
- Support the countries with the mobilization of funds directly available per revision of the current program estimates and to shift the work plans for the fight against the HPAI;
- Prepare the matrix of distribution of the emergency funds between donors, taking into account the times of its availability;
- Assist countries in the preparation of dossiers in order to seek complementary funds for the immediate actions.

PACE published technical information packages on the disease and its management comprising of the following elements:

- Technical packages (15);
- Dissemination of sheets by PACE (suspicion, decision-making aid sanitary, certificate of vaccination, culling, etc);
- Kit for preparation of crisis;
- Ten elements of management of crisis, models of emergency budget, estimate prices of materials and equipments for first intervention;
- Guidelines for evaluation of national emergency preparedness plan for the prevention and control of HPAI.

Taking into account the current epidemiological situation of the disease in Africa, it was defined concrete, targeted and concerted actions. To facilitate this, 28 missions have been carried out by PACE experts in the infected countries, countries under direct threat of disease or with strong suspicion of the disease.

5. Other activities

5.1. Export zones/systems

A concept note on commodity-based trade was written by PEU for the Scientific Commission of the OIE, following which, the OIE has decided to further investigate the proposal. A paper on commodity-based trade co-authored by several Common Services members and the consultant was presented at the East African Regional Animal Production Conference in March 2004 in Nairobi.

5.2. Livestock movement control

In order to develop means of improving management of livestock movement a workshop on this issue and livestock trade was organized in collaboration with OIE and the CAPE Unit in Cairo (Egypt), 11-13 October 2004. The theme of the said workshop was "Implementation of Animal Health Standards: the Quest for Solutions".

The participants at workshop made recommendations on three separate following topics:

Quality of Veterinary Services: an essential pre-requisite for the control of transboundary animal diseases and international market access for animals and animal products

- The OIE Member Countries of Africa and the Middle East implement the OIE *Code*

Standards and fundamental principles for quality of Veterinary Services, to be able to effectively control transboundary animal diseases, improve public health and have better access to international markets for animals and animal products

- Any evaluation of *Veterinary Services* should be based on the OIE Guidelines for the evaluation as contained in the *Code*.
- An evaluation of the *veterinary statutory body* form part of such an evaluation process, to ensure that the registration/licensing of veterinarians and veterinary para-professionals, when relevant, is included as an important element of the process.
- The OIE establishes more detailed guidelines for the establishment and functioning of the *veterinary statutory body*
- Self-evaluation of the *Veterinary Services*, based on the OIE guidelines assessing *inter alia* the capability for effective control of the health status of animals and animal products, is used by developing countries to provide data and arguments for additional funding from governments and international donors.
- The OIE provide to Member Countries new tools for strengthening the efficiency of *Veterinary Services* (evaluation kit, investment application forms, training kit for OIE Delegates, Veterinary public-private sector synergy models) using appropriate new mechanisms, such as STDF, ALive and others.
- Sustainable livestock development policies should be represented as an essential priority in national, sub-regional and regional PRSPs. When recognised as a priority area, national and international resources could be directed to livestock development as a major contributor to food security, food safety and fulfilment of international trade standards as recommended by the OIE.

Managing and controlling livestock movements in order to prevent the spread of transboundary animal diseases: a regional experience

- Cooperation between *Veterinary Services* of neighbouring countries be established to manage transboundary animal diseases on a permanent basis, through dialogue between epidemiological and diagnostic networks.
- The OIE undertake the necessary steps to establish and publish guidelines for the control of animal movement and the establishment of disease free zones.

International standards for trade in animals and animal products and their impact on inter-regional trade

- Substantial, appropriate, coordinated and sustained support should be provided by the international community to strengthen the policies designing the capacities of *Veterinary Services* in Africa and the Middle East to work towards compliance and application of international standards for the international and regional trade in animals and animal products.
- The OIE, in collaboration with other international organizations, facilitate the training of officials within the two regions in international certification standards for trade in animals and animal products.
- The Director-General of the OIE request the Scientific Commission for Animal Diseases to consider the development of an Appendix to the *International Terrestrial Animal*

Health Code to describe risk mitigation procedures that can be applied to specific animal products to render them safe for trade.

- The SPS Committee of the WTO should be requested to consider representative status for regional organizations within Africa and the Middle East for countries that do not have the capacity or expertise to ensure continuity of representation at the SPS Committee meetings of the WTO.
- The certification system proposed by the OIE Regional Representation for the Middle East should be endorsed and adopted for inter-regional trade between Africa and the Middle East in animals and animal products.
- The AU and OIE Member Countries of the Regional Commissions for Africa and the Middle East evaluate and establish export systems that would conform to regionally agree sanitary certificates to further facilitate the trade in animals and animal products.
- The OIE, in collaboration with international and regional organizations, consider support methods for the evaluation of *Veterinary Services* and the establishment of an independent audit system for *Veterinary Services*, which could be used by a Member Country to evaluate the delivery of their veterinary services and to facilitate in the identification of their needs for compliance to international sanitary standards and financial support when necessary.
- The ALive platform, in strong collaboration with the AU-IBAR and other relevant regional and international organizations, should be mandated during its first phase to promote animal health and convince decision-makers to strengthen support in animal disease control in Africa and possibly extend its model to the Middle East.

Support by international and regional organizations and public/private sector cooperation

- The OIE investigate and promote opportunities with international and regional organisations in developing new standards for risk reduction to trade in livestock commodities.
- The OIE assist the Middle East and African countries in investigating and formulating ways of improving the credibility and effectiveness of import / export certification through guidelines and capacity building programmes.
- The OIE support Member Countries to maximise the utilisation of available national and donor resources to continue the sustainable capacity building of *Veterinary Services*, including private veterinarians, and thereby improve the general health situation in Africa and the Middle East, in particular for TADs in order to both alleviate poverty and promote trade in compliance with the Doha Declaration.
- International organisations need to support the establishment and sustainability of animal health delivery systems in remote areas.
- A commitment that all available funds be aligned to complete the process of Rinderpest eradication and accreditation of Rinderpest freedom by 2010 in close collaboration with the African Union/PACE Global Rinderpest Eradication Programme and other forthcoming programmes.
- All countries of Africa and the Middle East sustain their commitment to GREP by striving to achieve OIE accreditation of Rinderpest freedom and that the drive to eliminate the last reservoirs of infection be awarded a high priority and urgency by all concerned countries and international and regional organisations.

5.4. Research Programmes

The Financing Agreement of the PACE programme stipulates that the FAO World Reference Laboratory for Rinderpest based at the Institute for Animal Health, Pirbright will co-ordinate

the research programme for Rinderpest and PPR. Since the PACE program is based on capacity building and sustainability, it was felt that wherever possible the research should be carried in laboratories to be identified in Africa. However, due to the lack of facilities in many African Laboratories some of the work may have to take place in Reference Laboratories such as IAH, *Pirbright* or CIRAD EMVT, Montpellier. The final stages of validation and adaptation to local conditions will take place in African Laboratories. The advantages of this approach would be to strengthen the collaborative links and technology transfer between the reference laboratories and the regions where Rinderpest and CBPP are still of concern.

Consequently, the following World Reference Laboratories for Rinderpest and PPR (*Pirbright* Laboratory, Institute for Animal Health, UK and CIRAD/EMVT, Montpellier, France) and for CBPP (CIRAD/EMVT) were given the mandate to provide PACE with the proposals for funding (for each disease) in respect with budget allocated in the financing agreement.

To strengthen the success of the Pan-African Rinderpest Campaign (PARC), and achieve the complete elimination of the Rinderpest virus from the continent and control of CBPP, initially there were identified research needs as per PACE financing agreement signed between AU/IBAR and EU:

- ✓ Use of PPR vaccine to protect ruminants against Rinderpest,
- ✓ Study of cellular immune response induced by Rinderpest and PPR,
- ✓ Study on mild Rinderpest strain in cattle sheep and goats,
- ✓ Validation of pen-side test,
- ✓ Research on CBPP.

5.4.1. Research Programme on Rinderpest (RP) and peste des petits ruminants (PPR)

As far as the Rinderpest research is concerned a first draft of proposal was received from *Pirbright* (UK). PEU made comments and forwarded its back to *Pirbright* Laboratory for finalizing. The following research priorities were identified for the achievement of the above-mentioned objectives:

- Development of improved highly specific and sensitive assays to assist in the serological surveillance of Rinderpest, capable of differentiating antibodies to Rinderpest, PPR and vaccine strain viruses.
- Development of specific diagnostic test enable to differentiate serologically PPR from Rinderpest
- Development of multiplex PCR for the diagnostics of Rinderpest and BVD in one tube
- Development of marked vaccines, which would similarly allow distinction of vaccinated animals from those, infected with either RPV or PPRV using the currently available serological tests.

A consortium of three main institutions is carrying out the Research activities namely:

- Institute for Animal Health, UK (the co-ordinator of the project) will carry out the work on the marked Rinderpest vaccine and the improved serological tests for Rinderpest (in collaboration with the FAO/IAEA Agriculture and Biotechnology Laboratory, in Austria),
- CIRAD-EMVT (France) for the PPR marked vaccine and the PPR serological tests (in collaboration with the FAO/IAEA Agriculture and Biotechnology Laboratory, in Austria),

- FAO/IAEA Agriculture and Biotechnology Laboratory (Austria) for the tests to differentiate RP from stomatitis-enteritis syndrome and the transfer of the different tests developed within the consortium to African laboratories.

So far the PEU didn't receive a final report from Pirbright on Rinderpest and PPR research programme.

➤ **PPR vaccine trial**

A major constraint to the final eradication of Rinderpest, and therefore the planned 2010 Global Eradication Declaration – is that currently available vaccine against Rinderpest induces serological responses in cattle that cannot be differentiated from those that follow infection with field viruses. For instance, in the Somali Ecosystem it appears that a strain or strains of Rinderpest lineage II are prevalent that produce only mild disease in cattle. In the absence of effective movement control, the only effective weapon against the viruses causing “mild Rinderpest” is vaccination. However, once vaccination is applied on any scale in the field, the use of serology as a surveillance tool becomes problematic because differentiation between serological responses to vaccination and natural infection is impossible using currently available assays.

“Marker systems” based on Rinderpest genes cloned into other viruses or by insertion of foreign genes into Rinderpest vaccine virus that express additional proteins that can be detected serologically are potentially available. However, for one reason or another, none of these products are available commercially. This means that the immediate and urgent problem of Rinderpest persistence in the Somali Ecosystem, or elsewhere, cannot be addressed. It has therefore been suggested that use of PPR vaccine (a product available commercially) against Rinderpest could be used since the two viruses are genetically and immunologically related. It has already been shown experimentally that PPRV vaccine Nig 75/1 protect small ruminants from challenge with the highly virulent Saudi strain of RPV. Such study needs to be carried out in cattle. Furthermore, it would need to be proven that the serological responses to PPR vaccine are readily distinguishable from those resulting from infection with Rinderpest virus.

In line with the above a consensus protocol for the experimentation has been designed and agreed by PACE, FAO, IAEA, CIRAD – EMVT and the World reference Laboratory for Pirbright. The 8th PACE Advisory Committee Meeting endorsed the protocol and recommended that the experiment be carried out at the National Veterinary Research Centre of Muguga of the Kenyan Agricultural Institute (Kenya). The World Reference Laboratory and CIRAD – EMVT with the assistance of two experienced veterinarians selected by KARI and IBAR, should jointly coordinate the experiment. As a result the WRL and the National Veterinary Research Centre of Muguga of the Kenyan Agricultural Institute (Kenya) signed an agreement for the implementation of the trial. Thereafter, Dr M. Rweyemamu and Dr Henry Wamwayi (Somalia PACE Project Advisor) were appointed as international consultants to oversee the project and assess the NVRC Muguga facilities and undertook a mission to this end in May 2004. The consultants’ team has concluded that NVRC Muguga is able to implement the program of work envisaged in the contract between AU/IBAR and KARI once certain conditions are fulfilled (19). Another mission was undertaken by Dr Tounkara Karim (Laboratory Expert) and Henry Wamwayi (Somalia PACE Project Advisor) to Muguga (Kari) in October 2004 to assess the completion of the preparatory stage (20).

The results of the first phase of trial were presented at the 12th ACM held in Bamako in April 2004, and the conclusion was that vaccine is not working as expected. Due probably to the

low dose of vaccine the results were not conclusive, and therefore, As the way forward, the ACM recommended to repeat the test by revising the protocols, increasing the number of animals in groups and extending the experiment to sheep and goats. The ACM recommended also that an internationally recognised expert be appointed to monitor the project. This would be in addition to the visits planned by scientists from Pirbright and CIRAD to help with the technical aspects of the work. Because of the urgent need to provide the OIE Scientific Commission with information on the innocuity test of the PPRV vaccine in cattle, Dr Emmanuel Couacy Hyman was appointed.

Due to the many last minute difficulties that have arisen with the PPR trial, and the incredibly short time available to complete it before the end of PACE, it was proposed to postpone the test and continue with it under the extended SERECU project.

5.4.2. PACE Research Programme on Contagious Bovine Pleuro-pneumonia (CBPP)

In view of limited budget available for CBPP project, as compared to all possibilities of research, careful selection of priorities has been established and validated by group of African Scientists during an OAU/IBAR consultative meeting held in Nairobi from 10th to 12th December 2000. The final proposal is aiming at obtaining short-term results that may have rapid application at the field level.

The key outputs expected at the conclusion of the research are:

- Definition of dose of T1sr and T1/44 microorganisms that is capable to provide a significant level of protection on challenge,
- Determine vaccination strategy that provides durable protection,
- Set up a database of candidate genes contributing to the phenotypic differences between the strains, which could potentially be applied to develop improved vaccines against and diagnostic for CBPP,
- Tools for detection of chronic carriers.

A consortium of three main institutions is carrying out the Research activities namely:

- CIRAD-EMVT will carry out bacteriological and immunological studies; characterization of the animals; use of immunological tools for the selection of potential new vaccines and development of T-cell lines specific for MmmSC; screening of the MmmSC antigens; development and immunological screening of potential new CBPP vaccines by expression of MmmSC antigens in suitable vectors.
- IZSTE for immunological study.
- ILRI for chemotherapy trials; follow up of vaccinated animals, immunological study and analysis of cellular immunity in immunized cattle.
- MOREDUM for development of pen-side test that will allow the rapid detection of CBPP cases in the field.
- KARI for boosting effect of revaccination; chemotherapy trials; follow up of vaccinated animals; clinical observation of experimental animals; use of PCR in live

Achievements of the programme

The first year of CBPP research program was mainly devoted to put into place the conditions for the implementation of the vaccine trials to be done in LANAVET and KARI. Before the end of the first year of implementation of the project 145 animals and consumables were purchased in LANAVET. Animals were dewormed and tested for tuberculosis, brucellosis and CBPP. LANAVET and KARI received ten vials of each vaccine from CIRAD and after titration the titre found was 10,1 log per vial.

In 2003 two major studies have been implemented that can have direct applications in the field. This applies to the dose effect trial made at LANAVET and to the antibiotic trials performed at LANAVET and KARI.

CBPP transmission to the control group was successful and the mortality rate 32%. Most of surviving animals displayed typical lesions of CBPP with or without seroconversion and presence of *Mycoplasma*. The mortality rate in vaccinated animals was significantly reduced (6%) and the protection was also obvious from the shift in lesion score distribution. These lesion score distributions seem to indicate a better protection afforded by strain T1/44 (70%) as compared to T1sr (60%), although differences are not statistically significant. There is also no obvious pattern of correlation between dose and protection. Alternative ways to increase the protection rate with the current vaccines may be to perform a booster injection shortly after the first one. Such trial is ongoing and results should be available next year.

For the antibiotic trials performed at LANAVET and KARI tetracycline and oxytetracycline of long acting were used. The injection of these antibiotics to animals suffering from an invading oedema and typical CBPP form was followed by rapid improvement of the animal conditions and reducing the mortality rate. However, MmmSC strains were re-isolated from these animals (sequesters and tracheobronchial nodes).

Regarding the evaluation of protection afforded by one or two vaccinations with T1/44 the results show that a proliferative response has been recorded in three groups post vaccination. Vaccination with inactivated antigen adjuvant with saponin induced a high and rapid proliferation (detectable as early as one week post immunisation). By contrast the vaccination with T1/44 induced a milder response detectable roughly 4 weeks post vaccination. However, the injection of a second dose of T1/44 vaccine was followed by rapid and high response.

Concerning the issues that could play an important role in the development of future vaccines major results were obtained. One was performed at KARI and concerned the experimental evidence that post vaccinal reactions, seen sometimes with strain T1/44, may be due to a reversion to virulence. This experiment shows clearly that strain T1B has reverted to virulent, and indicates that few genes may be involved in virulence. Another result was obtained mostly in a parallel study including collaboration between CIRAD and INRA in Bordeaux. It concerns the development of tools to transform MmmSC strains that may pave the way to attenuated strains that has been selectively attenuated by knocked out genes.

Regarding the evaluation of pen-side test the various latex beads meant to detect circulating antigen or antibodies have been validated in the field in Tanzania and Mali. These validations have evidenced the need for some improvements of the tests especially in terms of reproductivity.

Finally the characterisation of the immune responses following various immunization protocols may lead to an understanding of the responses leading to recovery or to disease. These results may then be compared to what has been obtained in parallel INCO project.

6. Workshops and meetings organized by PEU during the reporting period

During the first phase of PACE PEU has organised the following workshops and meetings:

1. Workshop on optimisation of epidemio-surveillance systems in PACE member countries held in Dakar (Senegal), 23rd -26th August 2004
2. Workshop on budgeting to sustain national livestock development activities in PACE member countries held in AU Headquarters, Addis Ababa, Ethiopia, 29th – 30th March, 2004
3. Workshop on Emergency Preparedness plan and OIE Pathway held in Abidjan (Côte d'Ivoire), 11th -15th February 2002
4. Tripartite Meeting held in Khartoum (Sudan), 27-29th November 2001.
5. Workshop on policy for control of CBPP held in Ghion Hotel, Addis Ababa, Ethiopia, 19th – 21st November 2001
6. Workshop on strategies for control CBPP held in Accra (Ghana), 3rd –6th February 2003
7. Technical Workshop on CBPP: Recent information made available through modelling studies. 8th May 2003, International Livestock Research Institute, Kabete (Nairobi, Kenya)
8. Workshop on OIE Pathway for PACE Eastern African countries held in Nairobi, 7th – 8th October 2003
9. Eastern African Regional workshop on mild Rinderpest held in Nairobi (Kenya), 17th -19th June 2002
10. Workshop on the eradication of mild Rinderpest from the Somali Ecosystem, Nairobi, 18th –20th February 2004
11. Meeting on wildlife epidemio-surveillance held in Nairobi, 11th – 13th December 2000
12. Workshop on African Swine Fever (ASF) held in Lomé (Togo), 29th – 31st October 2001
13. Regional workshop on Rift Valley Fever (RVF) held in Dakar (Senegal), 20th – 22nd January 2004
14. Workshop on strategies control for CBPP, 25th – 27th February 2004, Conakry (Guinea)
15. Meetings of the third Research Coordination Meeting of the FAO/IAEA/OUA-IBAR Coordinated Research Programme on diagnosis and control of CBPP in Africa, Nairobi (Kenya) 18th – 22nd June 2001

16. Meeting of the final Research Co-ordination Meeting of the FAO/IAEA Co-ordinated Research Programme on the “Monitoring of Contagious Bovine Pleuropneumonia in Africa Using Enzyme Immunoassays” 17th – 21st February 2003, Bamako (Mali)
17. Training workshop in epidemiology and epidemio-surveillance, dakar (Sénégal), 14 – 25 April 2003.
18. PACE wildlife training workshop held in Arusha, Tanzania, 29th November – 3rd December 2002
19. PACE national and regional Laboratories Network Meeting held in Accra (Ghana), 27th September – 1st October 2004
20. Workshop on planning of Regional training programme held in Bamako (Mali) in November 2001
21. Training workshop training held in Niokolo Koba National Park (Senegal), 8th – 12th January 2001
22. Training workshop training held in Lopé National Reserve (Gabon), 9th – 13th July 2001
23. Training workshop training held in Bénoué –Garoua National (Cameroon), 12th – 16th January 2003
24. Training workshop training held in Shai Hills National Reserve (Accra,Ghana), 30th July – 2nd August 2001
25. Training workshop training held in Natitingou and Pendjari Parks (Bénin), 17th – 21st December 2001
26. Training workshop training held in Yankari National Yankari Park (Nigeria), 14th – 18th January 2002
27. Training workshop training held in Shange (Zimbabwe), 23rd-28th September 2002
28. Training workshop training held in Bénoué –Garoua National (Cameroon), 19th – 23rd January 2003
29. Training workshop training held in Kainji Lake National Park (Nigeria), 17th – 21st February 2003
30. Workshop on the consolidation of the PACE surveillance systems achievements was held from the 17th to the 21st of July 2006 in Hotel SAWA, Douala, Cameroon.
31. Workshop on harmonization of integrated national emergency plans for prevention and the control of highly pathogenic avian influenza. Bamako (Mali), 18th – 21st March 2006

32. Second Annual Meeting of the Pan-African programme for the Control of Epizootics (PACE) National and Regional Laboratories Network workshop, Entebbe (Uganda) 1st – 10th September 2005
33. Third annual coordination of national and regional reference laboratory network meeting. June 5th – 9th, 2006
34. Training workshop of African Experts on HPAI (epidemiology, surveillance, emergency response, crisis management and simulation exercise), Dakar (Senegal) 31st October – 9th November 2006
35. Meeting of expert group on regional mechanism of coordination for prevention and control of HPAI. Bamako (Mali), 16th – 17th March 2006

The PEU has participated actively in:

- All annual PACE Co-ordinations Meetings organised by PCU from 1999 to 2006 inclusively;
- The workshop to formulate a strategy for PACE programme held in Machakos (Kenya) in October 2000;
- The two OIE Regional representative meetings held in Arusha (Tanzania) and Maputo (Mozambique) in 2001 and 2003 respectively as well as in the general OIE session held once a year in Paris (France);
- All Advisory Committee meetings organised during this period;
- Sixth Ministerial Meeting held in Addis Ababa, Ethiopia in March 2002;
- The workshops on RVF FAO/TCP held in Dakar in April 2001, and “Update on technologies for surveillance of Rinderpest freedom held in Dakar (Senegal) in November 2001;
- The workshop on the end of RVF TCP held in Dakar (Senegal) in April 2001;
- The third Research co-ordination Meeting of the FAO/IAEA co-ordination research program on diagnosis and control of CBPP in Africa held in Nairobi (Kenya) in June 2001;
- Two consultative Group Meetings on CBPP in Africa held in FAO Headquarters, Rome (Italy) in November 2003 and 2006 respectively

7. Constraints

During the period 1999 – 2007 the PEU faced several constraints, which affected its performance. These constraints are related to the implementation of activities, management and technical issues technical.

➤ *Implementation of activities and management issues*

PACE at the time of the initiation of the PEU was delayed in relation to the initiation of National projects. In East Africa, PACE Ethiopia, Rwanda and Eritrea were effective programmes only from October 2000. In West and Central Africa, the majority of countries were effective from January 2001. This restricted activities in relation to National Programmes in general. The inception phase of PEU in 2000 was slow due to the delay in staffing of the team and this has been recognised by the PEU as the main cause.

There were considerable delays in setting up efficient office support services by the PCU during 2000 and these remain poor with a significant constraint on the basic functions of PEU. The appointment of an administrator is helping to alleviate the administrative

problems but the general organization of the Common Services and linkages within and between units, PCU and OAU IBAR remains poor. Considerable time was wasted during the initial few months on poorly organized missions, planning and document preparation with few cohesive and well co-ordinated activities initiated.

There is much room for improvement of communication between projects and programmes hosted by IBAR, between the PACE regional coordinator and the Director of IBAR, as well as between the PCU and the common services units. Some of the communication problems could be overcome by installing a system of projects and programmes presenting their progress to all IBAR staff. Every month one of the projects could present a 30 minutes PowerPoint on their project, which is followed by a half hour discussion. If this were done at a Friday afternoon, a drink for all staff could follow it.

Unsuitable working conditions caused by serious shortage of office space were constraints for the staff to implement properly their activities. Furthermore, some issues of management are inadequately addressed. Factors other than workload and lack of office space include inconsistent grading of staff. This made staff morale was low. International recruited counterpart of main epidemiologist signed contract before moving to Nairobi but on arrival in Nairobi was asked to sign a revised contract with considerably lower level of remuneration than that offered in the initial contract. Returning to back to his home country was no longer feasible and he felt obliged to sign the revised contract. In Addition, there were anomalies between responsibilities and grading of positions. The problems of grading and pay had not been adequately addressed and have prevented the teambuilding of team spirit.

➤ *Technical issues*

The approach to the epidemiology component of the PACE program was to rely on each specialist to identify the needs within his area of responsibility and subsequent implementation of the activities necessitated by the needs identified. It must be admitted, however, that this has led to a somewhat fragmented approach and a lack of a common strategy, which in the long run will be unhealthy. Consequently, agreement on a concept of epidemio-surveillance was reached after some delay. It is maybe understood that countries will be advised about the kind of surveillance systems and control strategies to adopt but will be free to choose. Disease control is beyond the scope of PACE, but work on the design of control strategies continues. As before, this consists of bringing together various specialists and advisory groups for the exchange of information and review of experiences.

Regarding the progress along the OIE Pathway, the following constraints were listed:

- Delay in mobilisation of PACE funds
- Decentralisation affecting chain of command
- Lack of capacity in risk analysis
- Uncontrollable livestock movement
- Outdated legislation
- Efficiency and output of the surveillance systems
- Lack of information flow between regional and national PACE programmes, particularly surveillance (passive and active) data.
- Lack of initiative to draft dossiers and application to progress along the OIE pathway
- Perception of some countries that the OIE pathway is an obstacle rather than an aid to international certification and part of the strategy for the eradication of Rinderpest (international commitment)

Establishment of the current epidemiological situation within Sudan and Somalia was not achieved due to organizational, logistic and political constraints, some of which were outside of the control of the PACE components. However considerable time was spent convincing the Somalia programme of the importance of the wildlife surveillance and only towards the end of the programme had this been adequately embraced and incorporated into their planning.

In relation to the practical execution of wildlife disease surveillance, the organizational structure of PACE and method of funding (through PACE National programmes), was found to be inappropriate and the most important constraint on the outputs. Although strategies and mechanisms for wildlife disease surveillance were established, at least in theory, at a National level the speed of execution of activities under the work plans was very poor and of a lesser scope than originally planned. The reasons were mainly financial due to delays in release of funds from EC to countries and from country programmes to executing agencies. This was a particular problem in Ethiopia and Kenya.

The problem encountered is that the laboratory expert has no budget to visit non-IAEA member countries and has been using the Director's travel budget for that purpose.

8. Conclusion

Since the beginning of the activities of PACE Program, 29 member countries out of 30 have set up or revitalized their national ESS (96,7% of them are operational) and declared the whole country or a zone of the country provisionally free from Rinderpest. By May 2006, Twenty-one (66.6%) PACE member countries of were recognized by the OIE free from disease, 2 of them on a zonal basis. Twelve (42.86%) of which, were recognized free from infection, and 5 on historical basis.

In 2006, Côte d'Ivoire, Ghana, Mauritania, Niger (reapplication), Tanzania and The Gambia applied for recognition of Rinderpest free from infection. At the same time Cameroon, Central Africa Republic (CAR), Gabon and Ethiopia (countrywide) applied for recognition of freedom from disease. The OIE Rinderpest Ad hoc group considered all these dossiers in September 2006.

To date, Out of 29 countries, which have drafted and sent their emergency preparedness plans to PEU for comments, the Director of AU/IBAR has approved 27.

Regional wildlife coordination within the epidemiology unit of PACE was established for Eastern Africa. A network for epidemio-surveillance of wildlife was maintained, with staff trained in both veterinary and wildlife governmental agencies in the region. Proper functioning of the network relied heavily on input from the regional co-ordination units. Due to the weak capacity for wildlife interventions in many countries, the TA's had to organise and manage at all levels; administration, wildlife capture, sample collection, processing and dispatch, training and laboratory follow-up. In all countries the relevance of the activities was well accepted.

Three (3) laboratories have been chosen as PACE regional laboratories: National Veterinary Research Center Muguga (Kenya); Laboratoire National D'Elevage et de Recherches Veterinaires (LNERV Dakar Senegal) et Laboratoire Central de Pathologies animales de Bingerville (Cote d'Ivoire). A Memorandum of Understanding between AU-IBAR and Directors of Regional laboratories has been agreed and signed.

The laboratories Rinderpest-testing network was re-activated and the first annual meeting for regular updates on specific laboratory techniques and external quality assurance program in the serological testing for Rinderpest was held in Accra (Ghana) in September 2004; the last two workshops were held in Entebbe (Uganda) and IN Bamako (Mali) in 2005 and 2006 respectively.

The protocols for detecting antibody in livestock and wildlife sera using virus neutralization tests (VNT) for Rinderpest and PPR in addition to c-ELISA H (OIE standard) was developed and adopted. For wildlife c-ELISA N tests are useful in the absence of VNT as the results obtained are consistent with previously reported insensitivity of c ELISA H test to antibody produced by the current lineage II strain of Rinderpest that is circulating.

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