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Promotion of Regional Integration in the SADC Livestock Sector (PRINT)

9 ACP SAD 002

Report of a Consultancy for SADC Veterinary Laboratories Network (VLNC)

May 2006

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List of Acronyms

AO	Angola
ASF	African Swine Fever
BNVL	Botswana National Veterinary Laboratory
BVI	Botswana Veterinary Institute
BW	Botswana
CBPP	Contagious Bovine PleuroPneumonia
CD	Congo Democratic Republic
CDrom	Compact Disk read only memory
CIRAD	Centre de coopération Internationale de Recherche en Agronomie et pour le Développement
CVL	Central Veterinary Laboratory
CVRI	Central Veterinary Research Institute
ELISA	Enzyme linked immunosorbent assay
FANR	Food, Agriculture and Natural Resource
FAO	Food and Agriculture Organization
FAT	Fluorescent Antibody Technique
FITC	Fluorescein isothiocyanate
FMD	Foot-and-Mouth Disease
HPAI	Highly pathogenic Avian Influenza
IAEA	International Atomic Energy Agency
ISO	International Standardization Organisation
LIMS	Livestock Information Management System
LS	Lesotho
MG	Madagascar
MU	Mauricius
MW	Malawi
MZ	Mozambique
NA	Namibia
ND	Newcastle Disease
OIE	Office international des epizooties: World organization for animal health
OVI	Onderstepoort Veterinary Institute
PCR	Polymerase chain reaction
PRINT	Promotion of regional integration
QM	Quality Manual
QMS	Quality Management System
SADC	Southern African Development Community
SANAS	South Africa National Accreditation System
SOP	Standard Operating Procedure
SZ	Szwaziland
TADs	Transboundary Animal Diseases
TZ	Tanzania
ZA	Zuid Africa: Republic of South Africa
ZW	Zimbabwe
ZM	Zambia

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INTRODUCTION

This Consultancy mission has been implemented following the terms of references outlined here-after.

Background Information:

Beneficiary :
The Southern African Development Community (SADC)

Contracting Authority:
The Regional Authorizing Officer of the European Development Fund, Executive Secretary, SADC Secretariat, Private Bag 0095, Gaborone, Botswana

Relevant Background Information:
SADC was reformed in 1992 in response to a broadly perceived need to integrate Member States into a single body rather then merely coordinate their economies. There are currently 14 Member States. The primary role of SADC is to define regional priorities, facilitate integration and development, and assist in mobilizing resources and to maximize the regional impact of projects. The regional approach is designed to complement, support and enhance national activities rather than replace or compete with them.
In the course of the institutional reform, the former system of sector coordination units in Member States was centralized at the SADC Secretariat in Botswana and regrouped under 4 Directorates. The livestock sub-sector comes under the Food, Agriculture and Natural Resource (FANR) Directorate.
The PRINT Livestock Project was conceived to support the Livestock Sector Unit within FANR with the main objective to develop a sustainable, coherent approach to regional livestock development.

Project Objectives

Overall Project Objective
The *overall objective* is to contribute to poverty reduction in the SADC region through increased productivity and trade flows in the traditional livestock sector of the SADC Member States. Its *purpose* is to lay down a sustainable base of a coherent regional approach towards the development of the livestock sector in the SADC region.

Specific Contract Objectives
The project has three main intervention strategies, namely

- The establishment of a Livestock Information Management System (LIMS) to be established at the SADC Secretariat and in the Member States
- Implementation of national and regional studies in order to identify and fill information gaps in the livestock sector
- Improvement of the human resources in the livestock sector through a regional training

The objective of this contract is to establish the efficiency and networking of Veterinary Laboratories in Member States in promoting generation of quality data in diagnostics.

Expected Results of the Consultancy:

- The Network of Veterinary Laboratories has been assisted in the identification of deficiencies in their diagnostic capabilities in collaboration with field services, with special reference to Foot-and-Mouth Disease, Contagious Bovine Pleuropneumonia, Avian Influenza, African Swine Fever, Newcastle Disease and Rabies;
- Quality Assurance systems in place in Member States have been assessed;
- Intensity of Networking and development of harmonized Standard Operating Procedures (SOP's) assessed;
- Diagnostic capacity (personnel and equipment) assessed;
- Inventory of available tests established;
- Major limiting factors in the efficient operation of laboratories identified; and
- Training needs identified.

….

Specific Activities of the Consultancy

- Establish contact with members of the Sub-Committee of the Veterinary Laboratories Network (facilitated by PRINT);
- Prior to the onset of the consultancy in the SADC region, develop a web administrated questionnaire and database to be submitted to all laboratories on information relevant to the expected results of this consultancy. To accomplish the analysis of the survey before the final workshop and present preliminary results at the workshop;
- Carry out visits for laboratory assessment to at least three national laboratories representing three levels of diagnostic capacity and make recommendations on the status of equipment (including reagents/consumables and testing procedures);
- Consult laboratory results and assess information flow and its management;
- Establish staffing levels, technical performance and training needs;
- Determine progress in SADC laboratories towards implementing Quality Management Systems and accreditation (under ISO/IEC17025 International standard), with a detailed approach during laboratory visits, and a survey approach with the questionnaire for all laboratories;
- Organize a facilitated regional Workshop for the Sub-Committee towards the end of the consultancy;
- Recommend strategies of harmonizing and standardizing diagnostic test protocols (SOPs) for the uniformity of test results and reliability of diagnostic outputs for epidemio-surveillance purposes, with special reference to the diseases mentioned above;
- Identify opportunities and constraints for the role of Veterinary Laboratories in supporting the generation of quality data in animal health and production;
- Formulate recommendations on mitigating strategies; and
- Produce a report.

CONSULTANCY FINDINGS

1 QUESTIONNAIRE

1.1 Method

This questionnaire has been designed for the evaluation of quality management in veterinary diagnostic laboratories. The idea of using a website for disseminating the questionnaire (downloading), or for answering the questionnaire online, has been rejected because of the difficulties to connect to internet in many SADC countries. As each laboratory had to be contacted by Email or by post, it was felt more convenient to prepare a questionnaire as an excel file. Each file was individualized by using a two-letter extension corresponding to the ISO code for the country (ISO codes can be found as a file in the CDrom).
The questionnaire has been prepared to fit exactly the norm ISO 17025 and it has been divided in 11 folders.
The first folder is the introduction that explains how to answer the questionnaire and to send it back.
The second folder is a description of the lab
The third folder contains 69 questions relating to the "management" part of the norm
The fourth folder contains 65 questions relating to the "technical" part of the norm
The fifth to the tenth folder relate to each of the diseases that was targeted during this consultancy.
The eleventh folder is an abbreviated questionnaire (50 questions) designed for the laboratories that have a limited experience in quality management.
The twelfth folder is an appraisal form for this questionnaire

The questionnaire was sent by Email to all laboratories that answered positively to a preliminary Email (AO, BW, MG, MZ, NA, ZA, ZM, ZW). For the others the questionnaire was sent on a CDrom by DHL the 20/03/06 (CD, LS, MW, MU, SZ, TZ).

1.2 Results

An unexpected problem occurred with some countries as the excel file was quite large (2300Ko) and some Email providers do not accommodate large files. When this situation was identified a modified file was sent. The size of the original file was due to the lay-out of the file with part of the folders being protected (to prevent any mis-handling) or colored (for easier reading).

Very few responses were received before the end of this consultancy. Beside the four labs that were visited, only CD and LS laboratories had sent the questionnaire back.
The four visited labs had prepared the questionnaires beforehand. During the visit of each laboratory, half a day was devoted to the analysis of the questionnaire's answers. It appears that many corrections had to be made for the labs that were not very familiar with the ISO17025 norm. On that respect it seems to be quite important to specify that the questions were relating to what was actually happening in the lab (not what was planned) and that a definitive "yes" answer could be given only if the subject of the answer was

- Covered in a written document (Quality manual for example)
- Implemented in the lab
- Recorded in an appropriate way

The status of the questionnaires is summarized in an excel file in the CDrom:
Questionnaire-sending-received.xls

The questionnaires answers were used to establish some kind of "Quality Management performance indicator". This was done for each part, management and technical, by summing all positive answers and by calculating the percentage of these positive answers compared to the total number of questions. In the presentation a clear distinction was made between results obtained with validated data as compared to the raw data obtained for the other labs.
For the management part and the validated data, the results ranged from 38 to 84%
For the technical part and the validated data, the results ranged from 40 to 82%
This gives a clear indication on the various situations of the laboratories concerning Quality Management practices. It was no surprise that the only accredited laboratory visited during this consultancy had the highest score. This is also a good indication that this questionnaire can be used as a tool to monitor the evolution of quality management in each laboratory. Some of our colleagues even told us that they would have wished to get this questionnaire before some external auditors came to their labs…

The various folders concerning the 6 targeted diseases were used to establish some kind of "activity evaluation" rated from 0 (no activity) to 3 depending on the number of tests that were performed in the lab (isolation/identification, serology, rapid detection).
All the results are summarized in an excel file:
Management evaluation-SADC-labs-2006
The first folder contains the general table and validated data are colored in green.
The individual questionnaires files are also included in the CDrom.

Interestingly, Rabies is the disease for which every lab that has answered the questionnaire declares being able to perform at least one diagnostic test. After rabies, Newcastle disease comes next with five out of six labs performing at least one test.
What is more worrying is that for the four remaining diseases there are less than 3 labs out of 6 that are able to carry a diagnostic test. This absence of testing ability can be balanced by some sub-contracting activity. However subcontracting very often leads to further delays and this may be a serious limitation in the fight against transboundary notifiable infectious diseases.

Questionnaire conclusion and perspective

The limited number of responses to this questionnaire is something that is certainly worth investigating from a SADC point of view. Among other possibilities, this limited number of answers could be due to various reasons such as:
lack of commitment to implement ISO17025
lack of time to answer the questionnaire
lack of commitment to share with others the questionnaire evaluation (but this is contrary to the "quality basic principles": "say what you do, do what you say")

From our own experience with the colleagues in the various labs, this questionnaire seems well suited to monitor the evolution of the implementation of the quality management practices. It could be used as a "performance indicator" to monitor the evolution of the situation for each laboratory or in SADC laboratories as a whole (provided the other labs send back the questionnaire).

The validation of the questionnaire answers could be performed in two different ways. One could be to select a few questions for which the answers are positive and ask the Quality manager of the selected laboratory to send rapidly a number of requested documents (Part of Quality manual, SOPs, records…). The percentage of correct answers could then be used to measure some kind of "reliability index" for the questionnaire's answers. This can be done by Email exchanges and would be relatively cheap. The other possibility would be to commission another consultancy to continue the visit of the laboratories.

2. QUALITY ASSURANCE SYSTEMS IN PLACE IN MEMBER STATES

As already mentioned, the questionnaires answers give a good idea of the level reached by every lab in its quality assurance system implementation and this frame can be used as a convenient tool to follow from time to time its own improvement. The current scores range from about 40 to 80% for the both management and technical parts, with highest values obtained for the only accredited lab. These results, confirmed by a more thorough examination during the visit of the four labs, point two important features: I) the management and the technical fields are treated with about the same priority by the labs and ii) every lab can improve its performances, even the accredited one.
The findings observed during the visits, are given in separate reports for every lab in Annexes 1 to 4. From these observations five points seem to merit particular attention to improve the quality assurance management in all SADC veterinary laboratories:

2.1-The documents management, including the definition of the different types of documents (management as quality manual, technical as SOPs, external as norms, formulas as bench worksheets, …), their identification (single code, version index, pages numbers, …), their management (writing, checking, approval, diffusion, localisation, archiving, …), the holding of updated lists of documents, their regular review;

2.2- The records management, including the definition of the different types of records (management as job descriptions, organograms or management reviews reports, technical as equipments calibration reports, daily bench worksheets or maintenance planning, …), their identification (file name, …) , their management (writing, checking, location, archiving, duration time, …);

2.3- The equipments management including their single codification, independently of their size (the general inventory often performed does not always take in account the small equipments as micro-pipettes for example), an updated list of general and critical for tests equipments, their management (individual life sheets which traces all the history of every equipment, eventual choice of suppliers, for calibration for example, in accordance with ISO 17025 requirements), their maintenance and calibration planning, their visual status (eg "out of order"), their specifications;

2.4- The traceability of the important actions concerning the lab activity. This item, compulsory to prove the obtained results, includes many fields: the documents, across the version index, the different kinds of records (tests reports, bench worksheets, …), the reagents (batch number, date of preparation or opening, validation of expired reagents records), the equipments (linkage to international standards), the samples (single identification allowing to follow them during the different steps of their presence in the lab, from their entrance to their elimination);

2.5- The supervision and the improvement of the quality management system. This includes simple actions such as recording and treatment of clients complaints, encountered problems in management (eg lack of job description) or technical (eg tests performed with expired reagents) fields, regular (eg yearly) management reviews where the previous period running is overviewed and practical actions can be planned.
The commitment of the persons encountered during the visits was well perceived and these five targets may be adapted by every lab, in function of its management and/or technical level, by choosing realistic and short term aims to progress.

3. INTENSITY OF NETWORKING AND DEVELOPMENT OF HARMONIZED SOP'S

3.1 Networking

From the questionnaire's answers and the discussions with various colleagues, it is clear that networking is very limited within the SADC veterinary laboratories. This was quite clear from the beginning of the consultancy as it was quite difficult to obtain an accurate and up-dated list of laboratories. It seems also that inter-laboratory "roundrobins" have been organized only for CBPP (ZA, NA, BW). For the other diseases the various labs subcontract some testing to external laboratories within SADC (OVI, BVI) or to reference laboratories overseas (Pirbright, IZS Teramo…)
However the need for networking was considered as a priority by all our colleagues and the main limitation identified was the lack of funds to establish these network activities.

A number of proposals can be made to foster networking within the SADC vet labs.

The creation of a specialized website for veterinary diagnostic activities is an absolute necessity. This website should include an updated list of laboratories (using the format from the 2nd folder of the questionnaire for example) and a number of documents of common interest. This website should be sufficiently "autonomous" to appear when the relevant query is made through general web search-engines.

The organization of inter-laboratory roundrobins is also an absolute necessity. It is almost considered as compulsory by the norm ISO17025 and this would be a very good way to ensure the reliability of the results which are issued by the various labs and it would give credibility to the official declarations to the OIE. The organization or roundrobins can be feasible with a number of conditions: 1) Some funds are available to organize them, 2) There is one lab that takes the responsibility to organize it (for each disease) according to international standards (OIE), 3) A number of "SADC internal reference material" are gathered in sufficient quantities to ensure aliquoting and dispatch to the various labs and 4) The problem of transport to the labs is solved (biohazard risk)

Networking is very often facilitated by direct contact between persons. A good example is given by the regular meetings of the diagnostic subcommittee that ensure open discussions between the stakeholders. Networking within SADC labs would be facilitated through a program of exchanges for technicians of laboratory head of sections for very specific topics (Quality management, diagnostic…). Again this type of program will be successful only at the

condition that 1) There are some funds available and 2) Some labs volunteer to receive colleagues in their premises.

Finally networking will be also facilitated by sharing the aforementioned website to exchange a number of documents such as reference documentations, quality manual lay-out, technical formulas etc …

3.2 Harmonized SOPs

It is quite clear that, up-to-now, there has been little effort made in the SADC to issue some standardized SOPs. Each laboratory that has started Quality Management has developed its own documents (ZW, BW) and the other visited labs were in the process of issuing their own documents as well. It has to be noted that a consultant from the OVI (ZA) had visited the ZM-CVRI and provided a standard SOP layout.
In fact there are two aspects in the standardization of the SOPs. The first one is to develop a standardized SOP lay-out to re-enforce the SADC identity of these documents (some kind of graphic chart with defined head of chapters). The second one would be to adopt some common procedures for a number of tests to ensure the consistency of results from one lab to another.
The first objective is certainly worth implementing and quite easy to achieve. Various labs could propose their SOP layout and a consensus could be found to issue a standard layout (As a reference center for CBPP, CIRAD does not see any objection to sharing some of its SOPs).
The second objective may be more difficult to achieve. First of all for the simple reason that for a specific disease there may be various tests that have been developed and that have passed the internationally recognized requirements (OIE standards). The second reason is that some laboratories have developed in-house tests that are much cheaper to produce and these laboratories may be reluctant to adopt any other test. There is no point of the norm that forces the lab to use a single test. The norm requests that the tests in use are correctly validated and that they are chosen by a person of adequate training and expertise. For that matter, the implementation of inter-laboratory roundrobins with representative number of internal reference materials would be a way to validate the different tests used in the various laboratories.

4. DIAGNOSTIC CAPACITIES (PERSONNEL) AND TRAINING NEEDS.

First of all, this consultancy team would like to pinpoint the fact that all the colleagues met in the various labs were dedicated to their task and in many cases very enthusiastic. This is a very good point.
The situation concerning the personnel seemed to vary a lot from one country to another. The most striking feature was the brain drain observed in ZW and ZM where most of the staff present in 2002 (identified during an IAEA consultancy by K. Tounkara) was no more present in the labs in 2006. As a consequence the personnel present are very young scientists who may lack the relevant experience and university degrees required by quality management. From the discussions held in Livingstone it is clear that this situation is common to a number of other countries. The reasons for some colleagues to leave for “greener pastures” are quite numerous but the most common one is the lack of financial incentive to work in a laboratory. The states have to recognize this problem and give adequate solutions if they really wish to benefit from efficient veterinary laboratories.

The first training need that has been identified relates to quality management as it seems obvious that some quality managers lack the necessary skills to be able to disseminate efficiently the quality management practices (this is not the case for the labs that have already put in place quality management). This training need seems to be common to many other SADC labs and this is the reason why we put this need as a top priority to ensure a better efficacy for all subsequent networking activities.

The second training need concerns the isolation and identification of mycoplasmas, in relation to the "regional study" on CBPP surveillance corridor. Isolation of the CBPP causative agent is one of the best tools for the confirmation of a CBPP suspicion. It has the additional advantage to allow for the isolation of other pathogens that may be present and may not be detected by specific PCR tests or specific serological tests. In addition there is some uncertainty on the persistence of antibodies in cattle that are infected by MmmSC strains of lower pathogenicity or in animals that have received an antibiotic treatment.

The third training need concerns the use of molecular diagnostic techniques such as PCR or Real time PCR. The necessary equipment may be provided to many SADC laboratories for the surveillance of avian influenza in the region. This is a very good opportunity to use these equipments for other aims and especially for the surveillance of the 6 targeted diseases. PCR is advantageous as in many cases it can be performed on samples that have been dried (no need of a cold chain). Amplified products can then be sent for sequencing for confirmation or for a finer subtyping of strains.

The fourth training need identified concerns the young scientists that have only a Bachelor's degree. On the one hand this degree may not be considered sufficient from an ISO17025 point of view to be a head of section and, on the other hand, allowing young scientists to upgrade their university degrees may be a way to maintain their enthusiasm and ensure that they wish to continue a career in veterinary diagnostics. It is therefore recommended that each head of section is undertakes a Master of Science degree in a local university (the best would be with a sandwich program with other universities or reference laboratories) with a subject chosen among the 6 priority diseases.

Finally equipment calibration has also been identified as a training need to fulfill ISO17025 needs: balances, micropipettes, incubators…

5. DIAGNOSTIC CAPACITIES AND MAJOR LIMITING FACTORS

Except for the BW-BNVL which is suffering from an "excess" of number of samples that can be seen as a limiting factor for implementing the quality management policy (which needs time to put in place), most of the visited laboratories suffer from the contrary: a limited number of samples.
This discrepancy can easily be explained by the fact that the activities of the BW-BNVL are supported by the export markets which drives a regular flow of samples to meet the demand of the European Union mainly (surveillance of notifiable diseases, residues…). In the other visited countries, on the contrary, the implementation of a "cost/recovery" policy has lead to a decrease of the flow of samples. This can be seen as the major limiting factor as it does not allow young scientists to gain sufficient experience, as it leads to a de-motivation of the technicians and that it poses a number of problems for the purchase of reagents. Stocks of

reagents become expired and this, in turn, necessitates putting in place various SOPs for the re-qualification of these reagents…
Improving the capacity of the various SADC veterinary laboratories will necessitate to increase the flow of samples and every effort has to be made to do so. Among other possibilities:
* Participation in interlaboratory trials and roundrobins (as discussed in "networking")
* Participation in multilateral surveillance projects such as that described in annex 5 for CBPP
* Participation in multilateral or bilateral research activities.

It is therefore important that heads of laboratories and head of sections should be pro-active and prepare concept notes (short, concise, with a detailed evaluation of costs) that can be proposed to various donor agencies. These concept notes can be transmitted to the various reference laboratories or any other internationally recognized laboratory so that these SADC national laboratories are included in future research projects. Beside CBPP surveillance, obvious subjects of interests are the surveillance of avian influenza but also Newcastle disease or rabies (in fact any of the 6 priority diseases).
For example, for Newcastle disease the main objective of the concept note would be to demonstrate to the donor agencies that the input of the laboratory is of paramount importance in any project that aims at protecting backyard poultry. (The EU is financing such a project in Mozambique). The laboratory could be used to monitor the onset of antibodies after vaccination programs but also for the surveillance of "Newcastle-like" suspicions to confirm or infirm the presence of Newcastle disease (or of Influenza virus). The chances to obtain a contract will be greatly increased if the laboratory can prove that it is implementing a quality management policy (service to the client) and if it participates to interlaboratory trials that prove its competence…

Finally one of the main limiting factors to a proper implementation of quality management is the maintenance of the premises but more important the maintenance of the critical scientific equipment. This problem has been identified in all the visited laboratories and it is urgent to find solutions to this problem. The problem can be divided in two. First of all it seems necessary to perform an appraisal of the situation and the needs for many of the laboratories. This could be performed through a consultancy mission by a specialized company. The terms of reference need to be refined but the main points should be to establish an inventory of the basic laboratory equipments (Autoclaves, Deep freezers, Freeze-driers) evaluate their performance, evaluate the cost for their repair (if need be), the annual cost for their maintenance and the issuing of calibration certificates in accordance to ISO17025. Another point concerns the calibration of critical equipments but it has been developed elsewhere.

FINAL CONCLUSION

Quality management plays a major role in diagnostic laboratories. Such managerial procedures ensure the reliability of the results that are issued by the laboratory and the satisfaction of the client that has sent the samples. As a consequence, rapid and reliable diagnostic results can be obtained that will allow prompt action to be taken in the field. The swiftness of the reaction will often result in reduced costs for the control of major diseases that may emerge. In addition, quality management is now required by international agencies for the validation of disease status. As such, quality management becomes a prerequisite for countries that wish to be part of the international trade for live animals or for animal products.

The situation of the various SADC countries in terms of veterinary laboratory quality management varies a lot. As expected, countries that are part of the international trade have already started implementing quality management. Others have only started recently and the effort devoted to quality management has not met the intensity which is necessary.

Implementing quality management needs time and effort to put in place the various operating procedures, registration documents and all the quality management organization. This is not the most difficult part as it may need only some additional trainings, funds and follow-up. What is more puzzling, in many SADC countries, is the lack of reliable companies for the implementation of equipment maintenance and accreditation for quality (metrology and link to international standards). Some additional risk for the implementation of quality is the high turnover of personnel in some laboratories. Young scientists may lack the required experience and training will necessitate more time and resources.
The questionnaire that has been sent to all laboratories is derived from the ISO17025 norm that is internationally recognized for quality assurance. Answers given to this questionnaire may have helped a number of colleagues “qualiticians” to evaluate what level of quality they have reached and where efforts are still needed. This questionnaire may be used regularly in order to monitor the evolution of quality in the labs. As such we hope it can be a useful tool. The frequent meetings of the SADC vet labs subcommittee is an excellent opportunity for strengthening the links between the various laboratories of the sub region. Such meetings could include systematically some point of discussion on quality management. It could also be an occasion to put in place some networking for inter-laboratory trials.

The consultancy team wishes to outline the pleasure it had to undertake this mission. We would like to thank all our colleagues that have welcomed us in their laboratories and allowed us to pose some “inquisitorial questions” on quality management. Our wish is that these visits will have a beneficial impact and that the PRINT project or any other project will allow the fulfillment of some of our recommendations so that this report does not stay in a drawer without some practical action to be taken. Furthermore we wish that all the personal contacts made during this mission will last in the future and that we will continue our exchanges in spite of the daily burden of work we all have in our laboratories.

Finally we have prepared a final “Consultancy appraisal” as to measure the satisfaction of our client. We would be glad to have some feed-back from the SADC team (once in quality management, always in quality management.)

Annex 1

09/04/2006

SADC Veterinary Laboratories Network Consultancy (VLNC)

Visit of the Mozambique CVL in Maputo
3rd April to 7th of April 2006

Corrected report
Code: VLNC-MZ-V02

Authors: D. Babre, P. Sinyangwe, F. Thiaucourt

INTRODUCTION

Terms of references of the consultancy

1- The Network of Veterinary Laboratories has been assisted in the identification of deficiencies in their diagnostic capabilities in collaboration with field services, with special reference to Foot-and-Mouth Disease, Contagious Bovine Pleuropneumonia, Avian Influenza, African Swine Fever, Newcastle Disease and Rabies;
2- Quality Assurance systems in place in Member States have been assessed;
3- Intensity of Networking and development of harmonized Standard Operating Procedures (SOP's) assessed;
4- Diagnostic capacity (personnel and equipment) assessed;
5- Inventory of available tests established;
6- Major limiting factors in the efficient operation of laboratories identified; and
7- Training needs identified.

IMPLEMENTATION OF THE VISIT

Monday April 3rd
Arrival at Maputo airport with some delay at 17H (instead of 15)
Transfer to the VIP hotel Maputo
Meeting with Dr A. Nhamusso at VIP hotel at 18h

Tuesday April 4th
Reception and welcome by the IIAM General Director, Dr Calisto Bias, at IIAM headquarters.
Presentation of the consultancy's objectives

Reception and welcome by the directorate of animal science director, Dr Rosa Costa.
Presentation of the consultancy's objectives

Meeting with the staff of the veterinary diagnostic laboratory (MZ-CVL)
Presentation of the mission's objectives and initial discussion.
Introduction meeting MZ-CVL attendance list

Helena Matusse	Food quality control department
Simone Issaca Magalo	Veterinary pathology
Antonieta Nhamusso	Diagnostic and research department
Quintino Lobo	Vaccine production unit
Carlos Matos	Parasitology
Alfonso Sussuro	Veterinary pathology
Luziathe Julio Guanbe	Vaccine production unit
Raul Fringe	Vaccine production unit
Rosa Costa	Pathology/Director of animal sciences
Manuel Reis	Virology and quality manager
Venancio Quiba	Pathology

General visit of the laboratory

Wednesday April 5th
Evaluation of the Questionnaire's answers
Drs M. Reis and A. Nhamusso

Visit to the EU delegation in Maputo
Françoise Millecam, head of food security and agriculture section
Presentation of the mission's objectives

Thursday April 6th
Evaluation of the quality management system in place at the MZ-CVL
D. Babre, P. Sinyangwe and M. Reis at the virology section
F. Thiaucourt and A. Nhamusso at the bacteriology section

Friday April 7th
Day of the Mozambican women
Preparation of the preliminary report
Diner with Dr Songane, former CVO and actually coordinator of PROAGRI

Appraisal of the quality management system in place for ASF and rabies

1- PERSONNEL

- Personnel is adequate to perform both ASF and rabies diagnostic tests currently being performed in the virology laboratory.
- Academic qualifications "diploma level" and internal and external certificates of attendance were available but stored by the national laboratory administration.
- Each technical staff has a well documented job description outlining his/her responsibilities. However, the documents lack:
    i. Identification code including the version;
    ii. Signatures of the technician and the supervisor and date of effectiveness;
    iii. Specific skills concerning maintenance, calibration and checking of critical equipments
    iv. Nominative list of technical staff for each particular disease.

2- TESTS

For ASF, fluorescent antibody technique (FAT) and indirect ELISA test are the major tests performed in the lab. Two SOPs are simultaneously available for the ELISA test and theses are not coded according to the norm specifications. Then, the SOP for FAT was made available for verification but the team was informed that the SOP was not coded.

Rabies only the FAT test is performed in the lab whereas serological tests are subcontracted to OVI lab. Similarly, the SOP was not made available and not coded as required. (SOP for rabies was not requested and virus isolation in mice is also performed)

The standard reagents for the two diseases were made available for verification but they lacked the manufacturer's (OVI) certificates.

3- EQUIPMENTS

. The following key observations were made on:

- ❖ Critical equipments being used for the above tests have not been identified;
- ❖ The bulky equipments are identified by a single number given by the Ministry of Finance but the little / small critical ones (eg micro-pipets) are not given an identification number;
- ❖ Calibration of critical equipments except for balances are not performed (eg: freezers, micro-pipets, ELISA reader); calibration of micro pipettes is performed at virology although not records exist to proof
- ❖ The status (conform or not conform for a given specification) of the critical equipments is not easily visualized;
- ❖ The particular points of maintenance concerning critical equipments may be improved (eg: cleaning and desinfection of internal parts of the laminar area flow cabinet)

4- DOCUMENTS and RECORDS

Many kinds of documents and records are in place (eg: diagnostic SOPs, instruments users manuals, preparation methodology, incoming sample registration books, diagnostic results). However, there is a great need to properly formalize the documentation procedures and to secure a safe depository of these documents and records. The following observations were made:

- Identification of each document or record, including the number of each page and the total number of pages (eg: 1/22) are lacking;
- A systematic indexing system must be put in place. This should include the following elements: quality manual, general procedures, SOPs, instructions, records, external documents, formulas
- Logigrams
- Identifiable depository safety cabinet for these documents and records.

Appraisal of the quality management system in place for bacteriology

NB this appraisal included the preparation of media, as it is a key component for diagnostic quality

1- Visit of the media preparation

Presentation by the technician in charge : Augusto Nhampossa

Management

The staff has a long experience in media preparation and is dedicated to its job
The hierarchical organization is in place
Requests are sent to this unit on forms (not well identified nor stored in quality)
The possible complains of the “clients” are not recorded (Sterility, Quality)

Technical

The building is quite old and does not enable a good prevention of contaminations
Electric circuits need to be maintained to prevent risk (autoclave)
Essential equipment such as pH-meter is out of order although apparently recent
Washing machine exists but not installed
Cold room generates a lot of humidity and possible contamination of the products
Floor, walls and shelves difficult to disinfect (procedure not in place)
Many vials of products are expired

Recommendations

- Ensure good documentation recording and storage under quality practice
- Produce SOPs for media preparation
- Improve maintenance
- Improve purchase management as to ensure regular supply of reagents
- In case of large stock of expired media and unavailability of recent ones, ensure that their quality is still correct with appropriate testing (SOPs)

2- Visit of the freeze drying unit

Technical

There are four freeze dryers of different age and condition, but none is functioning
Two are obsolete
One is relatively new (Edwards: installed in 1995) but has encountered problems
One has been received recently and should be installed soon

Recommendations

- Remove the obsolete freeze dryers to gain space
- Gather information on the recent freeze dryer as to decide if it can be repaired or not and at which cost
- Ensure that proper maintenance is in place

3- Visit of the Bacteriology section

Technician in charge: Gawana Mbazima
Dr Nhamusso expresses the wish to be able to isolate and characterize mycoplasma strains and especially those from poultry and bovine (CBPP)

Management

The technicians in charge have a good experience in bacteriology work. However they lack experience in mycoplasma diagnostic techniques (cloning, identification by growth inhibition, PCR…). Training in that field is necessary for CBPP surveillance

Technical

Although quite old, all the necessary equipments are available for MmmSC isolation. The absence of a CO2 incubator is not a limitation as incubation can be done in a jar with a candle or under anaerobic conditions (gaspack).
Until a stereo microscope is available, observations can be made in the parasitology section.
The existing SOPs for media preparation may not be optimal for MmmSC isolation neither for *M. gallisepticum* or *M. synoviae*.

Recommendations

- A source of fresh yeast extract has to be found (otherwise a source of ready-made media but this is expensive)
- A source of appropriate serum has to be found. As it is difficult to find horse serum an alternative could be to use donkey serum.
- In all cases, SOPs should include the control of medium quality for example by performing some titrations of freeze-dried vaccines.
- Training is needed for mycoplasma isolation and characterisation (Inhibition of growth, PCR)
- A stereo microscope should be purchased as to enable observation of mycoplasma colonies. An equipment similar to that existing in parasitology section could be chosen (Olympus SZ 40)
- An excellent microscope exists, however it does not allow phase contrast observations. Additional condensers should be bought

PRELIMINARY CONCLUSIONS

The MZ-CVL has chosen to implement a quality management system, based on ISO 17025 and to address two priority diseases, ASF and brucellosis at first. Only one of them belongs to the priority list established by the SADC diagnostic subcommittee. This highlights the fact that priority diseases may vary according to local situations. The identification of priority diseases is also certainly dependent on the eradication or control policies in place which may have a direct impact on the number of samples submitted to the lab and the need for fast and reliable results. It also depends if the countries intend to export meat through the international market.

However it must be recognized by all countries that regional approaches for transboundary animal diseases (TADs) control are compulsory. Control of TADs cannot be achieved without proper diagnostic capacities. This is exemplified in Mozambique by CBPP which is not present in the country but for which diagnostic capacities have to be established in order to be able to establish an early and efficient detection system.

Quality management has been initiated quite a long time ago at MZ-CVL and other consultancies have been taking place to monitor the implementation and improvement of quality management at MZ-CVL (see for example, Baseline assessement of SADC central veterinary laboratories by JT Paweska and K. Tounkara, RAF/5/053-16.01 &02, or a report by Mary Louise Penrith contracted by the Proagri-Family Sector Livestock Program). Many of the recommendations that were made at the time have not been followed by action. For example no funds were allocated to the lab for the purchase of a new ELISA reader. This is quite unfortunate. It was considered of utmost importance that the recommendations made during this consultancy are ranked in order of importance and of time needed to implement them. This should enable a quantitative follow-up of these recommendations. Besides, many of these recommendations may fall within of the PRINT projects objectives, hence giving them a better opportunity to be implemented.

- **Short term**

1: The documentation and recording system has to be upgraded in order to be in conformity to ISO17025.
As the quality manager may not have enough time for this task, it is recommended that a technician (or 2) is seconded to him and trained accordingly. This technician could then devote half of his time to upgrade the documentation and recording system within one year.

2: Critical equipment lists have to be established for all the techniques that are to be in conformity to ISO17025. This list includes ASF and brucellosis and in the future CBPP. Once these lists are established, it is compulsory to put in place a system of calibration for these equipments within one year.

3: Among other equipment and reagents, it is felt that the purchase of a new ELISA reader (and software) is an absolute necessity.

- **Medium term**

4: As a PCR lab will be established for the detection of HPAI through funds given by World Bank it is suggested that this lab should be devoted for the rapid detection of all SADC priority diseases. Standard SOPs may be established at the SADC level and adapted to each laboratory.

5: A standard Laboratory Information Management System (LIMS) may be put in place and standardized among all SADC labs. As the “LabInfo” software from the FAO never took off, other solutions must be found: purchase of a software, development of a LIMS in collaboration (CIRAD,, PRINT, Others…)

- **Medium and long term**

6: The improvement of the maintenance is an absolute necessity.
This can be achieved by various means such as training and/or subcontracting the maintenance to specialised companies. In any case an adequate recording system has to be put in place in order to be able to follow the “life” of the equipment. Networking through SADC may help in identifying the relevant firms able to ensure the maintenance of critical equipments .

Training needs
- Documentation and recording
- Mycoplasma isolation and identification
- Maintenance

These trainings could be organized in the form of special training sessions for a number of SADC trainees or through an exchange program to various labs of SADC that have reached a satisfactory level of quality management.

Equipment purchase needs
- ELISA reader and software
- Certified calibration standards (temperature probe, weights, pH buffers, OD standards for ELISA reader…)
- Deep freezer
- Stereo microscope
- Phase contrast microscope or condenser

Annex 2

SADC Veterinary Laboratories Network Consultancy (VLNC)

Visit of the Zimbabwe CVL in Harare
9th April to 16th of April 2006

Preliminary report
Code: VLNC-ZW-V01

Authors: D. Babre, P. Sinyangwe, F. Thiaucourt

INTRODUCTION

Terms of references of the consultancy

8- The Network of Veterinary Laboratories has been assisted in the identification of deficiencies in their diagnostic capabilities in collaboration with field services, with special reference to Foot-and-Mouth Disease, Contagious Bovine Pleuropneumonia, Avian Influenza, African Swine Fever, Newcastle Disease and Rabies;
9- Quality Assurance systems in place in Member States have been assessed;
10- Intensity of Networking and development of harmonized Standard Operating Procedures (SOP's) assessed;
11- Diagnostic capacity (personnel and equipment) assessed;
12- Inventory of available tests established;
13- Major limiting factors in the efficient operation of laboratories identified; and
14- Training needs identified.

Sunday April 9th
Arrival at Harare airport 21H
Luggage claim
Arrival at Bronte hotel 23h30

Monday April 10th
Meeting with Dr P.V. Makaya, Chief veterinary officer at Laboratory Diagnostics and research, presentation of the consultancy's objectives and preliminary plan of action

Meeting with Dr U. Ushewokunze-Obatolu, Director veterinary public health, diagnostics and research, , presentation of the consultancy's objectives.

Presentation of the consultancy's objectives at the conference room.
Attendance list:

Rae Ries	CVLT	
L.S. Jomane	TIC	Protozoology
D.T. Kumbula	HOS	Protozoology
C. Gomo	HOS	Bacteriology
W. Makaya	QM	
S.K.	HOS	Molecular biology
G. Manjatelo	HOS	Toxicology
E. Kalanda	VRO	Virology
T. Minina	HOS	Poultry
G. Sandenga	VRO	Pig extension
M. Mparamoto	HOS	Virology
D. Bnumba	VLT	Toxicology
M. Kamuruko	Farm manager	
S. Musari	TIC	Bacteriology
D. Pawandima	RO	Epidemiology
S.T. Bore	HOS	Pathology
L.F. Gwenhure	TIC	Histopathology
P.V. Makaya	CVRO	Vet diagnostic and research

General visit of the lab: Bacteriology, preparation of media, virology, molecular biology

Trip to airport to fetch luggage

Tuesday April 11th

Meeting with Stuart Heargraves, CVO Zimbabwe
Presentation of the mission's objectives. Dr Heargraves insisting on the necessity for the lab to be able to ensure diagnostic before research.

Compiling of the questionnaire's answers (Mrs Makaya and Reis)

Checking some questionnaire's answers on quality management part (D. Babre, Mrs Makaya)
Checking some points in bacteriology (P. Sinyangwe, F. Thiaucourt, Dr Gomo)

Wednesday April 12th

Visit of the virology section
Discussions with the quality management

Thursday April 13th

Checking SOPs in Bacteriology (Mrs Musari)
Checking SOPs in Virology (Mrs Priscilla Tshabalala), ELISA readings

Preliminary findings presented to the quality management staff
Preliminary findings presented to a larger audience
Preliminary findings presented to Dr U. Ushewokunze-Obatolu

Friday and Saturday April 14th and 15th

Completion of preliminary report and presentation for the ZW-CVL

Appraisal of the quality management system in place for medium preparation

The visit of the medium preparation lab was lead by Dr Gomo (HOS) and R. Museredra (Laboratory assistant).

Mr Museredra was preparing a batch of XLD agar medium when we arrived and it was decided to use this medium as an example.

The SOP was not on the table when we arrived but Dr Gomo provided it when asked for it: SOP/BA/019 for XLD agar medium preparation.

- This SOP does not bear the signature of the person who wrote it (Alfred Kateta).
- Point 3.0 of this SOP is difficult to understand. A medium is by definition sterile and should not pose any infection risk. Therefore there is no need of gloves and masks, which the laboratory assistant was not wearing anyhow.
- This SOP mention XLD medium from Oxoid. Does this mean that only this producer can be used? (are some other producers able to provide XLD medium?)
- Point 7.1 states that 53 g should be weighted. There is no uncertainty attached to this measurement…
- Point 7.1 also states that distilled water should be used. It is not said if this water has to be sterile or not. If it is not sterile, it is doubtful that heating the mixture until it boils will ensure a correct sterilization of the medium.
- Point 7.2 states “DO NOT OVERHEAT”. As this statement is written in capital letters it has to be assumed that this is a critical point. However there is no indication on what is “overheating”.
- Point 7.3 states that the melted medium has to stand for 30 minutes in the waterbath at 56°C. In fact these values are not critical and this should be mentioned. However the time needed to ensure that the agar is well melted and the time needed for pouring the melted medium in the Petri-dishes are

critical. There were some agar “clumps” present in some Petri-dishes showing that the agar had not been completely melted.
- Point 7.7 states that the Petri-dishes have to be stored in plastic bags in the cold room. Upon checking many if not all the medium stored were not in plastic bags.
- Point 9.0 There was no appendix 2 attached to the SOP.
- Some appendix 2 (control that the medium is able to distinguish E. coli from Salmonella and that the medium is sterile) results were presented by Dr Gomo. These results should be considered as records but they do not bear any unique identification number. This type of result has to be included in the list of records.
- The identification of the strains that were used for the validation is not mentioned. They should be clearly identified as they are internal reference material and it should be possible to trace them.
- Appendix 3 is missing
- Point 11.0 The references mentioned in this paragraph are not sufficiently precise to allow tracing them back. For book chapters it should be mentioned the total number of pages, the pages of the chapter, the edition number, the editor… and if possible the ISBN reference which is the unique ID number of the book.
- Appendix 1: There is a written mark XL on this appendix (should it be XLD?). Why isn’t it typed and included in the appendix.

From a general point of view, this SOP has a good layout but lack precision on many points. On top of that the list of critical reagents and equipments is not present.

In a second step the storage room was visited and the stock of XLD medium inspected. The vial of XLD Oxoid mentioned that the medium should have a final pH of 7.4 +/- 0,2. However this was not mentioned in SOP/BA/019. There was apparently no pH-meter available nor any reference buffer for the calibration of the pH-meter.
There is apparently no sign that allows a rapid identification of the media that are critical for the acreditated testing.
A number of vials that were open had no mention on the date of opening.
Many vials were expired but did not bear any sign showing that they had been requalified.
The record for requalification of nutrient agar lot 20737159 exp 6/91 was requested but not able to retrieve immediately.
It remains to be checked if the requalification SOP are adequate or not.
The cold room was inspected. The file showing the temperature reading was missing the data from 5th April to the 11th April, date of the inspection. This is an obvious non conformity as temperature of storage is a critical point for medium quality. The ID of the temperature probe used to record the temperature in the cold room was not stated in the file. When requested, the temperature probe was clearly identified (EQ/BA/T001).
Finally the autoclaves were inspected. The only one functioning bears only an indication of pressure and not temperature. There was no table showing the correspondence between pressure and temperature. Due to time constraint it was not possible to retrieve the instructions for using this autoclave.

Appraisal of the quality management system in place for Virology Laboratory Foot and Mouth Disease

Head; Dr. M .Mparamoto
Technologist; Mrs Pricilla Tshabalala
Main Test conducted; Blocking ELISA SOP Nr VS/014

Observations
The test was developed and adapted for use in 1992 (Copy of the publication is available; Foot-and-mouth disease; detection of antibodies in cattle sera by blocking ELISA by K.J. Sorensen, R.L. Madekurozwa and P Dawe 1992). This test is designed to detect antibodies in bovine, sheep, goat, pig, and wildlife species. The laboratory staff were quite competent and conversant both with the SOPs and their implications. The choice to employ this in-house developed test was based on the economic implications in comparison to ready made kits which are available on the market. It therefore means that all the test reagents apart from the inactivated Antigens (SAT1, SAT2, and SAT3 obtained from BVI) have to be prepared in the lab by the responsible staff.

Antigen and Antisera;
The antigen, only SAT1(1098401 VI Bot 1/777) and SAT3 (Zim 9/81 3068606 VI) were available, aliquoted and stored at –20C. It comes as purified or crude antigen in liquid form. The same antigen is used to produce specific antisera in laboratory raised rabbits. However, there is no written SOP or GP for the rabbit inoculation regime, but a 2ml volume of either purified or crude antigen is used, boosted after two weeks and then tested for sero conversion using the ELISA test. The polyclonal antiserum is then purified using the DEAE Affi-gel Blue Gel column in desired quantity and stored at +4C until required for use in coating the plates or Bionylation. The standardization and titrations of both the antigen and antisera are performed by the virology laboratory personnel.

Equipment;
Micropipetors (multi and single channels) were classified as critical equipment in this particular test. They were adequately coded and exclusively used for the FMD ELISA Test. Calibration of the pipets was performed by the laboratory staff.
The ELISA reader (Bio-tek, BQ/VS/ER05) was not classified as a critical equipment in the test although its role was very essential. The equipment was quite new and in good operating condition with a spare bulb available. The test was read at 450nm wave length. The printer was fed manually which was very time consuming to the operating staff. The ELISA reader urgently requires a " KC junior" PC software. Installation of this software in a new computer will greatly improve the quality and speed of obtaining the results.
ELISA plates were available but lacked the manufacturer's expiry date hence no SOP was made available for verification. This important omission could undoubtedly influence the test results in the long run.

Cold chain;
Reagents for the ELISA test and including serum samples are kept at various recommended storage temperatures. A temperature probe was in place for the

monitoring of the actual temperatures. Temperature charts were filled on a daily basis. A number of refrigerators were non functional the major reason being lack spare parts.

Test validation;
Internal quality control on the positive and negative controls is performed every three months in retrospective at CVL. Compiled OD reading Results were presented for verification. Plotted graphs of ODs against the runs with the mean at 1.000, upper limit at 1.300 and a lower control limit of 0.800 for the negative control. For the negative control the OD range is 0.05 to 0.25 with a mean of 0.150 were examined. Only the Negative and the 100% Positive are performed by the lab. The results obtained were quite satisfactory and could clearly determine the virus under test. The results would have read better if they were expressed as percentage of competition.

Appraisal of the quality management system in place

Organisation and quality system
- A quality system management policy, specifying the whole dispositions taken by the lab to be in accordance with the ISO 17025 standard, is in place.
- A person (Wedzerai MAKAYA) is appointed as quality manager.
- A policy statement signed by the chief veterinary research officer (eg 06/01/21) specifies the targets set to the lab for the current year and is postered at different places.
- The field of the accreditation (eg bacteriology and virology) is exactly identified in the quality system management policy.
- The lab and the quality manager positions are clearly identified in a general logigram belonging to the quality system management policy.
- A detailed organigram shows, for each of the technical section (eg bacteriology), the name and the function of each agent.
- The allocations of each technical function (eg head of section, research officer, technicians in charge, technologists) are accurately described in the quality system management policy.
- Job description sheets specify the current activities and responsibilities of each agent (eg M. MPARAMOTO, C. GOMO). These documents are recorded (name and date) but the previous ones are not kept.
- A management review is held yearly with the staff of the lab. All the items required by the standard are taken up (policies and procedures, outcome of internal audits, corrective and preventive actions, changes in work, clients feedbacks, complaints, needs of human and material ressources, requirements of staff training, ...). The findings and the actions that arise are recorded in a report of this meeting (eg management review 2005). Each item is very concisely treated and refers to separate and complete files. Nevertheless, because of this choice of presentation, the reading of the report does not give directly a good idea of its content.

Non conforming activities
Non conformances management is described in a procedure (P05).
A board synthesizes all the non conformances which have come back from the system during the current year.

Each non conformancy is exactly described in a sheet which is identified by a single code (eg NC/013/06).
The NC/013/06 sheet was not available because of its change of place after an audit: a simple and visual way to insure the traceability of the sheets when they leave their current location may be to replace them by a coloured post-it which precises their new position.

Internal audits
Internal audits management is described in a procedure (P07).
A large number (12) of persons belonging to the different technical sections of the lab are trained and qualified to perform internal audits.
A great planning of internal audits (eg one by quarter by section) is drawn up for the current year and manually held but is not up to date. Furthermore, although internal audits concerning quality system are performed, this section is not identified in the planning.

Purchasing
Purchasing management is described in a procedure (P06). P06 should theoretically apply to all kinds of purchase whereas, in reality, it involves only those concerning laboratories goods.
A new and very detailed purchasing form has been written recently.
One purchase of reagents (eg BA/001/05) in the bacteriology section was followed from the start to the end, including the check on receipt (eg blood agar base 2 – batch n° 172048) and showed a rigorous traceability.

Training
Training management is described in a procedure (P18).
A very precise board concerning the trainings planned for the staff during the current year is held and updated (eg human ressources development plan 2006).
Each staff's training is recorded in an individual sheet (eg Calvin GOMO).

Documents control
Documents control is described in a very precise and complete procedure (P03).
The documents are classified in 4 types.
The measures for codification, traceability (eg name of the document, version index, page number / total number of pages), approbation, diffusion and review for each kind of document are complete.
The external documents are recorded but not codified. This may lead to a problem when the same document changes (eg ISO 17025 from 2001 to 2005).
A list of the current procedures is compiled and updated every year with a new version index (eg quality management policy – procedures – version 5).
Nevertheless, some documents are not filled up according the relevant procedure (eg SOP/BA/019: only 3 pages on a total number of 5, lack on each page of the identification code, of the number of pages and of the total number of pages).

Equipments
Every equipment is identified by a single code related to the section and its type (eg EQ/VS/MP 49).
A general equipment inventory exists (eg equipment inventory – March 2005) but:

It takes into account only those having an immobilization value;
It does not involve the low price ones having a critical effect on the lab tests (eg micro-pipets);
The column concerning the frequency of verification/maintenance is never filled;
The critical equipments are not mentioned;
A list of the equipments specifically used, but no necessarily critical, is annexed to each procedure but the required specifications are not always specified (eg temperature specifications for the incubator in the SOP/VS/MP49 “FMD Virus Blocking ELISA”).

Four equipments, with a critical effect on the lab tests were investigated:

A micro-pipet (eg EQ/VS/MP49 / 5_50 µl / PROLINE):
One yearly calibration is achieved by an external society (eg Total Tech Ltd);
The certificate delivered by this supplier (eg 05/05/03) lacks capital informations related to the number of replicates, the traceability to the international standards, the reference of the balance used and of the certified weights used to calibrate this balance. It does not take into account the volumic mass of water, the evaporation, the reference of the procedure used to perform this calibration, the details involved to calculate the uncertainty, ...
Intermediates checks are performed by the lab staff. Although the appropriate records are achieved, the volumic mass of water is not taken into account (it includes a systematic error of about 0.4%), the impact of the evaporation is not evaluated (it may be important when the volumes are less than 50 µl) and the acceptation criteria are not specified to declare conform or not the equipment.
An individual life sheet has just been put in place recently. It does not allow a good traceability of the life of the equipment.

A balance (eg EQ/VS/AB04: SARTORIUS BP 410S):
An external document (eg Installation and operating instructions) is provided by the supplier but has not a single codification.
A daily check is performed by the technical staff according to the “internal calibration and operational checks on analytical balances” (eg GP/MGT/005) with a 10g weight but:
* this weight is not codified, although it is an important equipment used to check many others equipments;
* it was calibrated by an external society (eg Total Tech LTD) which issued a certificate presenting the same shortcomings than those of the micro-pipets.

A pH-meter (eg EQ/VS/PM03):
This equipment is calibrated when used with buffer solutions;
An adequate certificate is provided by the supplier; nevertheless, the old certificates are not stored.
Each calibration is well recorded in a book (eg Log BOOK EQ/VS/PM03).

An incubator (eg EQ/VS/IN02):
A daily record sheet is posted on the equipment;
The recorded temperature is given by the digital output but is measured at a single position: it does not take into account the possible heterogeneity inside the incubator;
The temperature probe is not linked to the standard temperature by a calibration certificate.

If the general system of quality management is in place and well followed by the quality manager, there are important shortcomings concerning the calibration and verification of the equipments, although their management (codification, life sheets, ...) is correctly achieved.

General conclusions

The great strength of the ZW-CVL is that it has a good quality management system in place. This is in accordance to the fact that it has been accredited by SANAS. The documentation system is well in place, there is a good management of non conformities, all staff members have clear job descriptions… It is also clear that the personnel in charge of quality management is well trained and committed to its task.

There are however a number of weaknesses which have been identified during this consultancy.

- The high turnover of personnel. Except for the director, none of the persons identified during the 2002 consultancy (RAF/5/053-16.01 &2) was still present. This represents a loss of experienced personnel. This will also increase the need for training as it is considered necessary that each Head of Section should have at least an MSc, which is not the case actually. Beside the direct cost of the training, the personnel under training will be absent from the lab for a certain period of time.
- The aging of the premises and equipment. Although the buildings are in good condition, it is clear that the furniture is quite old and need to be replaced. As an example, the benches in bacteriology section do not allow a good washing and disinfection in case of spilling of infections material. The same applies for the hood where embryonated eggs are inoculated.
- Lack of discipline for good housekeeping. Many rooms are not properly tidied nor in order. This may reflect a certain lack of commitment from the technical staff.
- Some SOPs merit to be revised thoroughfuly. This need was identified for the medium preparation SOPs as exemplified in this report. Other SOPs were checked and necessitated the same corrections. Among many corrections, the most important consist in identifying clearly the critical parameters (and their allowed uncertainty) and equipments.
- Calibration certificates. They do not allow a good linkage with the international standards. This may be due to the fact that the company that perform the calibration is not accredited (there is none accredited in Zimbabwe).

Opportunities for the ZW-CVL
In the difficult economical context of Zimbabwe today, every opportunity has to be grabbed.

- Export markets should be used to sustain laboratory activities.
- Participation to international and multilateral projects may be a way to renew some equipment and to purchase reagents
- Avian influenza surveillance could be an opportunity to put in place rapid detection systems for a number of TADs and not only for HPAI

There are however some threats that are a direct menace to the mere existence of the ZW-CVL.

- The lack of foreign currency to purchase reagents and equipment. This has a direct impact on the capacity of the lab to fulfill its tasks and to maintain the level of expertise and technicity which is necessary for accreditation.
- The brain drain is also very damageable and every effort should be made to maintain sufficient financial incentive to retain the qualified laboratory personnel.
- Inflation is a major concern and it is clear that budget increases of 100 or 200% cannot cope with actual inflation rates of 600 to 800%.

RECOMMENDATIONS

Training needs

Calibration
CBPP isolation and identification
MSc training? (subject to be identified among the 6 priority diseases)

Equipment

Computer and software for connection with ELISA reader
Autoclave
Certified probes?

Reagents

Antigen for FMD ELISA
Funds for inter-laboratory testing

Annex 3

20/04/2006

SADC Veterinary Laboratories Network Consultancy (VLNC)

Visit of the Zambian CVRI at Balmoral, Lusaka
17th April to 21st of April 2006

Preliminary report
Code: VLNC-ZM-V01

Authors: D. Babre, P. Sinyangwe, F. Thiaucourt

INTRODUCTION

Terms of references of the consultancy

15- The Network of Veterinary Laboratories has been assisted in the identification of deficiencies in their diagnostic capabilities in collaboration with field services, with special reference to Foot-and-Mouth Disease, Contagious Bovine Pleuropneumonia, Avian Influenza, African Swine Fever, Newcastle Disease and Rabies;
16- Quality Assurance systems in place in Member States have been assessed;
17- Intensity of Networking and development of harmonized Standard Operating Procedures (SOP's) assessed;
18- Diagnostic capacity (personnel and equipment) assessed;
19- Inventory of available tests established;
20- Major limiting factors in the efficient operation of laboratories identified; and
21- Training needs identified.

IMPLEMENTATION OF THE VISIT

Monday 17th

Easter. Meeting with Dr Kabilika for plan of action

Tuesday 18th

Meeting with Dr P. Mangani, acting Director of veterinary services and Dr …
Presentation of the consultancy's objectives

Arrival at Balmoral CVRI at 11h
Preliminary discussions with Dr Kabilika
General visit of the laboratory

Presentation of the consultancy's objectives to the CVRI staff (attendance list)

SURNAME	Forname	Section
BWALYA	Gregory	Virology
MUUKA	Geoffray	Bacteriology
TINGIYA	Sikombe	Virology
MUYAMWA	Namukolo	Vaccine Production
MATAA	L.	Vaccine Production
NCHIMA	Gilbert	Biochemistry and Toxicology
CHOOPA	C.N.	Parasitology
MOONO	Gife	Quality Control Manager
SINYANGWE	L.	Parasitology
MUNYAMA	G.	Parasitology
MWAMBASI	L.M.	Bacteriology
CHEELO	M.	Virology
KAMULETE	Maputa A.	Bacteriology
NYELETI	Charles	Pathology and Epidemiology
KAYESA	Edgar	Pathology and Epidemiology

Review of the CVRI questionnaire's answers for Management and general technical matters.

Wednesday 19th

Review of the questionnaire's answers for the disease sections
Visit of the various sections of the lab and appraisal of quality management in place: Management, Bacteriology, Virology

Thursday 20th

Writing the preliminary report
Visit of the other premises (standby generator…)
Presentation of the conclusions to the Director and staff, Discussions
Visit of the vaccine production unit (actual and premises that are not used)

Friday 21st

Debriefing at the Ministry of Agriculture and Cooperatives

To deepen the answers given by the lab at the questionnaire, complementary investigations concerning management and equipments requirements were made in the lab.

MANAGEMENT

Mr Gife Moono

Organisation and quality system

A **quality system management policy** is in place.
A person (Giffe MOONO) is appointed as **quality manager**.
A **policy statement,** signed by the chief veterinary research officer (eg 06/01/26) is postered and specifies the wish of the lab to be in accordance with the ISO 17025 standard.
A **general organigram** situating the lab exists but is not identified as a record (no code, no date, no version).
A **detailed organigram** presenting the 5 sections exists but is not identified as a record (no code, no date, no version).
The **position** of the quality manager is precised in the detailed organigram but his situation concerning the regional labs, indicated in his job description, does not appear.
Documents concerning the **attributions** for every hierarchic level (eg principal lab technician, quality manager) are in place but the precise **responsabilities** (eg who does write or sign the tests reports?) are not identified. These documents are not identified as records (no code, no date, no version).
Job descriptions exist for every type of function but they s are general and do not precise the name of the agent, his deputy and are not signed by the agent and his hierarchical head.
Internal communication is insured by a monthly meeting of each section. A report of each of these meetings is written (eg Management meeting report – February 2006) and the yearly schedule of these meetings is postered in public place.
A **quality manual** is being written. It includes a code, a date, the number of each page and the total number of pages and follows rigourously the layout of the ISO 17025 norm, which facilitates its reading, but:

- It is not **signed**,
- It is not **verified** (eg the page 7 is repeated two times);
- The **version** is not precised, but only the date;
- The sections concerned by the **accreditation** are not clearly identified;
- The complete **references** of the lab are not mentioned (name, address, telephone and fax numbers, email, ...);
- The **summary** is lacking;
- It is written with the **future** which lets to think that it is not yet in place.

The **documents management** is well described in the quality manual but is not in place; a corresponding procedure and the map (eg quality manual, general procedures, SOPs, formas, ...) of the documents do not exist.
The **records management** is well described in the quality manual but is not in place; a corresponding procedure and the map (eg technical records as tests reports,

equipments calibration, ... management records as management reviews reports, job descriptions, ...) of the records do not exist. Many records exist today but are not codified, located and are so difficult to find quickly (eg yearly report of tests performed by the BVI).
Management reviews having a defined layout, as described in the ISO 17025 norm, are not yet held. Nevertheless, monthly meetings are held in every section and reported.

Non conforming activities, corrective ad preventive actions, internal audits are not yet performed as required in the ISO 17025 norm.

EQUIPMENTS

A **list of the equipments** in place in each section (eg inventory, virology section) is held but is not managed as a record.
The principle of a **single codification** for each equipment (CVRI/BALA/nnn) and the running of a yearly **maintenance and calibration schedule** are being studied and will be proposed at the next section meeting.
The **critical equipments** are not identified, neither in the inventories, nor in the SOPs.
The **life sheets** reporting all the events concerning each equipment (eg acquisition date, characteristics as serial number, brand, ..., single code, location, nature of events as repairing, calibration, ..., status (eg conform or not for using) are not performed.
The **calibration or checking** of the critical equipments (eg incubators, ovens, micro-pipets, balances) used for each test is not performed.
Nevertheless, the recent or future **acquisition** of certified equipments, respectively weights and temperature probe, will allow to begin calibration and/or checking of equipments. These operations will necessarily take in account the specifications written in the certificates given by the manufacturers and those required by the SOPs.
As an advice, the calibration of the micro-pipets should take into account the **volumic mass** of the water used to run these operations otherwise it would generate a systematic error.

Visit of the Bacteriology Section

Dr G. MUUKA
Mr L. MWAMBAZI

The identification of a mycoplasma from a CBPP suspected sample was taken as an example.

The samples are recorded in a book specific to the bacteriology section. However each sample is not uniquely identified, although the description does not allow any ambiguity. The ID number of primary registration is reported in that book and should allow a good linkage with the information registered at the entrance of the lab.
The final testing results are written directly on this book however:

- There is no mention of any laboratory worksheet that could ensure a control of what has been done with the samples (time of testing, operator, type of medium…). Such worksheet does not exist in the lab.
- There is no signature of the technician that performed the work and no signature of the Head of Section that reviewed it.

The media used for mycoplasma isolation are those from “Mycoplasma experience” which had been bought by a project. These media are stored in a refrigerator however

- They are expired
- The refrigerator does not bear any temperature curve that could guarantee the cold chain and, in addition, it was said that there are regular power shortages that may last for many hours.

The choice of a “ready made” medium is a good one especially since the supplement for this medium is freeze dried which should make it much more thermo-stable. The quantity which is stored is sufficient for the moment due to the low number of samples received yearly (7 in 2005). The purchase of this reagent may become critical if a more intensive surveillance work is undergone at CVRI. In addition there is no certainty that this medium is still performing correctly as it is expired and the storage conditions are not optimum. Hence there is a need to establish a procedure for testing the medium conformity. This could be done by vaccine titration of a reference batch.

Le laboratory work for identification of MmmSC stops at seeding the “diagnostic” medium provided by “Mycoplasma experience”. This may be sufficient for the confirmation of acute outbreaks of CBPP where samples contain high quantities of mycoplasmas in pure culture. The procedure would certainly not be adequate for the search of Mycoplasmas in chronic lesions or for the routine checking of samples from the slaughterhouse. In that case it is expected that more than one species can be found in a sample. Furthermore the differentiation of the different species of the mycoides cluster would require additional identification techniques. In particular it is absolutely needed to be able to clone the strains to ensure purity of the culture before going for identification. To this aim a stereo-microscope is utterly needed.

The three mycoplasma strains that had been isolated were stored in a freezer but were apparently lost because of electricity failure. These strains were not freeze-

dried although a freeze drier exists. This freeze drier has not been used since 2002, hence its actual status is not known.

Medium for anthrax isolation
The blood agar base used for this medium was expired and no re-qualification has been performed (through anthrax vaccine titration for example).
There is no record of batch number for medium production which would allow a good follow-up.
The autoclave which is present is still functioning, however there is no instruction for use and electrical connexions are “suboptimal”.

Serology

For the moment only the CFT is performed at the lab.
The SOP is adapted from the producer’s SOP (CIRAD)
Reporting of the results are not according to quality rules: worksheets do not mention the name of the technician that did the work nor the HOS that controlled it, the ID of the critical equipment used (Micropipettes, tips), the ID of the reagents nor the values of their parameters (dilution for the complement, the red blood cells used and the animal that gave them…), the values for the reference control given by the producer.
Therefore there is no way to have a good traceability of the result and to make retrospective enquiries to monitor any drift of result.
Some of the reagents which are prepared locally (VCM buffer made from powder and mixing with sterile water) lack any identification of their date of processing and expiring date.

Some cELISA kits for CBPP (I. Pourquier) were present in the refrigerator
However these kits are expired as of july 2004. The reason for this long storage may have two origins. Firstly the two technicians that were trained to use cELISA were no more present in the lab (Jim Belemu left and Catherine passed away). Secondly there is no one left who is familiar with handling the ELISA reader and its softwares.
When trying to connect the reader and the computer there were some connexion problems. The “Transmit” program was not able to recognize the reader, nor the EDI software. Multiple trials to modify the Pin setting at the back of the reader or the com-settings at the software level failed to solve the problem. There may be some problems with the cable linking the computer with the reader or the good combination of pin-setting and com-setting was not found (there is no instruction of use for these equipments).
In those conditions, it was not possible to check the accuracy of the ELISA reader although a reference plate was received from BDSL through the IAEA.

Virology Laboratory: Rabies Diagnosis

Head; Dr G Bwalya
Dr M Cheelo
Mr T Sikombe

Technologist Mr O Chibomba
Mr L Mooya
Mr M Simweemba (Lab Attendant)

Main Test conducted; Fluorescent Antibody Test SOP Nr. Not available.

Observations;
The virology laboratory has a full complement of both professional and technical staff in place according to the CVRI establishment. However, most of these staff is very new and not familiar with the routinely applied virological techniques and concepts. This inexperience is a reflection of a high staff turnover the laboratory and the Institute as a whole has experienced in recent years. The virology section like other sections at CVRI is only in its basic phase of the preparation of the SOPs. This developmental stage requires a focused and a committed approach for it to be successful for the future intended SOPs development. Hence there is a lot of work to be done if the Institute is to meet the requirements and challenges of the NORM and the ISO 17025.
The Institute has a variety of equipment most of which are poorly maintained or have not been used in the last two years or so. The laboratory equipments have no visually displayed ID numbers nor their use indicated. Equally lacking are the accompanying operational SOPs. Custody of the equipment users' manuals and test results is rather haphazard at the moment and requires redress.
The general building infrastructure and water reticulation require major rehabilitation works if the option of relocation the present CVRI is not possible. House keeping requires some extra attention. The poor road network and communication make it prohibitive to receive adequate samples, timely transmission of results and does not offer the farming community to freely interact with the diagnosticians. As a consequence of this and other factors young recruited staff are easily frustrated.

Reagents;
The Anti-lyssavirus FITC polyclonal lyophilized conjugate was obtained from Onderstepoort Veterinary Institute (OVI), South Africa. The manufacturer has provided in detail instructions for use of this conjugate in terms of: reconstitution, preparation and storage of stock solutions, determination of optimal dilutions and preparation of the working dilutions. The lab has however not developed its own SOP to incorporate the manufacturers details and which will also indicate whether the conjugate was a critical material in the test. These must be included and the references of the source of information cited.

Equipment;
There was no distinction between the critical and non-critical equipment currently used in the test. Classification and identification of equipment such as Fluorescent microscope, biosafety cabinets, bench centrifuge, freeze-drying machine, phase

contrast microscope and refrigerators (from +4C to -80C) pH meters etc. require proper documentation. Service and calibration records of all operational equipments are not in existence. This is a major omission in the inventory system of the essential laboratory facilities. These observations are common to all the diagnostic tests being undertaken at the Institute. The maintenance unit to look after various pieces of equipment does not exist at the Institute but depend on the good will of a sister nearby Institution. This type of arrangement is not sustainable for an institution such as this one.

Test validation;

Neither the protocol nor the SOP were made available for verification. The test results and the interpretation thereof lacked detail in the draft SOP. These findings were common to all other tests being performed by the same section. This should be improved upon and taken into account as new SOPS are prepared.

General conclusions

Strength

- Staff number (recently hired)

Weaknesses

The appraisal of the accommodation and environmental conditions that was made in April-may 2002 (JT Paweska, K. Tounkara, RAF/5/053-16.01 & 02) are still valid for the CVRI

- Accessibility is very poor with only a rough road leading to the laboratory. This road might be very dangerous during rainy season and is certainly a huge limitation for sample submission (in fact intermediary deposits for samples are organized…)
- There is no internet facility at the laboratory
- Control of access is still a problem and metallic bars are being installed on all doors and windows in order to prevent any break-in (will it be sufficient?).
- General maintenance of the premises is very poor. The flat roofs of the lab are leaking seriously during the rainy season. This leads to a degradation of the walls and ceiling integrity and/or security problems with electrical installations. It is a risk for the equipment in place.
- Power failures are still encountered. There are two stand-by generators. One is out of use (Ford), the other one is in the process of being repaired, batteries have been bought but the lab was still waiting for some pro-forma invoices for the repair. At the time of this visit the generator was not functioning.

The list of personnel present in 2002 also shows that there has been a huge turnover of staff as only the director (Dr Kabilika) and the parasitology HOS (LN. Sinyangwe) remain (out of 8). As a consequence most of the staff is very young and lack experience. This is particularly true for the quality manager that did not follow an adequate training for quality management. Hence the quality management at CVRI is only at its initial implementation phase. A mission by an external expert (Mrs Delisle Wessels) has allowed some work to be started however the report for this consultancy has not been received by the head of laboratory. In addition many documents that are in the process of being written do not match the “quality standards”.

Networking is not present at the CVRI. Some samples are sent to other reference laboratories (BVI, Pirbright…). Standard SOPs still need to be put in place.

In general terms there is a number of equipment present in the laboratory. They are apparently in good condition but a proper inventory with working status, user’s manual, simplified instruction for use… are still lacking.

The CVRI is sufficiently provided with personnel. The persons we have met were particularly enthusiast and motivated. However most of them lack experience in the field of laboratory diagnosis and the flow of sample run yearly may not ensure that the personnel will gain sufficient experience.

The premises, as they are, would not allow the setting up of a PCR laboratory for rapid diagnostic purposes, and especially for the surveillance of HPAI.

RECOMMENDATIONS

Owing to the existing shortcomings of the CVRI with critical domains such as accessibility, power supply, acces to internet, roof leakage leading to a rapid degradation of the premises… the CVRI has in fact only two alternatives if it wishes to raise its quality management standard:

- Find ways to correct these problems rapidly
- Consider transferring part of its activities to another location

The director of the CVRI has indicated that steps had been made for the purchase of a satellite-base internet connection system, that the standby generator should be repaired soon and that the administration responsible for building repair should soon intervene. It was however difficult to foresee when the road could be improved.
As a group of consultant we would like to urge the Zambian administrations in charge to speed up all these actions (MACO, Budget…) as failing to improve these critical parameters would not allow the CVRI to reach a satisfactory level of quality.
As an alternative option, part of the CVRI activities could be transferred to another laboratory in another institution. Having strong links with the UNZA would have some advantages for both Institutions. This could ensure that the CVRI head of sections have access to continuous education and are pursuing Master degrees. This level of university degree is deemed absolutely necessary for a head of section.
On top of continuing education, it is also deemed necessary for the CVRI to have a sufficient flow of samples as it is the only way for the technicians to maintain their level of expertise and for the head of sections to gain experience (which they lack at the moment). Failing to do so would lead to a de-motivation of the newly acquired staff and a brain drain of the best for more interesting or better paid jobs.
As such it is very important to link the CVRI with international (bi-lateral or multilateral) projects that are able to yield funds for the purchase of equipment or reagents. The CVRI should also be commissioned to perform regular testing of samples from slaughterhouses for the surveillance of notifiable (CBPP for example) or zoonotic diseases (TB, brucellosis, Anthrax…)

Owing to the fact that the CVRI is only starting its quality management practises, it is felt by the consultancy team that a number of points merit attention:

- The quality manager should be trained in that field. This may need a medium term training (1-2 month) and in that case the quality manager should be bound, by contract, to work for the CVRI for a minimum period of time (1-2 years) to put in place the quality management system.
- There should be a careful planification of the quality management actions to be undertaken with very specific objectives, time laps to achieve them and persons in charge. The level of achievement should be reviewed and recorded every 2 months.

Among the most important tasks to fulfil rapidly, here are some suggestions:

- Setting up a list of documents and records that will be used at the CVRI and ensure that they are designed and labelled according to quality assurance. This should include the definition of bench worksheet that should allow the linkage between the registration records and the final test result records.
- Define 4 SOPs that have to be taken as examples. W e suggests SOPs for Newcastle, Rabies, CBPP and Anthrax (or Brucellosis) diagnosis. These SOPs should be revised by trained personnel in order to verify that they are in accordance to quality management practices and contain, for example, correct identification, numbering of pages, criotical equipments and reagents… The SOP model provided by Delisle Wessels could be taken as a starting point and standardized SOPs could also be implemented at the SADC level.
- Ensure that there is a precise inventory of the available equipments that is registered according to quality management (ID, Life sheet, Instruction manual, abbreviated instructions for use…)

The setting up of rapid diagnostic techniques has been identified as a priority in all SADC countries. The Avian Influenza crisis may be seen as an opportunity in that matter, as a number of funds may be available through international aid. However the general condition of the CVRI as it stands today would certainly not allow to run PCR under satisfactory quality management conditions. It is therefore suggested to re-locate any new PCR lab to another lab until the conditions at CVRI have improved.

Some training needs have been identified by the group of experts.
Beside the quality management training already mentioned some more technical trainings are deemed necessary

- Training on calibration and metrology (eg calibration of multichannel pipettes)
- Training on mycoplasma isolation and identification (for CBPP diagnosis)
- Training on two viral diseases diagnosis: Newcastle and rabies.

Annex 4

26/04/2006

SADC Veterinary Laboratories Network Consultancy (VLNC)

Visit of the Botswana National Veterinary Laboratory in Gaborone
30th March and 24th of April 2006

Preliminary report
Code: VLNC-BW-V01

Authors: D. Babre, P. Sinyangwe, F. Thiaucourt

INTRODUCTION

Terms of references of the consultancy

22- The Network of Veterinary Laboratories has been assisted in the identification of deficiencies in their diagnostic capabilities in collaboration with field services, with special reference to Foot-and-Mouth Disease, Contagious Bovine Pleuropneumonia, Avian Influenza, African Swine Fever, Newcastle Disease and Rabies;
23- Quality Assurance systems in place in Member States have been assessed;
24- Intensity of Networking and development of harmonized Standard Operating Procedures (SOP's) assessed;
25- Diagnostic capacity (personnel and equipment) assessed;
26- Inventory of available tests established;
27- Major limiting factors in the efficient operation of laboratories identified; and
28- Training needs identified.

IMPLEMENTATION OF THE VISIT

The Botswana National Veterinary Laboratory (BW-BNVL) was not originally included in the laboratories to be visited under this consultancy. However it was felt important to be given the opportunity to visit this lab although the time available to do this was quite limited. We would like to express our thanks to the Director of BW-NVLC and to the colleagues that devoted part of their time to allow our visit to be successful.

30th March, morning

Questionnaire evaluation and validation

24th April

Visit of the PCR laboratory
Discussions with the persons responsible for Quality Management, Virology (Rabies) and Bacteriology

26th April

Report writing

Appraisal of the quality management system

Person met: **Gregory NDLOVU** (Quality Manager).

A person (eg Gregory NDLOVU) is appointed as **quality manager**.
A **policy statement** signed by the director specifies the targets set to the lab for the current year and is postered at different places.
A **quality manual** (eg BNVL Quality Manual) is written and in use. Its presentation is nice and follows the ISO 17025 lay out, which makes easy its reading. It is **codified**, the version is mentioned but this important document is **not signed** by the persons who wrote, checked and approved it.
The **field** of the accreditation (eg 7 sections) is exactly **identified** in the quality system management policy.
A **general logigram** presents the organization of the BNVL, showing the position of the quality manager.
A **detailed logigram** identifies, for one section (eg pathology), the different involved **functions** but this document is **not recorded** and the same description is **lacking** for the others sections.
A very precise **job description** exists for many functions (eg chief technical officer – QMS.JOB.DESCR.RES/CTODPM-05) belonging to the residue section. It refers to one person, mentions his duties and responsibilities, is signed by the agent and his hierarchy but the version concerning this document is not indicated and this type of job description is not in place for the others sections.
A **management review** is held every **three months** with the staff of the lab. All the items required by the standard are included (policies and procedures, outcome of internal audits, corrective and preventive actions, changes in work, clients feedbacks, complaints, needs of human and material ressources, requirements of training, ...)

but are sometimes labelled "**untreated"**. The findings and the actions that arise are recorded in a **report** of this meeting. An advice would be to maintain these quaterly meetings but to reserve the name of management review at one yearly of those which would treat really all the items required by the ISO 17025 standard.
The **documents management** is described directly in the quality manual. The documents are classified in **3 types**. The main points (eg codification, version number, number of page, total number of pages, the names and dates for writing, checking and approval, implementing of corrections, reviews, archiving, ...) are treated. Nevertheless, the management of the **external documents** (eg norms, users manuals given by the suppliers, regulates, ...) are not well defined and a **list of the current documents**, identifying their title, their code, their version, the date of their review is **lacking**.
A list of the **types** of **records** is given in the quality manual. It concerns all the aspects of the system (eg quality and technical fields) but some are **not involved** (eg job descriptions, structure organigrams, ...).

EQUIPMENTS

Each piece of equipment is identified by a **single code** (eg 0005 for the balance PP303).
A general **list** of the equipments is available but it does not precise which are **critical** for the lab use.
A **verification planning** exists for each section (eg BNVL pathology section equipments verification program 2005/2006). The number of each page and the total number of pages of this record are not mentioned.
A set of **calibrated weights** is used to check the balances but they are not identified by a single code as the equipments. The presence of two non identified weights of 10 grams in the same box can introduce errors during their manipulation.
The **calibration certificates** for the weights are made by an external accreditated by SANAS company (eg WIS LTD). They are well established (eg reference procedure, uncertainty, precisions on k factor, ...) and traceable to the international reference standards.
The **status** of every equipment is clearly indicated (eg out of order) when it is not conform for use.
The **micro-pipets** are calibrated inside the lab. The record sheet does not take in account the **volumic mass of water** at the temperature they are performed (it implies an error of about 0.4%) nor the **evaporation** when the measured volumes are small (less than 50 µl). The suitability of the balance used to check the micro-pipets was not verified but it must be pointed that for the accurate calibration of 10µl volumes, the minimal resolution of the balance must be of 0.01mg.
The **refrigerators and freezers** are daily verified but:
The **resolution** of the used thermometers (eg 1 °C) is **not quite adequate** for the specified requirements (+/- 2°C);
The reading of the temperature needs the **opening of the door** which may be an important source of trouble, in particular for the low temperatures (eg – 20°C);
The **thermometers** used to check these equipments (eg NADU6) are **not calibrated** in comparison with a certified probe;

The temperatures are measured at one **single point**: as the temperature may vary from the top to the bottom, it would be better to do at least one time the map of the temperatures inside the equipment to appreciate the homogeneity of their repartition;
The measured temperatures are monthly recorded on an Excel file and presented as control charts. The corresponding graph does not show clearly the situation of the measured temperatures between the two extreme allowed values (eg 4 +/- 2°C).

If the basis of quality management is in place and in accordance with the ISO 17025, it is actually applied to only a few parts of the system (eg detailed organigrams and job descriptions) and must be generalized. Nevertheless, even if the main principles of equipments management (life sheets, list, single codification, ...) are running, many **important shortcomings** concerning their calibration or checking (list of critical equipments, linkage with reference standards, influence of evaporation or volumic mass of water, ...) should be corrected.

Appraisal of the quality management system in place for FMD

Head; Dr J.M.K. Hyera
Technologist; Mrs Lilian Tlagae

Main Test conducted; Solid Phase Blocking (SPB) ELISA.

Observations;
The term Working Instructions (WI) rather than SOPs has been adopted by the Botswana National Veterinary Laboratory (NVL). Very little time was allocated to this lab as compared to other labs previously visited in the region. Hence the investigations in the Virology Section were not as detailed as expected. Currently, the lab is using the SPB ELISA (*Annon*) although the Liquid phase test was used in the past. The SOPs for both tests were made available for verification. The Technologist was very competent and very open to discussions. There is no Assistant Technologist therefore in her absence the Chief Technologist of the Section takes the responsibility of diagnostic activities.

Antigen and Antisera;
Standard Antisera and Antigen are supplied by the BVI, these are used and stored according to the BVI protocols recommendations. SOPs for these two biologicals and those used in the preparation of an assortment of reagents were made available for verification. They were all found to be in satisfactory conditions.

Equipment;
Equipment was not categorized as critical or non critical. This appeared to be the general trend with all the SOPs concerning the frequent and routinely used diagnostic equipment. There are two ELISA readers (makes: GDV and Labsystems) but only one of them is functional. However, the functional reader lacks an appropriate software hence all the data and calculations have to be done manually. Considering the large in flow of serum samples to be examined daily by limited personnel, the human error source from fatigue cannot be ruled out in the final output

of results. More staff is therefore required to make the lab more efficient and produce acceptable results.

Cold chain;
Refrigerators especially the -20^0C and -80^0C require urgent attention. The -80^0C freezer can only reach -51^0C which falls far below the manufacturer's recommendations with some products. Calibration of these freezers, the balances and pH meters was a responsibility of the Quality Managers' Section.

Recommendations;

1. The current technical support staff strength needs to be beefed-up for it to meet the routine national FMD surveillance and individuals' diagnostic needs and challenges.
2. The sample size for routine FMD surveillance requires revisiting otherwise there is too much workload and pressure on the limited staff who hardly go on long vacation breaks.
3. It is strongly recommended that an appropriate software for the functional ELISA reader be procured as soon as it is convenient in order to reduce the pending sample volumes. The cold chain equally needs some remedial measures to be put in place.
4. Short term training courses in virus diagnostic techniques would be an added advantage to the technical staff currently engaged in the virology section (rabies and foot and mouth diagnosis).

NB Although the rabies diagnostic section was visited, due to time constraint it was not possible to meaningfully make comments.

Appraisal of the quality management system in place for PCR

Person in charge: Mrs Boitumelo TLOTLENG

The visit of the various labs were made at the beginning of the BNVL visit and quite rapidly (1h30)

There is a good separation of the three rooms that are used for PCR mix preparation, extraction of DNA and PCR amplification and detection. There is also a regulation that forbids returning to the first labs once a technician has entered the last lab.
However it seems that the pipette calibration is performed in the first lab even if they are used in the lab where detection of amplified DNA is performed. This procedure may be analyzed thoroughfuly to check if it does not pose a risk and maybe find another solution.
The work instruction for CBPP detection was analyzed during the visit.
It was not updated as the described procedure and kit (Pleurotrap) seems to be no more available commercially. It is therefore difficult to check if the tests are performed according to the procedure.
When checking the last CBPP-PCR results, there seemed to be a number of positive controls that were included in the testing (more than in the examined work instruction). Many of them gave negative results but this did not give rise to a non-

conformity. In any case there was no indication on the current work-instruction to explain when the test results are non-conform. The absence of a positive test result for these controls may arise from the use of gel agarose electrophoresis for DNA detection which is a less sensitive method than the immunological method used formerly with the pleurotrap kit.
There is apparently no bench-working sheet which describes all the reagents used.
The micropipettes are tested regularly. However it is difficult to understand if they pass the control as evaluating volumes of 0,5µl is very difficult. In any case it could be interesting to have more relaxed demands in terms of precision as the volumes delivered may not be very critical (many reagents are included in excess and a small variation of volume should not alter the final result).

The use of a polaroid camera is satisfactory but could pose a problem of availability of reagent. The purchase of a digital apparatus may be worth wile both in terms of quality management and economy.

Appraisal of the quality management system in place for CBPP diagnosis Isolation and CFT

Technician present: E. DIHORO (deputy to Sephaco SEDIADE)

1) **Mycoplasma isolation**

It was not possible to see the job description of Mr Dihoro and check if the isolation of Mycoplasmas was included in his duties.
Mr Dihoro was apparently trained in house but there was no proof of this training nor any appraisal of the training exercise.

The test result for sample 2322- BNVL 2006/3273 was examined.
This result was signed by Mr MS Kohliwe who is apparently not formally trained for Mycoplasma isolation.

It was not possible to have a look at the work instructions for mycoplasma isolation.
The medium used (Mycoplasma experience medium) is suitable for MmmSC isolation, however the description sheet and the QC data sheet were not there to check if this medium is suitable for other types of mycoplasmas such as *M. galisepticum.*
The liquid medium was present in small quantity and would not allow the testing of large number of samples in case of a CBPP suspicion.
The agar medium present was expired and there was no indication that it had been requalified (there is no work-instruction for this nor any reference material)

Besides, all the necessary equipment for mycoplasma isolation were present and in good condition

2) **CBPP-CFT**

WI: Bact-sero/02-04 rev 03
Test result TR-BNVL 2006/061

This test result does not mention the results of the positive controls and there is no related bench worksheet that enables this control.
Very recently a new worksheet has been established. It is an improvement compared to the previous situation but a number of important data are missing (those concerning the critical equipment and reagents such as sheep red blood cells, kit references, pipettes…)
The result for the control positive serum provided by IZS (lotto 001/90) varied from one time to another (+ at 1/80, + at 1/160) when the theoretical value given by the producer is ++ at 1/320. This discrepancy did not give rise to any non-conformity.
There is also no follow-up of the important controls (such as C+) in order to verify if there is any drift in the technique (s it is required by the norm).

Furhermore the multichannel pipettes seem to be controlled on a single channel.S

Recommendations

Improve the quality management by using bench worksheets that enable the linkage between registration forms and result forms with the identification of the critical equipments and reagents (which have to be identified in the work instructions)

Establish flow charts with the critical values of the positive controls for the CFT to monitor possible drifts or non conforming results.

Ensure that the isolation of mycoplasmas is performing correctly as isolation may be one of the most sensitive tool for the detection of MmmSC.

Purchase of equipments

Digital camera for agarose gel electrophoresis results to be stored and analyzed.
Software for ELISA reader connection to be able to use new ELISA kits
Automated temperature probes with relevant software to follow the temperature in critical equipments (deep freezers, freezers, incubators…)

General recommendations

The BW-BNVL is clearly well advanced in terms of quality management practices. The lab itself is in excellent condition and has clearly been well maintained since its inception in 1986. At the time of this consultancy there was a problem with the internet connection and the E.mail of the director was not accessible. This should be corrected as soon as possible.

One of the biggest problems that may face the BW-BNVL may be the high number of samples and duties that should be performed together with the implementation of the quality management system. The consequence seems to be that a number of staff did not go on vacation as normally planned. This could lead to a certain de-motivation of the personnel. It is recommended that the procedures are simplified as much as possible in order to allow the system to work more efficiently. For example the purchase of an ELISA software to analyze ELISA data or a temperature probe system to record automatically the temperatures…

The recent visit of auditors (SANAS) allowed the identification of points that merit some more work before the accreditation can be obtained. The use of the quality questionnaire could be another way to record the evolution of the lab towards quality management.
Due to time constraint it was not possible to establish a list of training needs. From what was observed there is a clear need of training for mycoplasma isolation and identification. This could be done through the participation of the CBPP corridor surveillance study.

Annex 5

SADC PRINT Project

Concept note for a regional study

"Laboratory surveillance of CBPP in a corridor of strategic importance"

Introduction

Contagious bovine pleuropneumonia (CBPP) is an infectious disease of cattle caused by a mycoplasma, *M. mycoides* subsp. *mycoides* SC (MmmSC). It is considered by the FAO and the OIE as a serious threat for cattle industry and a threat to exchanges of live animals. CBPP was introduced in the "Cape Colony" in the middle of the 19th century and it progressed northwards, causing very important economic losses. Many countries implemented eradication programs based on test-and-slaughter policies at the beginning of the 20th century but the success was not complete on a regional basis. Foci of infection persisted in the Northern part of Namibia as well as in Angola which posed a great threat for the re-introduction of the disease to neighbouring free regions or countries. For example Botswana was re-infected in 1994 and it became CBPP free again only after the implementation of a very expensive eradication program. More recently the Caprivi Strip was re-infected by CBPP and it had to be included in the Namibian regions that are under repeated vaccination programs.
Within SADC countries, the situation of Zambia is the more puzzling as CBPP is present in the Western Province at the border with Angola and the Caprivi Strip and the disease progresses eastwards towards the Southern Province (outbreaks in Sesheke in 2004 and recent suspicions at Kazungula). The disease is also present in the North-Eastern part of the country at the border with Tanzania but the distribution of the disease is not exactly known.
The presence of CBPP in the countries located in the north of SADC poses a permanent threat to countries situated in the South such as Namibia (the regions situated southern of the cordon fence), Botswana, Zimbabwe, Malawi and Mozambique. It is therefore of utmost importance that these countries are in a position to diagnose the presence of CBPP if it is introduced and to take immediate action to maintain their CBPP-freedom status by swift action (emergency preparedness).
In regions that are free of the disease but at high risk of re-infection, the surveillance for CBPP involves at least three components:

- A preparedness in the field for cattle owners, technicians and veterinarians that must be aware of the disease and its whereabouts (clinical signs, lesions)
- A preparedness in slaughterhouses or slaughter crushes so that suspicious lesions are spotted and sent to the lab regularly
- A preparedness at the laboratory that must be able to confirm the presence (or absence) of CBPP through serology and isolation of the causative agent.

Objectives of the regional study

The main objective of this study is to allow the various central veterinary laboratories of the zone to be in a position to confirm the presence of CBPP if it exists.
The secondary objective will be to establish a more precise distribution of CBPP at the "interface" between infected and CBPP-free countries (see map in Annex 1) to be in a position to propose future control strategies with a final aim of eradicating CBPP from SADC.

Means

1) If it has not yet been done, awareness of field personnel will have to be dealt with any communication deemed necessary: Leaflets in local languages, radio, meetings…
2) A good communication will have to be established between field veterinary personnel and the laboratories (regional labs, central labs)
3) Contacts will have to be made with slaughterhouses and slaughter crushes in order to collect suspicious samples. Instructions will have to be issued for the collection of the samples and their dispatch to the laboratory.

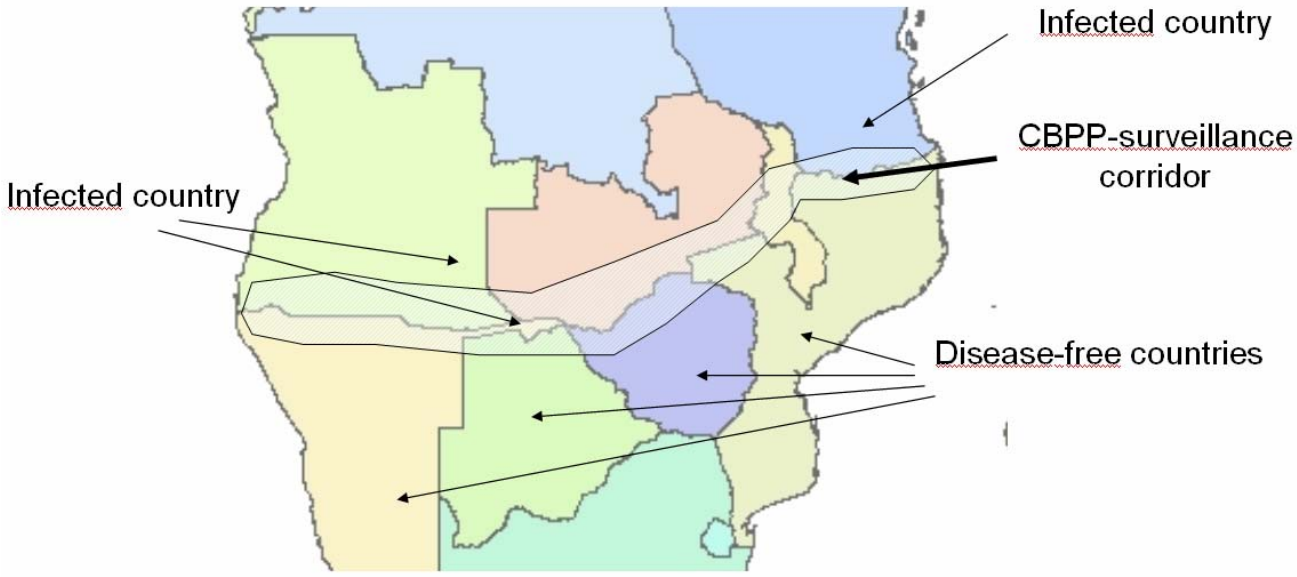
These steps should ensure that there are a number of samples that reach the CVLs for CBPP diagnosis. The main flow of samples will consist in samples for MmmSC isolation but also from blood samples taken from suspicious herds.

4) At the laboratory level a number of actions will have to be taken
   4.1: The necessary equipments will have to be purchased (although the visited labs are in a position to undertake their task immediately)
   4.2: The necessary media will have to be purchased or produced locally
   4.3: The necessary SOPs for mycoplasma isolation (and preliminary identification) and CBPP serology will have to be established.
   4.4: A technical training will have to be organized within the next year
   4.5: A roundrobin will have to be initiated once the training is finished (mycoplasma identification, serology)

At the same time it is advised that a young scientist from each laboratory is undertaking a Master of science degree at a local University (with possible sandwich programs when funds are available to link these masters with Universities from other countries).

The help of regional as well as world reference laboratories for confirmation of mycoplasma identification and finer molecular typing will be sought.

Annex 1: SADC map with proposed CBPP surveillance corridor



Annex-6:

IMPLEMENTATION OF THE MISSION

1. Preparation of the laboratory questionnaire and contact with SADC vet. Labs.
Selection of the three labs to be visited: Mozambique, Zimbabwe, Zambia
From 06/03/06 to 25/03/06
D. Babre, P. Sinyangwe, F. Thiaucourt.

2. Arrival in Botswana. Meeting at SADC, first visit of the BNVL
From 28/03/06 to 02/04/06
F. Thiaucourt, P. Sinyangwe

3. Arrival at Maputo. Implementation of the visit of the MZ-CVL
From the 03/04/06 to the 09/04/06
D. Babre, P. Sinyangwe, F. Thiaucourt.
Report to be found in Annex 1

4. Arrival at Harare. Implementation of the visit of the ZW-CVL
From the 09/04/06 to the 16/04/06
D. Babre, P. Sinyangwe, F. Thiaucourt.
Report to be found in annex 2

5. Arrival at Lusaka. Implementation of the visit of the ZM-CVRI
From the 16/04/06 to the 21/04/06
D. Babre, P. Sinyangwe, F. Thiaucourt.
Report to be found in annex 3

6. Arrival at Gaborone. Continuation of the BW-BNVL visit
Preliminary oral report to SADC-Print staff (24/04/06)
Preparation of the presentation to be done at the Livingstone meeting.
From the 21/04/06 to the 25/04/06
D. Babre, P. Sinyangwe, F. Thiaucourt.
Report to be found in annex 4

7. Travel and arrival at Livingstone
Discussions with participants
Presentation of the preliminary report (27/04/06)
Presentation to be found as a powerpoint file in the CDrom: VetLab-SADC-Prelim-report-V02
P. Sinyangwe, F. Thiaucourt.

8. End of mission 29/04/06
Preparation of final report

Annex7: CDrom content