

***The FAO/IAEA External Quality Assurance Programme
(EQAP) and Movement Towards a Generic Veterinary
Diagnostic Testing Laboratory Accreditation Scheme***

*Report of an FAO/IAEA Consultants Meeting organized by the
Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture
and the FAO/IAEA Agriculture and Biotechnology Laboratory
Vienna International Centre
2-6 February 1998*



JOINT FAO/IAEA PROGRAMME
OF NUCLEAR TECHNIQUES IN FOOD AND AGRICULTURE

Animal Production and Health Subprogramme



1.	SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS	3
2.	INTRODUCTION	4
3.	CURRENT STATUS OF THE FAO/IAEA EQAP	5
	3.1 Background of the FAO/IAEA EQAP	
	3.2 Scope of the FAO/IAEA EQAP	
	3.3 Implementation - 1995 to 1997	
	3.4 Results and Impact	
	3.5 Planned Implementation - 1998	
4.	THE CONCEPT OF “FAO/IAEA RECOGNITION”	8
	4.1 Background to FAO/IAEA Recognition	
	4.2 Revised Definitions and Criteria for FAO/IAEA Recognition	
5.	MOVEMENT TOWARDS INTERNATIONAL VETERINARY DIAGNOSTIC TESTING LABORATORY ACCREDITATION	10
6.	CONCLUSIONS AND RECOMMENDATIONS FOR THE FAO/IAEA EQAP FOR ANIMAL DISEASE DIAGNOSIS	12
7.	CONCLUSIONS AND RECOMMENDATIONS FOR AN INTERNATIONAL VETERINARY DIAGNOSTIC TESTING LABORATORY ACCREDITATION SCHEME	13
	REFERENCES	14
	LIST OF PARTICIPANTS	15
	ANNEX 1: FAO/IAEA EQAP FLOWCHART	17
	ANNEX 2: PROPOSAL FOR PRINCIPLES OF QUALITY MANAGEMENT IN VETERINARY DIAGNOSTIC TESTING LABORATORIES	18
	ANNEX 3: PROPOSAL FOR MONITORING COMPLIANCE WITH THE PRINCIPLES OF QUALITY MANAGEMENT IN VETERINARY DIAGNOSTIC TESTING LABORATORIES	30

1. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The FAO/IAEA EQAP has been successfully implemented according to the guidelines established in the 1994 Consultants' Report (1) for a limited number of FAO/IAEA-supported ELISA's. The results of the EQAP rounds indicate that full implementation of the EQAP across the Subprogramme's animal health activities may not be a realistic goal for the immediate future. *The priority for future implementation of the EQAP should be for the established FAO/IAEA assays (e.g., rinderpest, brucellosis) before significant expansion to other assays.*

The design of the FAO/IAEA EQAP for Animal Disease Diagnosis as described in the 1994 Consultants' Report (1) is still appropriate and sound, and the central elements of the programme should be maintained. *Moreover, equal emphasis should now be placed on quality management and operations, as well as proficiency testing.*

The implementation of this programme at an optimum level to meet Subprogramme objectives has been limited by lack of funding and staff resources and overly centralized responsibilities. *The movement towards shared responsibilities between the EQAP Coordinator and relevant Technical Officers should be encouraged. Each FAO/IAEA Technical Officer should receive training in quality assurance principles and practices such that he/she can act as a EQAP quality system "auditor" for EQAP monitoring purposes while on official visits to FAO/IAEA counterpart laboratories.*

Training is essential in any quality assurance effort. *Workshops, training courses, and expert services should be used to assist counterparts in the development of their quality systems.*

IQC data provides the best measure of routine assay proficiency and maintenance of assay control in the FAO/IAEA EQAP. *The documentation and use of IQC data by counterparts should be supported through the development and distribution of training materials by the Subprogramme staff.*

It is recognized that the FAO/IAEA EQAP is programmatic in nature, but is also designed to assist counterpart laboratories to bridge the gap between what they have now and formal national or international recognition of QM and technical competence. *The revised definitions and criteria for FAO/IAEA Recognition should be adopted by the Subprogramme and circulated to all relevant parties including the counterparts, their respective ministries, the OIE, the FAO, and other international, regional, and national organizations, as appropriate.*

An internationally harmonized set of principles for the quality management of veterinary diagnostic testing laboratories and a process for monitoring compliance with these principles are needed to establish a common ground for understanding and evaluating the reliability of the management, operations, and outputs of these laboratories. *Proposals for "Principles of Quality Management in Veterinary Diagnostic Testing Laboratories" and "Monitoring Compliance with the Principles of Quality Management in Veterinary Diagnostic Testing Laboratories" are appended to this report. These should be forwarded to the Secretariat of the OIE for consideration in the development of an international scheme for veterinary diagnostic laboratory accreditation.*

2. INTRODUCTION

FAO/IAEA support in the area of animal health is focused on enhancing the ability of regional reference laboratories and national veterinary authorities in developing countries to diagnose livestock diseases of major importance using nuclear and related technologies, and to help monitor the effectiveness of national and regional intervention strategies. This is done through provision of advice to the veterinary authorities concerning the development of appropriate sampling or research strategies coupled with FAO/IAEA-led collaborative development, adaptation, standardization, evaluation, and provision of quality-controlled enzyme-linked immunosorbent assay (ELISA) kits and the components necessary for diagnostic application of the polymerase chain reaction (PCR) techniques. Additional features of FAO/IAEA animal health support include provision of relevant laboratory equipment, training of counterpart scientists and technicians in the use of the equipment and standardized assays, and coordination of quality assurance (QA) programmes to monitor the proficiency of the assayists and help evaluate the impact of improved diagnostic capabilities.

The development and adaptation of immunoassay and molecular techniques for use in national veterinary laboratories in developing countries, the standardization of equipment, working protocols, and interpretation of test results, and the evaluation of assay reliability under the conditions found in such laboratories (validation) are complex and time-consuming activities. The situation is compounded by the number and diversity of diagnostic kits used within the framework of the FAO/IAEA Animal Production and Health Subprogramme, the variability of working conditions and staff expertise at laboratories in developing countries, and the stressful conditions that the kit components suffer in transit to counterpart laboratories.

It might appear that once the development and transfer of the technology is completed (i.e., the equipment is in place and functioning, the kits are supplied and validated, and the counterparts are trained in their use), the major objective of the programme has been reached. However, to ensure the sustainability of the overall effort and to make determinations of programme impact, the technology transfer cannot represent an end in itself. There remains a need and a responsibility to ensure both the proper use of the assay and the reliability of test results reported by the counterpart laboratories over time. The reliability of test results is important not only for the laboratory and its customers, but for external acceptance of the laboratory's diagnostic interpretations (e.g., for publication in scientific journals, for livestock policy-making decisions, for international trade, etc).

The current FAO/IAEA External Quality Assurance Programme (EQAP) for Animal Disease Diagnosis began as an effort to monitor the efficacy of mass vaccination programmes as part of the Pan African Rinderpest Campaign (PARC). Proficiency test panels, composed of 40 "unknown" serum samples, were sent to participating laboratories yearly to measure their abilities with ELISA in distinguishing between samples that were positive or negative for rinderpest antibodies. From this beginning, the EQAP has grown into an effort to measure general and specific components of FAO/IAEA counterparts' QA systems and provide assurance to outside observers that the use of FAO/IAEA diagnostic ELISA's are within established control limits and the test results and diagnostic interpretations are reliable.

A major objective of the current EQAP is to establish a network of national veterinary diagnostic testing laboratories that are recognized for their achievements in establishing QA systems and their proficiency in the use of specific diagnostic assays. This network would facilitate the exchange of epidemiological information and, in the current atmosphere of international and regional trade

agreements, provide a greater opportunity to increase the share of developing countries in the international trade of livestock and livestock products.

In February 1998, a Consultants' Meeting was convened to consider the design, impact, and proposals for future implementation of the current FAO/IAEA EQAP for Animal Disease Diagnosis and make recommendations with regard to its central purposes and future direction. In addition, the Consultants considered the broader question of a generic QA "accreditation" scheme for veterinary diagnostic testing laboratories that could be made available through international, regional, or national organizations as appropriate to the country of interest. This broader discussion was stimulated by the fact that few developed and no developing countries have nationally organized schemes to measure and recognize the QA systems and technical competence of veterinary diagnostic testing laboratories, but that such a scheme is of vital importance to the quality of policy decisions and actions taken on national animal health issues and the international trade of livestock and livestock commodities. It followed that, in the Subprogramme's role as a Collaborating Centre to the Office International Epizooties (OIE, or World Animal Health Organization), it would be appropriate to consider the FAO/IAEA EQAP within the broader scope of an international scheme for veterinary diagnostic laboratory accreditation for two reasons: 1) to use information learned through the design and implementation of the FAO/IAEA EQAP to assist in the appropriate development of an international scheme and 2) to ensure that the FAO/IAEA EQAP objectives and processes are in harmony with international QA guidelines as they develop in this area.

This report presents the summary information, conclusions, and recommendations made by the Consultants for both the FAO/IAEA programmatic EQAP and a generic veterinary diagnostic laboratory "accreditation" scheme. Appended are two proposals elaborating 1) the principles of quality management for veterinary diagnostic testing laboratories and 2) a scheme for monitoring compliance with these principles.

3. CURRENT STATUS OF THE FAO/IAEA EQAP

3.1 Background of the FAO/IAEA EQAP

Based on recommendations from a Consultants' Meeting held in 1994 (1), the FAO/IAEA EQAP for animal disease diagnosis was organized to consist of three components:

- 1) A questionnaire to gather information about the counterpart laboratory's infrastructure, staff qualifications, and operations in conjunction with the information supplied during technical visits;
- 2) A process to report on the internal quality control (IQC) data for FAO/IAEA ELISA's used in the counterpart laboratory; and
- 3) A process for measuring the proficiency of the counterpart laboratory's use of specific FAO/IAEA ELISA's.

The objectives of the EQAP effort were and remain to a) develop reference data for the assessment of new FAO/IAEA diagnostic assay performance in the field, b) determine the user's general QA status and specific assay proficiency, c) enhance the user's QA awareness and culture, d) provide reference data to help identify and solve systematic and random errors in FAO/IAEA diagnostic assay application, and e) provide an organized and transparent mechanism to enhance the national and international credibility of the user's laboratory. In addition, the data developed through the FAO/IAEA EQAP can be used from a programmatic perspective as baseline data for a) the development of

appropriate intervention strategies, b) monitoring project implementation, and c) evaluation of project impact during and after the project's conclusion.

3.2 Scope of the FAO/IAEA EQAP

The scope of the current FAO/IAEA EQAP is limited to immunodiagnosis of infectious diseases of animals, based principally on the ELISA. It was intended that the programme begin with the FAO/IAEA competitive ELISA (cELISA) for rinderpest, and progress to include the indirect ELISA (iELISA) for brucellosis, the antigen ELISA (AgELISA) for trypanosomosis, the antigen and antibody ELISA's (AgELISA and AbELISA, respectively) for foot-and-mouth disease (FMD), and other assays of importance to the Animal Production and Health Subprogramme. One round for each disease assay was to be conducted every six months.

3.3 Implementation - 1995 to 1997

Due to staff shortages and other technical and administrative problems, the actual implementation rate between 1995-1997 was lower than initially planned. During the period 1995-1997, two rounds for the FAO/IAEA rinderpest cELISA were completed [23 and 29 participating laboratories, respectively (2,3)] and one round was initiated [to be completed in 1998], two rounds for the brucellosis iELISA were completed [31 and 35 participating laboratories, respectively (4,5)] and one was initiated [to be completed in 1998], one round for the trypanosomosis AgELISA was completed [16 participating laboratories (6)], and one round for the FMD AgELISA and AbELISA was completed [12 participating laboratories (no summary report)]. Additional rounds for the trypanosomosis AgELISA and FMD AgELISA and AbELISA were not conducted because programmatic support for the trypanosomosis AgELISA was discontinued and the preparation and interpretation of proficiency test panels for the FMD AbELISA proved to be more expensive and difficult than could be handled with restricted programme resources.

EQAP Implementation 1995-1998

ELISA	1995	1996	1997	1998	Remarks
Rinderpest comp. Ab	Rp95a	Rp96a	Rp97a	1, 2	Africa and West Asia No. of participating laboratories: 1995 23; 1996 29, 1997 29, 1998 29
Brucellosis - indirect Ab - competitive Ab	Bru95a	Bru96a	Bru97a *	1, 2	Worldwide No. of participating laboratories: 1995 31; 1996 35, 1997 39
FMD - Ag - Ab		**		1	South East Asia No. of participating laboratories: 1996 10
Trypanosomosis - Ag - Ab		Tryp96a		2	The Ag Tryp96a included 3 Ag (T.brucei, T. congolense and T. vivax). 16 laboratories participated The Ab Tryp. ELISA planned for 98 will include only T.congolense
CBPP comp. Ab				2	

Rp95a, Rp96a, Rp97a, Bru95a, Bru96a, Bru97a, Tryp96a = Interim Reports

1 = full EQA cycle including interim report (A,B,C in Fig.1)

2 = start EQA cycle (e.g. A and B in Fig.1)

* = interim report in preparation

** = no interim report but results are communicated on an individual basis

3.4 Results and Impact

To date, the EQAP rounds conducted have represented a learning process for both the Subprogramme staff and the counterparts. The results for the rinderpest rounds showed that the majority of participating laboratories, particularly those involved with PARC, have a high level of proficiency in their use of the cELISA for seromonitoring (99% correct diagnostic interpretations of unknown samples among responders). This information has been communicated to the organizers of PARC, the Global Rinderpest Eradication Programme (GREP), and the OIE.

The results of the brucellosis rounds have been less clear-cut, although extremely informative. The positive/negative threshold for the brucellosis iELISA must be established by the end-user for each laboratory, as opposed to the threshold for the rinderpest cELISA which is established for all users at 50% inhibition, and the brucellosis thresholds vary widely among laboratories due to breed variations and other confounding local influences. Therefore, qualitative responses to a common set of unknown samples varied depending on the threshold used by any one laboratory. When the qualitative responses were evaluated alone, the proficiency in use of this assay was low (83% correct diagnostic interpretations among responders). However, when the quantitative data was normalized to a common threshold value, the "true" assay proficiency was much higher (96% correct diagnostic interpretations). This phenomenon illustrated that the proficiency test organizers must be careful when establishing the analytical criteria for evaluations of test panel responses. These results have also been communicated to the OIE.

The rounds for the trypanosomosis AgELISA and the FMD ELISA's have been of less immediate value than those described above. FAO/IAEA support for the trypanosomosis AgELISA was stopped shortly after this round was finished, so the exercise served to introduce the counterparts to fundamental QA concepts and FAO/IAEA evaluation techniques, but not much more. The FMD exercise was conducted during the period that the ELISA's were first being introduced into the participating laboratories, so it served to provide information on the success of initial implementation, but did not provide a fair test of established proficiency. A follow-up round in this area is planned for 1998 (see below).

To date, eighteen laboratories have fulfilled the criteria necessary to achieve recognition status under the criteria established by the 1994 Consultants' Report.

The establishment of QA systems in analytical and diagnostic laboratories can take several years under the best of circumstances. Therefore, it is difficult to provide an accurate assessment of the overall impact of the FAO/IAEA EQAP at this time. In the short term, responses from participating laboratories and outside observers (OIE, FAO, PARC, etc.) have been positive and indicate that a definite need is being served.

3.5 Planned Implementation - 1998

Implementation plans for 1998 include:

1. completion of 1997 rinderpest cELISA round and completion of two additional rounds (1st and 3rd quarters);
2. completion of 1997 brucellosis iELISA round and completion of two additional rounds (1st and 3rd quarters);
3. completion of one round for the FMD AgELISA and a limited AbELISA round in Asia;
4. initiation of one round for the new trypanosomosis iELISA; and
5. initiation of one round for the new cELISA for contagious bovine pleuropneumonia (CBPP).

4. THE CONCEPT OF "FAO/IAEA RECOGNITION"

4.1 Background to FAO/IAEA Recognition

To date, the major emphasis of the FAO/IAEA EQAP has been on proficiency testing. Information derived from the questionnaire and analysis of reported IQC data have represented adjuncts to a core programme of unknown sample analysis, but the criteria for "Recognition", as specified by the 1994 Consultants' Report (1), did not include specific requirements for quality management (QM) or laboratory performance with respect to assay control and IQC data analysis and documentation. Rather, general attention to improvement and documentation in these areas was encouraged, but the primary measure of successful EQAP participation for "Recognition" was correct identification of the five unknown samples of the proficiency test panel.

During the past two years, it has become clear that the strong correlation between proficiency testing and programmatic "Recognition" is inappropriate. It has been observed that performance on an annual or biannual proficiency test panel does not necessarily provide an accurate picture of the day-to-day quality of operations of the counterpart's laboratory. Additionally, many of the laboratories have not complied with the requirements to provide updated QM information or recent IQC data with each

proficiency test round because they did not understand the benefits to be gained from this exercise or did not consider these to be important elements of the FAO/IAEA EQAP.

4.2 Revised Definitions and Criteria for FAO/IAEA Recognition

To remedy this situation, the following revised definitions and criteria for FAO/IAEA Recognition have been developed:

4.2.1 *Definitions of FAO/IAEA Recognition*

1. FAO/IAEA Recognition is programmatic in nature and given retrospectively for a defined period of time. It is explicit recognition of an FAO/IAEA Coordinated Research Project (CRP) or Technical Cooperation Project (TCP) Counterpart's success in meeting FAO/IAEA criteria for good laboratory QM and operations (see criteria below), as well as successful participation in regular proficiency tests for specific FAO/IAEA animal disease ELISA's.
2. FAO/IAEA Recognition does not constitute certification, accreditation, or recognition of compliance as defined by the International Standards Organization (ISO), the Organization for Economic Cooperation and Development (OECD), or similar international, regional, or national organizations. In addition, it is not an explicit guarantee of a laboratory's future performance.

4.2.2 *Criteria for FAO/IAEA Recognition*

FAO/IAEA Recognition can be given only to those laboratories that have current or recent FAO/IAEA or IAEA project involvement and those that voluntarily subscribe to the criteria of the FAO/IAEA EQAP, the latter on a case-by-case basis as resources permit.

The criteria that *must* be fulfilled to achieve FAO/IAEA Recognition are as follows:

1. Provide evidence of a QM system including
 - a quality manual including, as a minimum, a statement of laboratory mission, a description of the laboratory organization, staff qualifications, general operational and laboratory procedures, safety procedures, standard operating procedures for routine assays, and work instructions for routine procedures.
 - documentation of quality control procedures including inventory controls, equipment calibration checks, and approved workplans for non-routine activities.
2. Provide evidence of the maintenance of assay control including
 - routine use of IQC samples where appropriate
 - routine use of control charts where appropriate
 - routine use of standard curves where appropriate
 - maintenance of documentation for all controls
3. Participate regularly and successfully in FAO/IAEA proficiency test rounds
 - respond to questionnaire/update
 - supply IQC data electronically and/or in control chart form
 - correctly interpret unknown samples within pre-established limits

4.2.3 *Monitoring and Evaluation*

Staff of the Subprogramme will provide assistance to FAO/IAEA EQAP participants in the development of a QM system and the use and documentation of IQC data. Standard formats for the presentation of this information will be supplied through the Subprogramme and their use will be encouraged. Once the QA elements are in place and in use by the counterpart, provision of evidence to meet criteria points 1 and 2 should occur on a regular basis, but no less than once per year, to achieve or maintain “Recognition” status (see below).

The evidence to meet criteria points 1 and 2 can be provided through a number of mechanisms. It may be communicated by e-mail, fax, or post in a timely manner to the EQAP Coordinator or relevant FAO/IAEA Technical Officer. It should be made available to any FAO/IAEA Technical Officer during official visits to the counterpart laboratory, if requested.

Regular successful participation in FAO/IAEA proficiency test rounds, including submission of Questionnaire updates and IQC data, will be self-evident.

Evaluation of the status of an EQAP participant will be the responsibility primarily of the FAO/IAEA EQAP Coordinator in consultation with the relevant Technical Officer and the Head of Section and Head of Unit.

4.2.4 *EQAP Status*

Participation in the FAO/IAEA EQAP is on a confidential basis, comprehensive reports are issued on an anonymous basis with respect to the participants, and the Recognition status of any participant can be disclosed only with the permission of the participant.

“FAO/IAEA Recognition” is awarded following the verification by the FAO/IAEA EQAP Coordinator of compliance with criteria points 1 and 2 plus successful participation in two proficiency test rounds. Continued participation results in continued Recognition. Lack of participation in one round results in a “Recognized laboratory” losing any recognition status in the FAO/IAEA EQAP.

Because a major objective of this programme is to assist veterinary diagnostic testing laboratories in developing countries to improve their performance and reliability, the primary focus is to help counterpart laboratories establish credible QM and operating systems and establish sustainable proficiency in the application of FAO/IAEA diagnostic assays, as well as provide a bridge between whatever level of quality system they now have and formal certification or accreditation to internationally-accepted standards. Therefore, the unique problems facing these laboratories and any other extenuating circumstances affecting a laboratory’s performance and status in this programme will be considered on a case-by-case basis.

5. MOVEMENT TOWARDS INTERNATIONAL VETERINARY DIAGNOSTIC TESTING LABORATORY ACCREDITATION

Virtually every country in the world has some type of national-level veterinary authority that makes policy decisions and takes actions affecting their country’s animal agriculture sector, based in part on information provided by a national veterinary diagnostic testing laboratory. One

hundred forty-nine countries are members of the OIE and are represented by their Chief Veterinary Officers or equivalent. However, few of these countries have mechanisms for granting national recognition of the QM or technical competence of their veterinary services or diagnostic testing laboratories. One notable exception is Australia, which has an ISO 25-based veterinary laboratory accreditation scheme in place and is making the scheme available to other countries in Asia on a cost-recovery basis.

An emerging challenge to the international animal health community is to make the organization and operations of national-level veterinary services, including diagnostic testing laboratories, clear to outside observers so that the quality and comparability of animal health programmes and data can be evaluated. Traditionally, the OIE has been a focus of information gathering and dissemination for animal health and trade issues, but there has never been an agreed mechanism for assessing the value or reliability of the data reported to this organization. As international and regional trade agreements become more prevalent, the need for internationally harmonized principles of QM for veterinary diagnostic testing laboratories and a common method for monitoring compliance with these principles has never been greater.

A variety of processes have been developed worldwide to recognize QA systems in the manufacturing, production, and service sectors, as well as the technical competence of testing laboratories. In particular, the ISO/IEC Guide 25 (7) forms the basis for many national standards for recognition of the competence of calibration and testing laboratories while the OECD Principles of Good Laboratory Practice (OECD-GLP) (8) are used internationally as a basis for judging a laboratory's competence in the general area of safety studies. It is noted that some government laboratories in developed countries have achieved both the equivalent of ISO 25 Accreditation and OECD Compliance recognition.

The primary purpose of a veterinary diagnostic testing laboratory is to perform routine tests on biological samples. Properly conducted validation studies of routine assays, documentation of assay controls, and other QA elements are important to the operations of these laboratories. However, some of the metrological principles of the physical sciences embodied in ISO/IEC Guide 25 are not directly relevant or applicable to veterinary diagnostic testing laboratories, and efforts to comply with the interpretations of these principles can lead to substantial expenses of time and money without adding substantially to the QA effort. Similarly, the study-oriented approach of the OECD-GLP does not lend itself well to evaluating the QM, general operations, or technical competence of a veterinary diagnostic testing laboratory. Essentially, a veterinary diagnostic testing laboratory accreditation scheme based on either ISO 25 or OECD-GLP alone would either be too costly for the benefits obtained and/or not provide fully appropriate assurances of good quality management or technical competence to regulatory officials or trading partners for the range of activities conducted in this type of laboratory. Therefore, the most practical route to development of an accreditation scheme for veterinary diagnostic testing laboratories could be 1) to define the needs of the customers (primarily the national regulatory authorities and trading partners) with respect to the operation and output of a laboratory, 2) review ISO Guide 25 and OECD-GLP with an eye towards those management elements that are essential to meeting the needs defined above and which have practical application in veterinary diagnostic testing laboratories, and 3) define, based on this review, the QM principles and a monitoring process that are appropriate to international, regional, and/or national application.

6. CONCLUSIONS AND RECOMMENDATIONS FOR THE FAO/IAEA EQAP FOR ANIMAL DISEASE DIAGNOSIS

- 6.1 The FAO/IAEA EQAP has been successfully implemented according to the guidelines established in the 1994 Consultants' Report (1) for a limited number of FAO/IAEA-supported ELISA's. The results of the EQAP rounds indicate that full implementation of the EQAP across the Subprogramme's animal health activities may not be a realistic goal for the immediate future.

The problems encountered in implementation of the EQAP indicate that the established assays, such as the rinderpest cELISA and brucellosis iELISA should form the focus and proving ground for future development of this programme. Once the operating principles for EQAP rounds of these assays are firmly established, they can be applied to other assays, as appropriate.

- 6.2 The design of the FAO/IAEA EQAP for Animal Disease Diagnosis as described in the 1994 Consultants' Report (1) is still appropriate and sound, and the central elements of the programme should be maintained.

The relative importance to FAO/IAEA Recognition of each of the three EQAP elements (questionnaire, IQC data, proficiency rounds) needs to be equalized operationally and clarified with the participants.

The questionnaire should be restructured and simplified to gather information on the general aspects of the laboratory's QM system. It should not force the counterpart to report in ever increasing detail. Rather, it should provoke the counterpart to become aware of the importance of the issues questioned and subsequently include the appropriate detail in the development of his/her quality manual and related documentation.

Standardized formats for SOP's, and work instructions should be developed by staff of the Subprogramme for use by the counterparts. Examples of completed forms would provide helpful guidelines for the counterparts.

- 6.3 The implementation of this programme at an optimum level to meet Subprogramme objectives has been limited by lack of funding and staff resources and overly centralized responsibilities.

The movement towards shared responsibilities between the EQAP Coordinator and relevant Technical Officers should be encouraged and enforced (see Annex 1 for graphic representation of these relationships).

Each FAO/IAEA Technical Officer should receive training in quality assurance principles and practices such that he/she can act as a EQAP quality system "auditor" for EQAP monitoring purposes while on official visits to FAO/IAEA counterpart laboratories.

- 6.4 Training is essential in any quality assurance effort.

FAO/IAEA-sponsored workshops, training courses, and expert services should be used to assist counterparts in the development of their quality systems.

- 6.5 IQC data provides the best measure of routine assay proficiency and maintenance of assay control in the FAO/IAEA EQAP.

The use and documentation of IQC data by counterparts should share equal weight with QM and proficiency testing in evaluating the overall QA level and technical competence of a laboratory.

Standardized formats for control charts should be developed by Subprogramme staff for use by the counterparts. These should include graphic information of the IQC sample data plus space to record the date of test, operator identification, and type of testing (e.g., routine diagnostic samples, reagent QC tests, assay validation, etc.).

- 6.6 It is recognized that the FAO/IAEA EQAP is programmatic in nature, but is also designed to assist counterpart laboratories to bridge the gap between what they have now and formal national or international recognition of QM and technical competence.

The revised definitions and criteria for FAO/IAEA Recognition should be adopted by the Subprogramme and circulated to all relevant parties including the counterparts, their respective ministries, the OIE, the FAO, and other international, regional, and national organizations, as appropriate.

7. CONCLUSIONS AND RECOMMENDATIONS FOR AN INTERNATIONAL VETERINARY DIAGNOSTIC TESTING LABORATORY ACCREDITATION SCHEME.

An internationally harmonized set of principles for the QM of veterinary diagnostic testing laboratories and a process for monitoring compliance with these principles are needed to establish a common ground for understanding and evaluating the reliability of the management, operations, and outputs of these laboratories.

Proposals for “Principles of Quality Management in Veterinary Diagnostic Testing Laboratories” and “Monitoring Compliance with the Principles of Quality Management in Veterinary Diagnostic Testing Laboratories” are appended to this report. These should be forwarded to the Secretariat of the OIE for consideration in the development of an international scheme for veterinary diagnostic laboratory accreditation.

REFERENCES

1. IAEA. Establishment of external quality assurance procedures for use with FAO/IAEA ELISA kits: Report of an FAO/IAEA Consultants Meeting, IAEA, FAO/IAEA Animal Production and Health Subprogramme, Vienna, 12-16 September 1994.
2. IAEA. The External Quality Assurance Programme for use with the FAO/IAEA Rinderpest Competitive ELISA: Interim report 1995. IAEA, FAO/IAEA Animal Production and Health Subprogramme, Vienna, 1996.
3. IAEA. The External Quality Assurance Programme for use with the FAO/IAEA Rinderpest Competitive ELISA: Interim Report (EQAP/RP/1996A). IAEA, FAO/IAEA Animal Production and Health Subprogramme, Vienna, 1997.
4. IAEA. The External Quality Assurance Programme for use with the FAO/IAEA Brucella abortus indirect ELISA: Interim report 1995 BRA/a. IAEA, FAO/IAEA Animal Production and Health Subprogramme, Vienna, 1996.
5. IAEA. The External Quality Assurance Programme for use with the FAO/IAEA Brucella abortus indirect ELISA: Interim Report (EQAP/BRA/1996A). IAEA, FAO/IAEA Animal Production and Health Subprogramme, Vienna, 1997.
6. IAEA. The External Quality Assurance Programme for use with the FAO/IAEA trypanosomosis direct sandwich ELISA for the detection of antigens of *T. brucei*, *T. congolense*, and *T. vivax* (EQAP round 1996 TRYP/a) Interim report 1996. IAEA, FAO/IAEA Animal Production and Health Subprogramme, Vienna, 1997.
7. International Standards Organization (1990). ISO/IEC Guide 25.
8. Organization for Economic Cooperation and Development. OECD Principles of Good Laboratory Practice (1997 revision). OECD, Paris, 1998.

LIST OF PARTICIPANTS

R. Bokma
USDA-APHIS-IS, Operational Support
4700 River Road
Riverdale MD 20737 USA

A. Colling
FAO/IAEA Animal Production Unit
P.O. Box 100
A-1400 Vienna AUSTRIA

K. de Clerq
Veterinary and Agrochemical Research Centre,
Groeselenberg 99,
1180 Ukkel BELGIUM

S. Edwards
Virology Department,
Central Veterinary Laboratory,
New Haw, Addlestone,
Surrey KT15 3NB UK

J. Gilmour
National Association of Testing Authorities (NATA)
7 Leeds Street
Rhodes NSW 2138 AUSTRALIA

T. Helder
Ministry of Health, Welfare and Sport,
Section GLP,
Postbus 5406,
NL-2280 HK Rijswijk NETHERLANDS

J. Hilton
Telos Consulting Ltd.
Suite 38 Beaufort Court,
Admirals Way, Waterside,
London E14 9XL UK

R. Jacobson
College of Veterinary Medicine
Cornell University
P.O. Box 5786
Ithaca New York 14853 USA

M. Jeggo
FAO/IAEA Animal Production and Health Section
P.O. Box 100

A-1400 Vienna AUSTRIA

M. Lelenta
FAO/IAEA Animal Production Unit
P.O. Box 100
A-1400 Vienna AUSTRIA

D. Long
Telos Consulting Ltd.
Suite 38 Beaufort Court,
Admirals Way, Waterside,
London E14 9XL UK

J. Lopez
Centro Panamericano de Fiebre Aftosa
Caixa Postal 589
CEP 20001- 970
Rio de Janeiro BRAZIL

J. Pearson
National Veterinary Services Laboratories,
USDA-APHIS,
PO Box 844,
Ames, IA 50010 USA

M. Robinson
FAO/IAEA Animal Production Unit
P.O. Box 100
A-1400 Vienna AUSTRIA

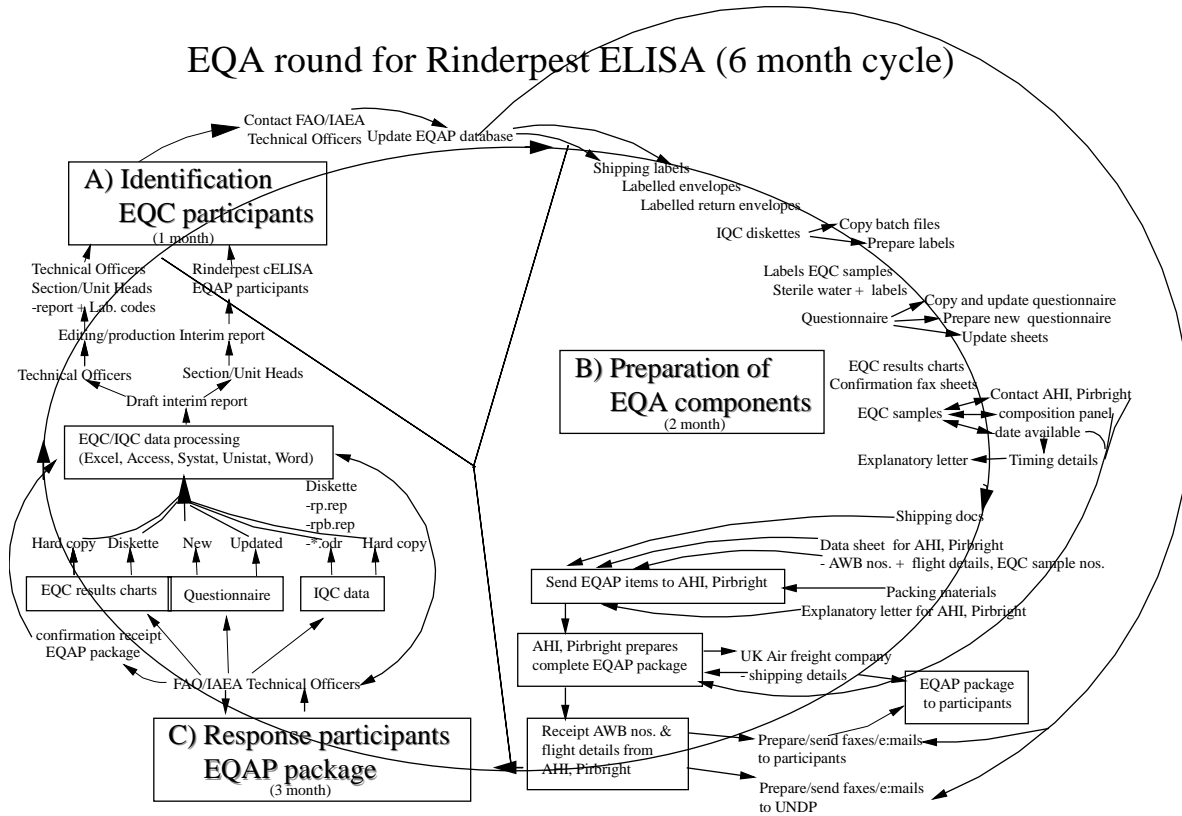
K. Tounkara
Laboratoire Central Vétérinaire du Mali
Departement de Microbiologie Medicale
B.P. 2295
Bamako, MALI

D. Turnheim
Environment Health and Safety Division,
2 rue Andre-Pascal 75775,
Paris SEDEX, FRANCE

OBSERVER

C. Groocock
USDA-APHIS-IS
Boltsmannngasse 16
A-1091 Vienna AUSTRIA

Flowchart of a Rinderpest EQAP Round Illustrating Organizational Interrelationships and Shared Responsibilities



Principles of Quality Management in Veterinary Diagnostic Testing Laboratories

This document describes the quality management principles within which a veterinary diagnostic testing laboratory, seeking to demonstrate sound quality management practices in harmony with those described in ISO/IEC Guide 25 and the OECD Principles of Good Laboratory Practice, should operate. It is applicable to laboratories working in areas such as bacteriology, microbiology, mycology, parasitology, serology, virology and other disciplines of relevance to diagnostic testing for infectious diseases of animals.

Statements in italics are advisory in nature or are provided as examples to the primary body of the text.

1. Organisation and Management

1.1 General

The laboratory should have staff with the competence, authority and time to achieve and maintain administrative and technical control over the assays within the defined scope of operations of the laboratory. Officers providing technical control over these activities should have sound knowledge of the sciences associated with the assays and demonstrated ability to provide the requisite level of supervision over subordinate staff. The ratio of supervising to supervised staff should be adequate at all times to maintain control over operations.

1.2 Organisational Structure

The organisational structure should provide for the functions of general management, technical management and quality management. *Ideally, these functions will be assigned to different staff positions, but limited staff numbers or other circumstances may cause them to be assigned to less than three staff positions..*

The staff structure should be clearly documented. The laboratory quality manual or associated documents should include an organisational chart that illustrates the lines of authority and outlines the duties and responsibilities of each staff position. The position and staff member responsible for quality management, including the laboratory quality documentation, should be identified.

In all cases, the level of supervision or direction required of each officer should be clearly defined and documented. Arrangements should be documented for delegating specific management responsibilities and authorities relevant to all senior staff positions in the case of planned and unplanned absences of those staff members.

The staff should be able to perform tests and associated tasks without undue pressure that might influence their technical judgement. Care should be taken to ensure that staff do not have any conflict of interest with clients. When relevant, the laboratory should have a written policy on disclosure of gifts from clients.

2. Quality system

2.1 General

The laboratory is expected to maintain a quality system appropriate to its size, complexity, and the nature of the work that it undertakes. Laboratory general management should define its commitment to good laboratory practices through a written policy statement, and ensure that the staff understands the objectives of and commitment to these practices.

The laboratory quality manual and associated quality documentation should state the laboratory's mission, policies and operational procedures established in order to meet the requirements specified in this document. A laboratory's quality documentation should include, as a minimum:

- a) a policy statement by senior management specifying the objectives of and commitment to quality management and good laboratory practices;
- b) a quality manual;
- c) procedures for control and maintenance of documentation;
- d) a record of amendments made to controlled documents;
- e) one or more charts showing the staff organization and the laboratory's relations to other operational units;
- f) job descriptions for all staff positions;
- g) identification of staff positions and individuals authorised to sign test documents;
- h) the assay methods used for testing purposes;
- i) arrangements for ensuring that the laboratory accepts only work for which it is competent and has the resources to complete;
- j) details of assay protocols including sampling and sample preparation when relevant;
- k) procedures for handling specimens and other items submitted for testing;
- l) an equipment inventory;
- m) procedures for calibration checks and maintenance of equipment;
- n) documentation of calibration checks and maintenance of equipment;
- o) details of the system for monitoring and documenting the validity of assay methods and tests results;
- p) procedures for corrective action to be taken after detection of test failures and/or departures from documented procedures;
- q) procedures for internal and external audits of the laboratory quality system;
- r) procedures for reviewing the quality system and audits;
- s) procedures for dealing with complaints;
- t) procedures for protecting the confidentiality of clients', their sample results, and other confidential information or proprietary rights;
- u) index(es) of quality documentation.

Guidance on the content of the quality system documentation is provided in each of the following sections of this document.

The quality documentation should be collated primarily within the quality manual, copies of which should be conveniently at the disposal of all relevant staff. Bulky sections should be stored in secondary quality manuals or methods manuals, and cross-referenced in the primary quality manual.

The senior management should ensure that all staff understand and implement the policies and procedures specified in the quality documentation.

3. Document Control

3.1 General

All documentation should be subject to control over its distribution to ensure only the most current version of each document is in use to minimise conflicts and misunderstandings.

Amendments should be controlled in the same way as original documents.

3.2 Method Documentation

Method documentation should be reviewed at least annually. If hand-written amendments are made between formal reviews, the signature of the responsible staff member and date should be recorded next to the amendment.

Method reviews should be documented. Where there are no changes, a date and signature is sufficient indication of review.

Methods no longer in use should be identified as such and archived.

4. Internal Audits

The operation of the laboratory should be audited internally at intervals that ensure continued compliance with the quality system.

All audit and audit review findings should be documented along with corrective actions taken. The officer responsible for quality management should ensure that such corrective action is completed within an agreed time-frame, and that clients whose work may have been affected by non-conformities are notified.

5. Quality Control

The laboratory should have a systematic programme for monitoring the reliability of its results. This program should include participation in relevant proficiency testing programmes.

Statistical techniques should be applied to the design and results of the monitoring programme.

Many factors can influence the frequency with which quality control (QC) is performed. The QC procedures should take these factors into account such that the responsible officer has confidence in the reliability of test results issued.

All new methods should be validated prior to introduction into routine use. The laboratory should conduct and document investigations to demonstrate the laboratory's ability to obtain valid results with a particular method. (*See Section 11.2*)

Where calibration of an assay is required, appropriate material should be used as a calibrator. If the material selected was not produced for use as a calibrator, ascribed calibration values should be substantiated.

The QC samples used should encompass the analytical concentrations encountered (*e.g., low/normal/high, normal/abnormal, positive/negative*) appropriate to the assay and animal species of specimen origin.

Acceptable ranges should be defined for QC samples.

A protocol should be documented for action to be taken in the event QC results fall outside acceptable ranges.

QC results should be recorded and retained for an appropriate period of time, as defined by the quality manager in consultation with the appropriate technical manager.

Details of action taken on unacceptable results should be recorded.

Where more than one assay method or instrument is established in the laboratory to perform a specific test, the correlation or comparability between the results from each method or instrument should be evaluated and documented at defined intervals.

Guidance on QC issues may be sought from the publications of relevant professional societies and other appropriate bodies.

6. Proficiency Testing

The laboratory should participate in proficiency testing programmes appropriate to the range of assays performed and species examined. Where proficiency testing programmes are not available, alternative measures (*e.g. exchange of samples with other laboratories*) should be considered.

On receipt of results from proficiency testing programme organisers, it should be ensured that:

- a) the proficiency testing performance is reviewed and discussed by the technical management and all relevant scientific staff;
- b) the review is documented;
- c) unsatisfactory results and other deficiencies identified by the programme organisers are addressed, with documentation of action(s) taken.

Proficiency test samples should be treated according to the same procedures as routine samples. All relevant staff should have an opportunity to participate in proficiency testing programmes.

7. Management Review

The quality system should be reviewed by management at least once per year. The review should account for internal quality control programmes, the results of the internal and external audits, performance in proficiency tests and the resolution of complaints.

8. Staff

8.1 General

Staff should be appropriately trained and qualified in accordance with their assigned responsibilities and authorities. Supervisory staff should have scientific or professional qualifications in the disciplines relevant to their areas of responsibility. Staff members providing diagnostic interpretations of test results should be professionally qualified with respect to the relevant disciplines. Subordinate staff should be suitably trained and qualified for their assigned functions.

The person responsible for providing technical control over assays should have demonstrable experience with those assays.

Senior management should be responsible for:

- a) approval of operational practices and staffing of the laboratory;
- b) regular review of the laboratory's quality assurance programme and for discussion of all aspects of the laboratory's performance with relevant staff.

The laboratory should have a documented training protocol for staff positions which covers their relevant responsibilities. This should include both initial and periodic refresher training. Management should ensure that relevant staff receive appropriate training in new or altered assay protocols.

Management should ensure that all staff has adequate and equal opportunity for continuing education. This should include in-house and external components, as well as access to appropriate reference texts and journals.

Components of in-house education may include:

- *regular educational presentations*
- *journal article reviews*
- *case presentations*
- *review of proficiency testing educational material*
- *membership and participation in relevant professional societies*
- *attendance at meetings conferences and workshops.*

8.2 Staff Records

Records of the qualifications, training and experience of staff should be maintained as part of the quality documentation.

8.3 Test Report Signatories

Staff designated by laboratory management to sign test reports on behalf of the laboratory should be able to prove through documentation that the tests were performed properly according to approved procedures.

Approved signatories may designate other suitably qualified members of staff to issue test results for specific classes of assays. A list of these designations, including the name of staff and the class of assay should be maintained as part of the quality documentation.

9. Accommodation and Testing Environment.

The laboratory accommodation should provide a testing environment that satisfies the conditions specified in the assay method, provide sufficient space for staff to perform their duties effectively and provide suitable housing for test equipment and records.

Provision should be made for secure storage of samples, documents, files, manuals, equipment, records and reports. Adequate facilities should be provided for performance of clerical and administrative functions and for systematic waste removal and cleaning.

When a test method specifies features of a testing environment, management should be able to demonstrate compliance through documentation with calibrated measuring instruments.

Access to and use of all areas affecting the outcome of tests and the security of information should be defined and controlled.

Testing equipment and standards should not be adversely affected by corrosion, temperature, humidity, vibration, electrical power instability, dust and electromagnetic influences. Specimens and test samples should be protected as appropriate from mechanical damage or contamination.

Separation of procedures from the main work area should be done where:

- a) the procedure may pose a hazard to staff (*e.g. tests involving the use or detection of radioisotopes, mycotoxins, or human pathogens*);
- b) the procedure may be affected or influenced by not being segregated, (*e.g. tissue culture*);
- c) a quiet and uninterrupted work environment is required (*e.g. cytology screening*).

There should be a clear delineation of clean areas (*e.g., areas used for clerical aspects of laboratory work*) and potentially contaminated areas (*e.g., areas used for sample accession, storage, processing and testing*).

A Safety Manual detailing the laboratory's policies and procedures for health and safety should be readily available to all staff, and account for all local workplace safety regulations.

10. Equipment and Reference Materials

10.1 General

The laboratory should have, and maintain in good working order, all measuring instruments, reference standards, reference materials and support equipment required to perform the assays within the laboratory's scope of activities.

Items of equipment that have not been calibrated and those that have been damaged or have been found through documented checks of calibration to be outside of specified limits should be labelled as such and excluded from use in testing procedures.

When equipment outside the permanent control of the laboratory is used for testing purposes, management should ensure that the requirements of this section are met before the commencement of any test involving that equipment.

10.2 Equipment Identification and Inventory

Each item of equipment that is used for routine diagnostic assays should be labelled with a permanent and unique identification that is recorded in an inventory. For each item of equipment, this inventory should include, as a minimum:

- a) the name of the item of equipment;
- b) the manufacturer's name, type identification, and unique identification;
- c) date received and placed in service;
- d) condition when received and placed in service;
- e) location of manufacturer's operating and maintenance instructions;
- f) a summary of the history of maintenance, calibration checks and calibration,
- g) location of maintenance and calibration records.

10.3 Computerised Systems

When computerised systems are used to capture data directly or to control test runs, the laboratory should be able to demonstrate the adequacy of the total system.

Accuracy and speed of reading are the principal contributors to adequacy of equipment. The signal to be discriminated should be matched to the accuracy required throughout the range. The system should accumulate data sufficiently often to ensure that the desired values are recorded and the memory should be able to store the data generated.

Systems should keep the operator informed of the precise stage of the test progress. *In some situations, this may require a display of progressive results to assure the operator that the test is proceeding normally.* Programs should allow for recovery from operator error and other interruption.

Software should be properly maintained. Modified and extended programs should have the basic steps of acceptance testing applied to them. The results of this testing should be recorded and

incorporated in the maintenance history. Software maintenance should include a back-up regime and system recovery plan.

Further information on this subject can be found in the OECD Consensus Document No. 10.

10.4 Measurement, Traceability and Calibration

All testing equipment having an effect on assay accuracy should be calibrated in terms of international standards of measurement (SI units) or their derivatives, and calibration documents should be retained in association with the equipment inventory.

The laboratory should have a mechanism that alerts management when calibration requirements and subsidiary checks are due, indicating the nature of the work required.

There are many such mechanisms available to management to achieve this objective. For example, a system of colour-coded calibration labels bearing expiration dates can be attached directly to instruments and to reference standards or their dedicated containers. Computer-based systems, card systems, wall charts and tables in the laboratory quality manual may be used, also. Whatever system is used, it should be coordinated with the remainder of the equipment inventory.

Materials used as laboratory reference materials should be traceable to national or international standard reference materials.

11. Assay Method Selection and Application

11.1 General

The assay methods used for testing purposes should take into consideration all factors that impact on the relevance of the assay to a specific diagnostic problem, its reliability, its acceptability by the scientific and regulatory communities, and its appropriateness to available laboratory resources. Laboratories should use standardised or harmonised assay methods to the extent possible.

Staff should have convenient access to the current versions of assay methods covering the full scope of the work to be undertaken.

Laboratories using assay methods prepared by national and international standards-setting bodies and other external technical organisations should have a formal system for updating their working copies.

Each assay method should be fully described in the quality documentation in the form of a Standard Operating Procedure (SOP). This should be located in the quality manual or in associated methods manuals. In all cases, the SOP should be identified in the quality manual with, as a minimum, a reference to the location of the full SOP.

Some manufacturers provide method documentation (kit inserts) with their product, and these may be included in methods manuals. Where this information is not sufficiently detailed to cover all required elements of the assay method, it should be supplemented by the laboratory.

SOP's should be followed in detail. In cases where a departure from the SOP is required by circumstances outside the control of the laboratory, and the departure is acceptable to any relevant contractual requirements, details of the departure should be recorded by the assayist and acknowledged by the technical supervisor in the relevant test records and on test documents.

In all cases the laboratory quality manual or a methods manual should contain SOP's that:

- a) provide clear and detailed instructions to operators;
- b) are uniquely identified, bear a date of adoption and are formally approved by a senior member of staff;
- c) refer to the literature or other source and acknowledge any differences;
- d) state any known limitations of the method, such as measurement ranges, possible interferences or environmental factors.

11.2 Assay Selection

Assay selection is dependent upon the facilities and expertise available. The assayist should have documented proficiency in maintaining defined control of the specific assay.

An assay is considered appropriate for compliance purposes only if it has been validated according to the principles outlined in the *OIE Manual of Standards*, Chapter I.3, and other related OIE guidelines. *This means that the assay accuracy, precision, reproducibility, and interpretation of the test result are clearly defined and documented with respect to its use in assayist's laboratory.*

Assay methods should be selected so that they are in harmony with contractual arrangements.

A new assay method should be validated before it is incorporated into the routine testing programme of a laboratory. The same prerequisite applies to an existing SOP that has been modified if the modification affects the performance characteristics of the assay.

Validation data should be retained by the laboratory. (*See Section 3*)

12. Consumables

The laboratory should have documented procedures covering the purchase, acceptance, and storage of consumable materials where the properties of these items can affect the performance characteristics of the assay.

13. Management of Material Submitted for Testing

13.1 General

The laboratory should have a documented system for providing each submitted specimen with a permanent and unique identifier, for providing each test sample derived from a specimen with a linked, but unique identifier, and for linking all relevant records to the specimen and its derived test samples.

13.2 Specimen Labelling

Each specimen container should be labelled with unique identification.

Documentation supporting submission of the specimen should contain, at a minimum:

- a) a record of the unique identification;
- b) the name of owner (or representative);
- c) the name of the submitter (if different);
- d) the date of collection;
- e) the type of specimen

13.3 Specimen Collection, Receipt, Handling, Storage, and Disposal

The laboratory should have documented procedures for collecting, accepting, logging, protecting, retaining and/or discarding specimens and test samples.

Where specimen collection is outside the control of the laboratory, the collector(s) should be advised of the laboratory's requirements for specimen collection as they relate to the specific assay.

These requirements may include:

- a) the type of containers/tubes required for specimen collection*
- b) labelling requirements*
- c) specimen storage requirements (e.g. room temperature vs. refrigeration)*
- d) specimen transport requirements*
- e) requirements with respect to request forms*
- f) provision of relevant clinical information*

The laboratory quality manual or referenced SOP should detail the procedures for the collection and handling of specimens, including those procedures between laboratory receipt and disposal or return of the specimen to the client.

Specimen collection containers should be labelled at the time of specimen collection.

Consumable materials provided by or used in the laboratory for specimen collection purposes, particularly those containing anticoagulant or other labile materials, should be monitored for expiration dates.

Documented specimen receipt procedures should cover:

- a) criteria for acceptance and rejection of submitted specimens;
- b) action to be taken in the event that a submitted specimen is rejected by the laboratory; and
- c) procedures for handling emergency or other high priority specimens.

The date and time of receipt of specimens at the laboratory should be recorded.

Where information concerning the identity, collection method, and/or transport and handling conditions of a submitted specimen is/are in doubt, the staff assigned to specimen reception should consult with the client or submitter to clarify the doubtful information before the specimen is accepted for testing purposes.

When deviations from specimen acceptability criteria are made, a detailed record should be kept of the problem(s) and other information related to such a specimen, including actions taken. All test reports and diagnostic interpretations related to such a specimen should make reference to the deviation from specimen acceptability criteria.

13.4 Specimen Retention

The quality documentation should define the periods and include records for the retention of specimens in accordance with legal and contractual requirements and practical considerations such as the amount of specimen left after testing, the ability to use a specimen for testing purposes at a later date, etc.

13.5 Specimen Referral

A record should be kept of specimens referred for testing to other laboratories.

If the referring laboratory is responsible for ensuring that results of referred tests reach the submitter, records of the results from the referral laboratory and communication of these results to the submitter should be kept. There should be a documented procedure for follow-up of results not received in a timely fashion.

13.6 Sample Care

Appropriate precautions should be taken to protect specimens from damage, corrosion or contamination that would affect test results or reduce the serviceability of the specimen for subsequent use.

Appropriate procedures for protecting the integrity of submitted specimens should be included in the laboratory quality manual.

14. Records

14.1 General

The records system should allow retrieval of all original test data.

The records system should provide a traceable pathway covering all activities from receipt of the sample to its disposal.

Records should be sufficiently legible and detailed to allow a person other than the person performing the original test, to repeat the tests under identical conditions.

The records system should include the following, as a minimum:

- a) sample identification;
- b) test document identification;
- c) identity of the assay method;
- d) identity of the assay equipment;
- e) original test observations and calculations;
- f) identity of the assayist;
- g) an indication that calculations and manual data transfers have been cross-checked;
- h) any other information specified in the assay method, other contractual documents or relevant statutory regulations.

When electronic systems (without direct data capture) are used to store records, original observations may be keyed directly into the system or may be transferred from workbooks or instrument print-outs. In the latter case, the workbooks or print-outs are the original record and hence must be retained. No matter what form the records take, precautions are required to maintain confidentiality and to protect against loss or deterioration. Computer-based systems require special precautions to prevent unauthorised access to and amendment of records.

The raw test data are considered to be the data leading to the reported result. Where test data are automatically downloaded from instruments to a computer database, there should not be any undocumented intermediate data or data conversions leading to the database record.

The records system should include sufficient information (*e.g., batch numbers of reagents, control material, kits etc.*) to allow identification of materials used for individual tests.

Any laboratory record that is related to quality management should be traceable to the originating staff member. *This includes test reports, records of assay conduct and test results, internal quality*

control results, equipment maintenance records, checks of equipment calibration, reviews of participation in quality assurance programmes, etc.

When the execution of an assay method requires the involvement of more than one staff member, the identity of each participating assayist should be recorded.

14.2 Retention of Test Documents

A complete and exact copy of all test documents should be retained in the laboratory archives.

Certain techniques such as photocopying assist in ensuring that copies of reports are complete in every way, including the form of signature, but, when electronic media or carbon copies are used for records, precautions should be taken to ensure that they are complete in every way.

14.3 Corrections and Alterations

Corrections to original test data should be made only by approved signatories or officers to whom an approved signatory has delegated this authority in writing.

When a correction or other alteration is made to a record, the method used to make the correction or other alteration should not obliterate the original data and should link the original and corrected records. The date of the change and the identity of the person making the change should be recorded on the document that is altered.

Calculations and data transfers should be checked systematically, and the procedures for performance of these checks should be recorded on the relevant documents.

Worksheets and workbooks should have a place dedicated for the signature of the checking officer.

Where testing is highly automated and/or routine, or where information is processed electronically, the emphasis should be on checking for errors created by the system, to audit these checks, and to automatic highlighting of results falling outside the expected range.

15. Test Reports

15.1 General

Test reports should provide a clear, unambiguous statement of test results and include appropriate units of measurement and any other information necessary to understand the results.

Test data, results, and diagnostic interpretations should be regarded as confidential between the laboratory and the client except where laws or regulations require specific information to be disclosed to regulatory authorities. The quality documentation should include the laboratory policies on disclosure of information to clients and other parties. Clients should be informed of the laboratory disclosure policies, particularly where submission of specimens for specific tests could result in mandated disclosure of test results to a third party.

15.2 Contents

Test reports should include, as a minimum:

- a) a title;
- b) the name of the laboratory;
- c) the date of issue of the document;

- d) unique identification of the document on each page;
- e) identification of the submitted specimen;
- f) the identity of the assay method and any deviations from it;
- g) the test results and, if appropriate, the diagnostic interpretation;
- h) any other information specified by the assay method or statutory regulation;
- i) a statement of the conditions pertaining to reproduction of the report;
- j) the signature of the designated authority.

Each page of a multi-page document should bear a statement of the page number and the total number of pages.

Other information, such as the condition of the specimen when submitted, the test time, location, date, environmental conditions, test sample preparation procedure, or client's identity may be included. Graphs and other diagrams may be included, as required.

If the report includes data produced by another laboratory, these data should be identified as such.

16. External Resources

Where the laboratory procures outside services or supplies which can affect the assay performance or test results, only those services and supplies shown by documented procedures to comply with specified assay method requirements should be used.

17. Complaints

The quality documentation of the laboratory should contain policies and procedures for the handling and resolution of internal and external complaints. A record should be maintained of all complaints, administrative actions, and resolutions.

When a complaint raises doubts of compliance with the documented policies and procedures of the laboratory, the relevant activities should be audited immediately in accordance with previously defined procedures.

Definition of Terms

Assay	The procedure used to detect an analyte in a specimen or sample.
Assayist	The person that uses the assay for conducting tests.
Sample	The material that is derived from a specimen and is used for testing purposes (may or may not be exclusively of animal origin).
Specimen	The material, exclusively of animal origin, submitted for testing.
Test	The use of an assay to generate a result.

Monitoring Compliance with the “Principles of Quality Management in Veterinary Diagnostic Testing Laboratories

I. General

One of the components necessary to the sustainability of quality assurance in veterinary diagnostic testing laboratories is the monitoring of compliance with the (proposed) *Principles of Quality Management in Veterinary Diagnostic Testing Laboratories*. This monitoring process should address the laboratory’s QA programme in support of, and technical competence with, the particular disease diagnostic assays for which recognition has been requested.

An effective compliance monitoring process is based on the triangular relationship between:

- A. Technical/Scientific guidelines or standards for the performance of the assays, coupled with the appropriate quality control steps;
- B. A quality management system to ensure that the tests are adequately planned, performed, recorded and internally monitored;
- C. A quality management compliance monitoring system operated by a recognized authority.

With such a generic model in mind, a compliance monitoring scheme for veterinary diagnostic testing laboratories is described.

II. Organization

A. Technical/Scientific standards

1. The scientific and technical standards for assays pertaining to the diagnosis of infectious diseases of animals should be set by the Office International Epizooties (OIE).
2. Quality control mechanisms should be intrinsic to the assay method as a measure of assay control.

B. Quality Management System

The OIE should adopt a set of Principles for quality management based upon elements of OECD-GLP and the ISO/IEC Guide 25, supplemented by specific guidelines applicable to veterinary diagnostic testing laboratories. These quality management Principles would become the recommended single standard for the quality management in veterinary diagnostic testing laboratories performing regulatory functions.

C. Compliance Monitoring

1. The OIE should be the seat of authority for the establishment and oversight of the monitoring programme. It should promulgate the standards for bodies which perform the monitoring tasks. A comprehensive set of “*Inspection Guidelines*” should be established by the OIE. These guidelines should be in harmony with the existing guides for ISO audits for Certification or Accreditation and OECD Compliance recognition procedures.
2. The OIE should delegate the practical requirement for monitoring to appropriate international, regional, or national bodies. These bodies should be responsible for the performance of

inspections and the tracking of the status of laboratories. They should report to the OIE in order to assure impartiality and harmonisation.

3. The monitoring process should be self-financing, with full recovery of costs including those for the administrative functions of the monitoring bodies and the OIE. This could be achieved by direct levy from OIE Member States to the OIE based upon the expected number of inspections to be performed in the laboratories of the member country. Alternatively, it is possible to finance the process through direct payment by the laboratory or relevant national body to the appropriate monitoring body designated by the OIE.

4. Travel and per diem costs and consultants fees associated with the inspection process should be based on OIE standards.

5. Monitoring inspectors should be specifically trained for their tasks. The inspectors should be independent of the personnel performing work in the laboratory subject to inspection. The inspectors could be drawn from other intergovernmental organizations with experience in inspection techniques.

6. Agreements relating to mutual acceptance of data between countries should be handled through the auspices of the OIE.

7. Complaints relating to compliance status, inspections, or procedures should be settled by the OIE. Trade disputes related to infectious diseases of animals and compliance recognized veterinary diagnostic testing laboratories should be settled by the WTO.

III. Process

A. General

The monitoring process should include the following:

1. A period for collection of information required for inspection purposes.
2. The appointment of inspector(s) delegated to perform a specific inspection.
3. Agreement by the laboratory to accept the inspectors.
4. A physical inspection of the laboratory facility and quality documentation.
5. An analysis and evaluation (review) of all information relevant to the inspected laboratory.
6. A decision to accept or reject the laboratory's request for compliance recognition.

B. Information Collection

The following information should be provided by the laboratory prior to the on-site inspection:

1. general features of the laboratory such as, name, address, legal status, technical and human resources;
2. general information concerning the activities of the laboratory such as the primary function, relationships to larger entities, government bodies etc.;
3. the list of specific assays for which recognition is requested;
4. details of staff qualifications for persons responsible for the technical validity of test results;
5. description of the internal organisation and quality system used by the laboratory, including the quality manual of the laboratory.

This information should be used for the preparation of the on-site inspection. This information should be treated with appropriate confidentiality.

C. Appointment of Inspectors

The OIE and/or the monitoring bodies should ensure that the inspectors are suitably qualified. In particular, the inspectors should receive training with respect to the (proposed) *OIE Principles for Quality Management in Veterinary Diagnostic Testing Laboratories* and the use of OIE inspection guidelines.

The inspectors shall receive formal delegation. The mandate given to the inspectors shall be clearly defined and made known to the inspected laboratory.

D. Laboratory Agreement

The laboratory should be provided with the name(s) of the qualified inspector(s) delegated to conduct the on-site inspection with sufficient notice to enable the laboratory to object to the appointment of an inspector. Any objections to inspectors should be restricted to issues of impartiality or technical competence and should be settled by the monitoring body prior to the inspection.

E. On-site Inspection

1. The purpose of the site visit is to establish the operational compliance of the laboratory with respect to the *OIE Principles for Quality Management in Veterinary Diagnostic Testing Laboratories*, including the technical competence with respect to the specific assays for which recognition has been requested.

2. The laboratory should be subjected to an on-site inspection by the delegated inspectors. The inspection process should be based on the OIE guidelines for inspections.

3. Site visit inspections should occur on a 24-36 month cycle. The duration of the site visit inspection would depend upon the number and type of assays for which the laboratory has requested recognition.

4. The inspection team should consist of 2 persons. One of the inspectors should be an expert in quality matters, particularly with respect to the *OIE Guidelines for the Quality Management in Veterinary Diagnostic Laboratories*. The second inspector should be an expert in the discipline of veterinary diagnostics, with emphasis on the assay(s) forming the basis for the request for compliance recognition. The quality expert should lead the inspection team.

5. The inspection team should produce a report on the inspection and provide this through the monitoring body to the inspected laboratory within one (1) month following completion of the inspection.

6. The inspected laboratory should reply in writing to the findings and conclusions of the inspection report, particularly any points indicating non-compliance. These comments could include arguments concerning the findings and/or propose remedial actions, and should be provided through the monitoring body to the inspection team within one (1) month of the laboratory's receipt of the inspection report.

7. Disputes concerning the impartiality or competence of the inspectors following the inspection should be resolved by the monitoring body.

F. Review

1. The inspection team should review all information available relating to the laboratory's compliance including the information gathered prior to the inspection, the findings of the inspection, and the replies from the inspected laboratory with respect to the inspection report.

2. The inspection team should make a recommendation about the laboratory's compliance to the relevant monitoring body.

3. On the basis of the review and recommendations of the inspection team, the monitoring body should recommend in writing to the OIE Director General (DG) acceptance or rejection of the request for compliance recognition of the inspected laboratory. This recommendation should be forwarded to the OIE Secretariat within one (1) month of the completion of the review process, along with copies of all documentation related to the review including the findings of the inspection team and any reply from the laboratory.

G. Decision on Compliance Status

1. The decision to accept or reject compliance recognition, or to limit the scope of compliance recognition to less than that originally requested for an inspected laboratory, should be made by the OIE DG, in consultation with the OIE Standards Commission, based on the findings of the inspection, the laboratory's reply, other related documents provided by the monitoring body relating to the review process, and the monitoring body's recommendation. A decision to limit the scope or reject compliance recognition should include the specific documentary evidence leading to such a decision.

2. The decision should be communicated in writing by the OIE DG within one (1) month of receiving the review documentation and recommendation from the monitoring body.

3. A decision to reject the request for compliance recognition or to limit the scope of recognition of a laboratory should include the possibility of a formal appeal by the inspected laboratory limited to consideration of any factual data in dispute.