

REQUIREMENTS FOR AN ACCREDITED VETERINARY MEDICAL DIAGNOSTIC LABORATORY



AMERICAN ASSOCIATION OF VETERINARY
LABORATORY DIAGNOSTICIANS, INC.

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MISSION STATEMENT

The purpose of AAVLD accreditation program is to accredit public veterinary diagnostic laboratories in North America relative to technical and operational competence compatible with appropriate standards, and to provide an administrative assessment.

OBJECTIVES OF THE ACCREDITATION PROGRAM

- To provide a mechanism for objectively accrediting veterinary diagnostic laboratories
- To continuously emphasize the importance of excellence in veterinary diagnostic service
- To periodically evaluate and modify the accreditation process
- To keep laboratories cognizant of current technological advances in diagnostic veterinary medicine
- To keep laboratories informed of the impact of legislative mandates and other regulatory actions
- To promote adequate training of specialists in diagnostic veterinary medicine
- To encourage hiring of dedicated and innovative diagnosticians with appropriate training and experience
- To encourage acquisition and maintenance of facilities suitable and adequate to provide quality services
- To promote appropriate quality system programs
- To assist laboratories to meet or exceed the standards of the World Organization for Animal Health (Office International des Epizooties) (OIE) described in the OIE **Quality Standard and Guidelines for Veterinary Laboratories: Infectious Diseases, 2008**

CLASSIFICATION

- 1.1 There are two types of accreditation: accredited and provisionally accredited.
- 1.2 An accredited laboratory is one that is capable of providing a full range of diagnostic services year-round in a majority of the following essential disciplines: necropsy, histopathology, clinical pathology, bacteriology, virology, mycology, parasitology, serology and toxicology. It is mandatory that a full service laboratory offers necropsy, histopathology, bacteriology, and virology on site. Mechanisms must exist for referral of those services not directly offered by the laboratory. The Accreditation Committee will evaluate the appropriateness of essential services referred to other laboratories.
- 1.3 A provisionally accredited laboratory is one that does not meet the requirements and guidelines but shows intent to do so. A provisionally accredited laboratory is given a period of time to correct the deficiencies noted. Provisionally accredited laboratories are required to document progress through periodic reports.

ADMINISTRATIVE REQUIREMENTS

2.1 Organization, Management and Personnel

- 2.1.1 Diagnostic laboratories reviewed for accreditation may be administered by a State/Provincial Department of Agriculture, a University, an Agricultural Experiment Station, a State/Provincial Department of Health, or by various combinations of such public institutions. The committee does not review commercial laboratories, or laboratory animal diagnostic laboratories supported by the National Institutes of Health.
- 2.1.2 The director/chief administrative officer shall be a veterinarian. The laboratory personnel shall be able to provide competence in all testing groups evaluated for accreditation. Minimum training levels are listed in the section on personnel qualifications in Appendix I.

2.2 Finance and Budget

- 2.2.1 The overall budget will be evaluated on the basis of salaries for personnel, operations, equipment, maintenance, travel, library resources and continuing education. The laboratory shall have sufficient resources to meet the requirements for accreditation as indicated in the support for the various disciplines and the overall administrative function of the laboratory.
- 2.2.2 As diagnostic laboratories are a vital part of disease surveillance and monitoring, finances must be available to sustain these assignments. Since these laboratories serve the public good, surveillance resources are not intended to be self-sufficient financially and require public financial support commensurate with the public good derived.

ACCREDITATION PROCESS

- 3.1 The Accreditation Committee will consider all written applications for an accreditation site visit from qualifying public laboratories, as described in the administrative requirements.

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- 3.2 The Accreditation Committee of the American Association of Veterinary Laboratory Diagnosticians will evaluate each laboratory in terms of the degree to which it meets its own statement of objectives and the established criteria set by the Accreditation Committee.
- 3.3 Each accredited laboratory will be requested to provide an annual update at the time of dues payment that outlines changes in Chief Administrator or administrative structure, or any major changes in personnel, physical facilities, equipment, or budget that could affect accreditation status.
- 3.4 Steps of the Accreditation process:**
 - 3.4.1 Application. Applications are considered confidential by the committee.
 - 3.4.2 Accreditation Committee review of the application. If the status and application of the laboratory is satisfactory, a site visit will be performed.
 - 3.4.3 A site visit will be conducted according to the AAVLD Site Visit and Accreditation Audit Report Guidelines, SOP 102.1.
 - 3.4.4 The site visit team provides written and oral reports and recommendations to the Accreditation Committee.
 - 3.4.5 The committee may make changes to the written report and recommendations, and determines the classification status of the laboratory.
 - 3.4.6 Reports, which are considered as confidential information, are sent to the laboratory director.
- 3.5 Accreditation is time limited. Laboratories are reaccredited periodically through reapplication. Accreditation may be withheld or withdrawn if the laboratory fails to meet the Requirements of the AAVLD Accreditation Committee.

SPECIFIC REQUIREMENTS

AAVLD incorporates by reference the World Organization for Animal Health (Office International des Epizooties) (OIE) document “OIE Quality Standard and Guidelines for Veterinary Laboratories: Infectious Diseases, 2008” from the Standards Commission of the Office International des Epizooties as a guide to specific requirements for accreditation. The entire OIE document is available to member laboratories through OIE. It is acknowledged that not all sections of laboratories conduct testing for infectious diseases. The good laboratory practice principles inherent in the OIE document still apply to those laboratory sections conducting work in areas other than infectious diseases.

4. Management requirements

4.1 Organization and Management

- 4.1.1 The laboratory or the organization of which it is part shall be an entity that can be held legally responsible.

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- 4.1.2 The laboratory shall be organized and shall operate in such a way that it meets the requirements of this Standard whether carrying out work in its permanent facilities, at sites away from its permanent facilities, or in associated temporary or mobile facilities.
- 4.1.3 The laboratory shall have a clearly defined organizational system and structure. This shall be supported with organizational charts and job descriptions. Organizational charts shall indicate key personnel and the laboratory's place within the larger organization. Relationships between management, technical operations, support services, and quality activities shall be specified.
- 4.1.4 The laboratory shall:
- a) have managerial and technical personnel with the authority and resources needed to carry out their duties and to identify the occurrence of departures from the quality system or from the procedures for performing tests, and to initiate actions to prevent or minimize such departures;
 - b) have arrangements to ensure that its management and personnel are free from any undue internal or external commercial, financial and other pressures and influences that may adversely affect the quality of their work;
 - c) have policies and procedures to ensure the protection of its clients' confidential information and proprietary rights, including procedures for protecting the electronic storage and transmission of results;
 - d) have policies and procedures to avoid involvement in any activities that would diminish confidence in its competence, impartiality, judgment or operational integrity;
 - e) specify the responsibility, authority and inter-relationships of all personnel who manage, perform or verify work affecting the quality of the tests;
 - f) provide adequate supervision of testing staff, including trainees, by persons familiar with the tests, their purpose, and the analysis of test results;
 - g) have technical management which has overall responsibility for the technical operations and the provision of the resources needed to ensure the required quality of laboratory operations;
 - h) appoint a member of staff as quality manager (however named) who, irrespective of other duties and responsibilities, shall have defined responsibility and authority for ensuring that the quality system is implemented and followed at all times; the quality manager shall have direct access to the highest level of management at which decisions are made on laboratory policy or resources;
 - i) appoint backups or deputies for key managerial personnel such as the quality manager.

NOTE: In laboratories with a small number of personnel, individuals may have more than one function and it may be impractical to appoint deputies for every function.

4.2 Quality system

- 4.2.1 The laboratory shall establish, implement and maintain a quality system appropriate to the scope of its activities, including the type, range and volume of testing it undertakes.

The laboratory management shall document its policies, systems, programs, procedures and instructions to enable the laboratory to ensure to the extent possible, the quality of the test and diagnostic interpretations it generates. Documentation used in this quality system shall be communicated to, understood by, available to, and implemented by the appropriate personnel.

- 4.2.2 The laboratory management shall define and document the policies and objectives to be achieved by implementing the quality system. The laboratory management shall ensure that these policies and objectives are documented in a quality manual. The overall objectives shall be set out in a quality policy statement in the quality manual, stating the standard of performance to be achieved and maintained. The quality policy statement shall be issued under the authority of the chief executive. It shall include at least the following:
- a) a statement of the laboratory management's intentions with respect to the standard of service it will provide;
 - b) the purpose of the quality system;
 - c) a requirement that all personnel concerned with testing activities within the laboratory familiarize themselves with the quality documentation and implement the policies and procedures in their work;
 - d) the laboratory management's commitment to good professional practice and quality of its diagnostic services to its client; and
 - e) the laboratory management's commitment to compliance with the AAVLD Standard.

NOTE: The quality policy statement and manual should be concise.

- 4.2.3 The quality manual shall include or make reference to the supporting procedures including technical procedures. It shall outline the structure of the documentation used in the quality system. The quality manual shall be maintained up to date.
- 4.2.4 The quality manual shall define the roles and responsibilities of technical management and the quality manager, including their responsibility for ensuring compliance with the AAVLD Standard.

4.3 Document Control

- 4.3.1 The document control system shall ensure that only the current version of the correct document is in use in the laboratory, and that documents needed for staff to perform their work are available at the work location.
- 4.3.2 The laboratory shall have documented policy, procedures, and/or work instructions that describe how laboratory documents affecting the quality of tests, including test methods, are reviewed, approved, issued, updated, revised, amended, retained or archived, and discarded. Procedures shall be reviewed and approved by authorized, qualified staff.
- 4.3.3 Amendments to documents shall be identified clearly in the text and reviewed and approved by an authorized, qualified officer, administrator or supervisor having access to pertinent background information concerning the change.
- 4.3.4 Documents shall be uniquely identified and accurately cross-referenced.

NOTE: In this context “document” means any information or instructions, in any format or medium, that have direct bearing on or affect the quality of test results, and includes not only the quality manual, policy, procedures, and instructions, but also test methods, worksheets, forms, international standards, and regulations.

4.4 Review of request or contract

- 4.4.1 The laboratory shall have documented policy and procedures that describe how the laboratory ensures that it is capable of and has the capacity for doing particular testing. The procedures shall ensure adequate review of the proposed work with laboratory staff and the client. The laboratory shall keep a record of the review and of client agreement.
- 4.4.2 The review shall also cover any work that is subcontracted by the laboratory.

4.5 Subcontracting of test services

The client shall be informed of and agree to any subcontracting of work.

4.6 Purchasing services and supplies

The laboratory shall have a policy and procedures to ensure that services and supplies meet pre-established specifications and will not adversely affect the quality of test results. These procedures shall include a description of the criteria for selection, evaluation, use, handling, and storage of materials and reagents having an effect or potential effect on test results.

4.7 Complaints

The laboratory shall have a policy and procedure for the resolution of complaints received from clients or other parties. Records shall be maintained of all complaints and of the investigations and corrective actions taken by the laboratory.

4.8 Control of nonconforming testing and test results

- 4.8.1 The laboratory shall have a policy and procedures that ensure that nonconforming testing (conditions that exist which have or could adversely affect the reliability of test results) is detected and promptly corrected. The laboratory shall have procedures for informing clients if test results are questionable or incorrect, particularly if this possibility is identified after test results have been reported to the client. These procedures shall describe who has the authority to withhold test results, implement corrective action, and authorize resumption of work.
- 4.8.2 When a serious issue or a risk to the quality of test results is identified, the laboratory shall ensure that appropriate corrective action procedures given in 4.9 shall be promptly implemented.

4.9 Corrective and preventive action

- 4.9.1 The laboratory shall have a policy and procedures for implementing corrective action when nonconforming work or departures from the policies and procedures in the quality system have been identified. The policy and procedures shall ensure:
- a) designation of appropriate authorities responsible for implementation of corrective action(s);
 - b) investigative procedures are implemented to determine the root cause(s) of the problem;
 - c) upon identification, appropriate corrective action(s) are implemented;
 - d) documentation of any required changes to operational procedures;
 - e) once implemented, corrective action(s) are monitored to ensure effectiveness in overcoming the problem; and
 - f) when appropriate, areas of activity subject to corrective action are audited in accordance with 4.11.

NOTE: Special internal audits need only be initiated when a serious issue or risk to the quality of test results or integrity of the quality system has been the subject of corrective action.

- 4.9.2 The laboratory shall identify potential sources of nonconformance and potential needs for improvement, either technical or with the quality system. Preventive action procedures shall include:
- a) identification and evaluation of potential nonconformance or improvement;
 - b) development and implementation of an action plan, including appropriate controls; and
 - c) monitoring of effectiveness in reducing likelihood of nonconformance or in addressing specific needs for improvement.

NOTE: Preventive action is a pro-active process. Identification of specific technical areas requiring preventive action often involves the ongoing monitoring and review of the validity of the test methods and the competence of the laboratory.

4.10 Records

All laboratory records must be maintained in an effective retrieval system and must be accurate, contemporaneous, attributable and legible. This retrieval system should include a system of classification of diseases. Records should be preserved in accordance with requirements for individual jurisdictions.

4.10.1 General

The laboratory shall have a records management system.

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- 4.10.1.1 The laboratory shall establish and maintain procedures for identification, collection, indexing, access, storage, maintenance and disposal of quality and technical records. Quality records shall include reports from internal audits and management reviews, as well as, corrective and preventive action records.
- 4.10.1.2 All records shall be legible and shall be stored and retained in such a way that they are readily retrievable in facilities that provide a suitable environment to prevent damage or deterioration and to prevent loss. Retention times of records shall be established.

NOTE: Records may be in the form of various types of media, such as hard copy or electronic media.

- 4.10.1.3 All records shall be held secure and in confidence.
- 4.10.1.4 The laboratory shall have procedures to protect and back up data and records held on computers at all times, and to prevent unauthorized access to or amendment of data or records on computers.

4.10.2 Technical records

- 4.10.2.1 The laboratory shall retain for a defined period of time, original observations, derived data, calibration records, staff records, a copy of each test report issued, and any other information necessary to recreate the activity. The records for each test shall contain sufficient information to facilitate identification of factors affecting the quality of test results and to enable the test to be repeated under conditions as close as possible to the original. The records shall include the identity of personnel.
- 4.10.2.2 Observations, data and calculation shall be clearly and permanently recorded and identifiable to the specific test at the time they are made.
- 4.10.2.3 When mistakes occur in records, each mistake shall be crossed out (not erased, made illegible nor deleted), and the correct value entered alongside. All such alterations to records shall be dated, signed or initialed by the person making the correction. In the case of computer—collected data, similar measures shall be taken to avoid loss or change of original data.

4.11 Internal audits

- 4.11.1 The laboratory shall periodically and in accordance with a predetermined schedule and procedure conduct internal audits of its activities to verify that its operations continue to comply with the requirements of the quality system and the AAVLD Standard. The internal audit program shall address all elements of the quality system, including testing activities. It is the responsibility of the quality manager to plan and organize audits as required by the schedule and requested by management. Such audits shall be carried out by trained and qualified personnel who are, wherever resources permit, independent of the activity to be audited. Personnel shall not audit their own activities except when it can be demonstrated that an effective audit can be carried out.

NOTE: In laboratories with a small number of personnel, effective internal audits may not be feasible. In such cases, it may be appropriate for two or more laboratories to cooperate in auditing each other.

- 4.11.2 When audit findings cast doubt on the effectiveness of the operations or on the quality of the laboratory's test results, the laboratory shall take timely and effective corrective and where appropriate preventive action, and shall notify clients in writing if investigations show that the laboratory results may have been affected (see 4.8).
- 4.11.3 The area of activity audited, the audit findings and corrective actions that arise from them shall be recorded. The laboratory management shall ensure that these corrective actions are discharged within an appropriate and agreed-upon time-frame.

4.12 Management reviews

- 4.12.1 The quality system and test related activities shall be reviewed by management at least once per year.
- 4.12.2 The laboratory shall have a procedure for performing a Management Review. The review shall take into consideration:
 - a) suitability of policies and procedures;
 - b) reports from managerial and supervisory personnel;
 - c) reports of recent internal audits;
 - d) corrective and preventive actions;
 - e) assessments by external bodies;
 - f) results of inter-laboratory comparisons or proficiency tests;
 - g) changes in the volume and type of work;
 - h) client feedback;
 - i) complaints;
 - j) other relevant factors, such as quality control activities, resources and staff training.
- 4.12.3 Findings from management reviews and the actions that arise from them shall be recorded. The management shall ensure that those actions are discharged within an appropriate and agreed-upon time frame.
- 4.12.4 This review and subsequent activities shall ensure the continuing suitability and effectiveness of the quality management system and shall ensure the introduction of necessary changes and improvements.

5. Technical requirements

5.1 General

- 5.1.1 Many factors can affect the reliability of test results. The extent to which these factors contribute to the reliability of test results differs between tests. The laboratory shall take account of these factors in developing or adopting test methods and related procedures for routine use, in the training and qualification of personnel, in the selection and calibration of equipment, and in the assessment of materials and reagents to be used in testing.

5.2 Personnel

- 5.2.1 The laboratory shall ensure the initial and ongoing competence of all laboratory personnel to do their assigned work.
- 5.2.2 The laboratory shall maintain current job descriptions for managerial, technical and key support personnel involved in testing and diagnostic interpretation, and the management shall authorize only staff who are documented as qualified and competent to do testing and related work.
- 5.2.3 The laboratory shall have a system which ensures the establishment and maintenance of a training program relevant to the present and anticipated needs of the laboratory.

5.3 Accommodation and environmental conditions

All aspects of the physical facilities must provide an appropriate environment for the conduct of the activities of all disciplines required for laboratory accreditation. Laboratories, offices, storage space and animal holding rooms shall be clean, maintained in good repair and be adequate in number and size for intended function of the laboratory. Adequate lighting and ventilation shall be provided. Safety, biosafety, biocontainment, and biosecurity features shall be incorporated as a part of the physical facility.

- 5.3.1 Laboratory facilities for testing, including but not limited to energy sources, lighting and environmental conditions, shall be such as to facilitate correct performance of tests. The laboratory shall ensure that the environment does not invalidate the results or adversely affect the required quality of any testing activity.
- 5.3.2 The laboratory shall monitor, control and record environmental conditions as required by relevant specifications or where they may influence the reliability of the results. Due attention shall be paid, for example, to biological sterility, dust, electromagnetic interference, radiation, humidity, airflow, electrical supply, temperature, and sound and vibration levels, as appropriate to the technical activities concerned. Test activities shall be stopped when the environmental conditions jeopardize the test results.
- 5.3.3 There shall be effective separation between neighboring areas in which there are incompatible activities. Measures shall be taken to prevent cross-contamination.
- 5.3.4 Access to and use of areas affecting test results shall be controlled.
- 5.3.5 The laboratory shall ensure the establishment and maintenance of safety, biosafety, biocontainment and biosecurity programs relevant to present and anticipated needs. The programs will provide staff training and address all necessary elements to ensure a safe work environment.

5.4 Test methods

5.4.1 General

- 5.4.1.1 The laboratory shall use appropriate test methods and related procedures for all animal disease diagnostic testing activities. Consideration shall be given to all factors that impact on the relevance of the test method and test results to a specific diagnostic interpretation or application. These factors include the suitability of the test method, its

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acceptability by the scientific and regulatory communities, its acceptability to the client, and its feasibility given available laboratory resources. See 5.4.3.1 note.

- 5.4.1.2 Test methods shall be approved for use by qualified, authorized personnel, according to established procedures.
- 5.4.1.3 Tests shall be appropriately controlled.
- 5.4.1.4 The laboratory shall have written instructions for all tests and related procedures used in its routine activities, the calibration and operation of all relevant equipment, and the collection, handling, transport and storage of specimens and preparation of samples for testing.
- 5.4.1.5 Laboratories using test methods prepared by national and international standards-setting bodies and other external technical organizations shall have a system to receive updates of these methods in a timely manner.

NOTE: International, regional or national standards or other recognized specifications that contain sufficient and concise information on any of the above subjects do not need to be rewritten as internal procedures if these standards are published in a way that they can be used as published by the operating staff in a laboratory. Consideration may need to be given to providing additional documentation for optional steps in the assay or additional details. As with all test methods, they shall be subject to document control (see 4.3).

5.4.2 Selection of methods

- 5.4.2.1 The client shall be informed of the test method chosen and if required, the laboratory shall provide the client with the rationale used in making this choice (see 5.4.1.1).
- 5.4.2.2 Analysts shall have a record of documented proficiency in the performance of the test. Proficiency shall be documented on an ongoing basis, at appropriate intervals. Assessment of proficiency shall be based on objective data, using blind samples of appropriate number and composition. These samples should be well characterized.
- 5.4.2.3 Test methods shall contain enough critical and descriptive information such that experienced personnel can properly perform the test within pre-established control limits without reference to other information sources. In addition, it shall include as appropriate:
 - a) evidence of document control;
 - b) relevant references;
 - c) a description of intended analyte(s)(e.g., antibody) and any quantities or ranges to be determined (e.g., titer);
 - d) any reference standards or reference materials required (e.g., reference strains, reference standards for antibody);
 - e) a description of the appropriate matrix or specimen for testing, including species (e.g., bovine serum);
 - f) safety considerations, including biocontainment level needed;
 - g) a list of and specifications for equipment, materials, and reagents, including software;
 - h) conditions for acceptance of specimens as fit for testing;

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- i) conditions for specimen identification, collection, handling, transportation and storage;
- j) conditions for sample preparation;
- k) a description of the controls used and their acceptance limits;
- l) checks to be made prior to beginning the test procedure (e.g., equipment checks and calibrations);
- m) acceptance criteria for results;
- n) data to be recorded, and the method of analysis/transformation, presentation, and/or interpretation (e.g., how an absorbance reading is transformed and interpreted as a positive or negative result relative to a cut-off), and recording; and
- o) most current description of the test procedure.

5.4.2.4 The test method shall be validated before it is incorporated into the routine diagnostic activities of the laboratory. The same prerequisite applies to an existing assay that has been modified if the modification affects the performance characteristics of the assay (see 5.4.3).

5.4.3 Validation of test methods

5.4.3.1 A test method, whether an international or national standard method, a harmonized method, or developed in-house shall be considered appropriate for routine diagnostic purposes if it has been validated, where possible according to the principles outlined in the *OIE Manual of Standards for Diagnostic Tests and Vaccines* or other related OIE references. While it is preferred that all methods, developed in-house or drawn from reputable collections of standard methods, undergo an in-house validation using an appropriate number of samples from the population of interest, the user is not required to re-validate international or national standard methods, but shall be able to define, at least through reference to public or private documentation, the analytical sensitivity and specificity, accuracy and precision, diagnostic sensitivity and specificity and other parameters relevant to the use of the test method in the user's laboratory. The user shall provide documented evidence of data on and statistically valid assessment of comparative performance for those assays that are harmonized by interlaboratory comparison to an accepted and validated standard method.

NOTE: Test methods may be classified as "validated for use" by meeting the following criteria.

- 1) Ongoing documentation of internal or inter-laboratory performance using known reference standard(s) for the species and/or diagnostic specimen(s) of interest,

AND one or more of the following:

- 2) Endorsed or published by reputable technical organization (e.g.: *OIE Manual of Standards for Diagnostic Tests and Vaccines*, *US Food and Drug Administration's Bacteriologic Analytic Methods*, *Bergey's Manual of Determinative Bacteriology*, *American Society*

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of Microbiology Manual of Clinical Laboratory Immunology, American Association of Avian Pathologists Isolation and Identification of Avian Pathogens, EPA protocols, American Fisheries Society Bluebook, AOAC, NAHLN);

- 3) Published in a peer-reviewed journal with sufficient documentation to establish diagnostic performance and interpretation of results;
- 4) Documentation of internal or inter-laboratory comparison to an accepted methodology or protocol.

5.4.3.2 Validation data, including all original observations, calculations, equipment monitoring and calibration records, and archived procedures used to formulate performance characteristics, shall be retained by the laboratory for at least as long as the assay is used for diagnostic purposes and for at least seven years after the assay has been retired from use.

NOTE: Depending on client needs, the laboratory may be required to define other diagnostic performance indicators such as positive and negative predictive values of the test. Such indicators may be particularly relevant to certain diagnostic applications or test populations.

5.4.4 Control of data

5.4.4.1 The laboratory shall ensure, using appropriate procedures, that all data resulting from test validation and all data relating to test results is secure, retrievable, and approved for use by specified, qualified personnel.

5.4.4.2 Manual calculations and data transfers shall be subject to appropriate checks in a systematic manner.

5.4.4.3 When computers or automated equipment are used for the acquisition, processing, recording, reporting, storage or retrieval of test data, the laboratory shall ensure that:

- a) computer software, modified or developed by the user, is documented in sufficient detail and suitably validated or otherwise checked as being adequate for use, i.e., the laboratory shall implement and document changes to control procedures such that these activities can be recreated and an audit trail is established;
- b) procedures are established and implemented for protecting the security, integrity, and retrievability of data; such procedures shall include, but not be limited to, integrity and confidentiality of data entry or collection, data storage, data transmission and data processing;
- c) computers and automated equipment are maintained to ensure proper functioning and are provided with the environmental and operating conditions necessary to maintain the integrity of test data.

NOTE: Commercial software in general use within its designed application range may be considered sufficiently validated.

5.5 Equipment

The laboratory shall possess or have access to all equipment necessary for the correct performance of all services. All equipment shall be identified, properly maintained and calibrated with maintenance and calibration procedures documented.

- 5.5.1 The laboratory shall be furnished with all items of test and related equipment required for the correct performance of the tests. In those cases where the laboratory needs to use equipment outside its permanent control, it shall ensure that the requirements of this AAVLD standard are met.
- 5.5.2 Equipment and its software used for diagnostic activities shall be capable of achieving the accuracy required and shall comply with specifications relevant to the procedures concerned. Calibration programs shall be established for key equipment where these properties have a significant effect on the results.
- 5.5.3 Equipment shall be operated by authorized, qualified personnel. Up-to-date instructions on the use and maintenance of equipment (including any relevant manuals provided by the manufacturer of the equipment) shall be readily available for use by the appropriate laboratory personnel.
- 5.5.4 Each item of equipment used for test activities significant to a test result shall be uniquely identified.
- 5.5.5 Records shall be maintained of each item of equipment significant to the tests performed. The records shall include at least the following:
 - a) identity of the item of equipment;
 - b) manufacturer's name, type identification, and serial number or other unique identification;
 - c) verification that equipment complies with the specification;
 - d) the current location, where appropriate;
 - e) the manufacturer's instructions, if available, or reference to their location;
 - f) dates, results and copies of reports and certificates of all calibrations, adjustments, acceptance criteria, and the due date of next calibration;
 - g) maintenance carried out to date, and the maintenance plan;
 - h) damage, malfunction, modification or repair to the equipment.
- 5.5.6 Maintenance procedures shall be established.
- 5.5.7 Equipment calibrations shall be performed by qualified personnel using procedures appropriate to intended use, accuracy and precision required, and at appropriate intervals as historical data indicate.
- 5.5.8 Equipment that has been subjected to overloading or mishandling, or gives suspect results, or has been shown to be defective or outside specified limits, shall be taken out of service, clearly labeled or marked, and appropriately stored until it has been repaired and shown to perform correctly. The laboratory shall examine the effect of the defect or departure from specified limits on previous tests and shall institute the "Control of nonconforming work" procedure (4.8).
- 5.5.9 Whenever practical, all equipment under the control of the laboratory and requiring calibration shall be labeled, coded or otherwise identified to indicate the status of calibration or verification and the date when the next calibration or verification is due.

- 5.5.10 When, for whatever reason, equipment goes outside the direct control of the laboratory, the laboratory shall ensure that the function and calibration status of the equipment are checked and shown to be satisfactory before the equipment is returned to service.
- 5.5.11 Test equipment, including both hardware and software, shall be safeguarded from adjustments that would invalidate the test results.

5.6 Measurement traceability

- 5.6.1 Where indicated and when possible, the laboratory shall have traceability of all measurements, including the calibration of equipment to Standard International (SI) units.
- 5.6.2 Where traceability to SI units of measurement is not possible, the best available means for providing confidence in the results shall be applied, such as:
 - a) the use of suitable reference standards or materials certified to give a reliable characterization of the material;
 - b) mutual-consent standards or methods that are clearly specified and agreed upon by all parties concerned;
 - c) participation in a suitable program of interlaboratory comparisons or proficiency testing.
- 5.6.3 Reference equipment, standards or materials used in conjunction with testing activities shall be handled, maintained, and stored in a manner that ensures proper performance and/or accuracy.
- 5.6.4 Biological reference material shall, where possible, be traceable to accepted international standards or to OIE reference materials (e.g., International Standard Sera).
- 5.6.5 Checks needed to maintain confidence in the status of working standards and reference materials shall be carried out according to defined procedures and schedules.
- 5.6.6 The laboratory shall have procedures for safe handling, transport, storage and use of reference standards and reference materials in order to prevent contamination or deterioration and in order to protect their integrity.

5.7 Specimens

5.7.1 General

The laboratory shall have procedures for the collection of specimens to ensure that they are both appropriate to the test being undertaken and suitable for testing.

NOTE: This applies to veterinary diagnostic laboratories only when the laboratory is directly responsible for specimen collection.

- 5.7.1.1 The laboratory shall have procedures for the collection, processing where indicated and preservation of specimens. Collection and related procedures shall be available at the location where collection is undertaken.
- 5.7.1.2 The laboratory shall have procedures for recording relevant data and operations relating to specimen collection that forms part of the test that is undertaken, whether the collection is performed by laboratory staff or by the client. Records shall include the collection procedure used, identification of the collector, environmental conditions (if

relevant) and diagrams or other means to identify the collection location as necessary (e.g., in the case of tissue specimens) and, if appropriate, the statistics that sampling procedures are based upon.

- 5.7.1.3 When sampling from populations, as appropriate, the laboratory shall have a statistically defined plan for sample collection.

NOTE: While the laboratory may provide relevant scientific and/or statistical input into the development of sampling plans for the testing of animal populations, the development of these plans does not fall within the AAVLD Standard.

5.8 Handling of specimens

- 5.8.1 The laboratory shall have procedures which ensure the integrity of specimens. These shall include transportation, receipt, handling, protection, retention and/or disposal of specimens.
- 5.8.2 The laboratory shall have a system for identifying specimens that ensure no confusion between specimens or derived samples. The identification shall be retained throughout the life of the specimen and its derived samples in the laboratory, and linked to the test report (5.10).
- 5.8.3 Upon receipt of the specimen, any abnormalities or departures from normal or specified conditions, as described in the relevant test method, shall be recorded. If there has been a departure from specifications, then the samples should not be considered fit to test.
- 5.8.4 When there is any doubt as to the suitability of a specimen for testing purposes, or when a specimen does not conform to the description provided, or if the test method required is not specified in sufficient detail, the laboratory shall consult the client for further instructions before proceeding and shall record the facts and results of that discussion.

5.9 Ensuring the quality of test results

The laboratory shall have quality control procedures for monitoring the validity of test results. This monitoring shall be planned and reviewed and may include, but not be limited to, the following:

- a) internal quality control schemes using statistical techniques (e.g., control charts);
- b) where applicable, use of international reference reagents for preparation of national and/or working standards for internal quality control;
- c) when practical, replicate tests using the same or different methods;
- d) correlation of results for different characteristics of a specimen or sample;
- e) re-testing of retained specimens or samples;
- f) participation in interlaboratory comparison or proficiency testing programs.

NOTE: The validity of test results is influenced by both technical competence and assay performance characteristics. If the validity of test results is called into question, it is important to be able to distinguish between the two. A test may demonstrate appropriate process control but poor diagnostic performance or vice versa.

5.10 Reporting test results

- 5.10.1 The results of each test performed by the laboratory shall be reported accurately, clearly, unambiguously and objectively, and in accordance with any specific instructions in the test method or contract.
- 5.10.2 Unless the laboratory has valid reasons for not doing so, each test report shall include at least the following information:
- a) a title (e.g., “Test Report”);
 - b) name and address of laboratory, and, if different, the location where the tests were performed;
 - c) unique identification (see 5.8.2.) at the beginning and on each page of the test report to ensure that the page is recognized as a part of the test report, and a clear identification of the end of the report;
 - d) name and address of the client placing the order;
 - e) description and unambiguous identification of the specimen(s) tested;
 - f) unique identification of the test method(s) used;
 - g) date of receipt of specimen(s) and date(s) of performance of the test where relevant to the validity and application of the results;
 - h) test results;
 - i) reference to specimen collection procedures used by the laboratory or by the client where these are relevant to the validity or application of the results;
 - j) where appropriate and needed, opinions and diagnostic interpretations of the test results;
 - k) the name(s), function(s), and signature(s) or equivalent identification of person(s) authorizing the test report.
- 5.10.3 Where applicable, the test report shall also include:
- a) date of specimen collection;
 - b) unambiguous identification of specimen source;
 - c) location of collection, including any diagrams, sketches or photographs;
 - d) reference to sampling plan used (see 5.7.1.3.);
 - e) details of any environmental condition during collection that may affect the interpretation of the test results;
 - f) identification of the collection procedure or technique.
- 5.10.4 When opinions and diagnostic interpretations are included in the test report, the laboratory shall document the basis upon which the opinions and interpretations have been made.

NOTE: When the results of a battery of tests are considered in formulating an opinion or making a diagnostic interpretation, it may be necessary to describe, for the client, the rationale behind the sequence of testing and the decision making process (e.g., presumptive vs. definitive tests or screening vs. confirmatory tests).

- 5.10.5 When the test report contains results of tests performed by subcontractors, these results shall be clearly identified.

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- 5.10.6 In the case of transmission of test results and/or interpretations by telex, facsimile or other electronic or electromagnetic means, the requirements of the AAVLD Standard shall be met.
- 5.10.7 The report format shall be designed to accommodate each type of test carried out and to minimize the possibility of misunderstanding or misuse.
- 5.10.8 When a battery of tests are to be performed and results reported as available, interim test reports shall be issued to the client. These reports shall indicate tests completed and tests pending. Such reports shall be uniquely identified as interim test reports, shall contain a reference to any and all preceding interim reports and shall meet all the requirements of the AAVLD Standard. Upon completion of all testing, a final test report shall be issued that is uniquely identified and shall contain a reference to any and all interim reports that it replaces.
- 5.10.9 When a material amendment to a test report that has been issued is necessary, a supplement to the test report shall be issued to the client. Such amendments shall be uniquely identified as a supplement, shall contain a reference to the original test report and shall meet all the requirements of the AAVLD Standard.
- 5.10.10 When it is necessary to issue a new test report, it shall be uniquely identified and shall contain a reference to the original that it replaces.

Document Revision Summary

Version 4.3	10/19/09	
	<ul style="list-style-type: none">• Entire document: Removed “Essential” from “Essential Requirements”• Entire document: Added Table of Contents• Objectives of the Accreditation Program, last bullet:<ul style="list-style-type: none">Changed date of OIE document from 2002 to 2008• Section 1.1: Changed “will be” to “are”• Section 1.3:<ul style="list-style-type: none">In the second sentence, changed “shall be” to “is”Last sentence, changed “will be” to “are”• Section 1.4 : Removed section• Section 3.4.1: Removed “The AAVLD Accreditation Application is provided as Attachment 1.”• Specific Requirements:<ul style="list-style-type: none">Changed date of OIE document from 2002 to 2008• Attachment 1: Removed the Application from Requirements and made it a separate document.• Personnel Qualifications: Removed 4th column from table	
Version 5.0	9/14/10	
	<ul style="list-style-type: none">• Entire document: Grammatical corrections• Table of Contents: Added Appendices 1 and 2, corrected page numbers• Section 1.2: Added “year-round” after “a full range of diagnostic services”• Section 5.7.1 Note: Replaced “sample” with “specimen”• Appendix 1, page 3: In * replaced “medical” with “veterinary”• Appendix 2: Added new appendix: Glossary of Terms	

Appendix 1

PERSONNEL QUALIFICATIONS

POSITION	MINIMAL QUALIFICATIONS	PREFERRED QUALIFICATIONS
Director/Chief Administrator	1) DVM*; 2) 2 years experience in diagnostic laboratory medicine; 3) Broad knowledge of laboratory disciplines.	DVM and MS and PhD and Specialty Board Certification; 5 years experience in diagnostic veterinary medicine; management training; Broad knowledge of laboratory disciplines.
Quality Manager	BS** in a biological science related field, + 2 years QA experience.	MS or PhD in a biological science related field, documented advanced QA training, QA certification.
Section Heads		
Pathology	DVM and MS or 2 years residency in pathology.	DVM and PhD; Diplomate ACVP + 5 years experience.
Clinical Pathology	DVM and MS or 2 years residency in clinical pathology.	DVM and PhD; Diplomate ACVP + 5 years experience.
Toxicology	DVM and MS, or relevant PhD, and 3 years experience.	DVM and PhD; Diplomate ABVT + 5 years experience.
Bacteriology	MS degree in microbiology + 2 years, or BS certified Medical Technician + 5 years experience in veterinary diagnostic bacteriology.	DVM and MS or DVM and PhD or PhD; Diplomate ACVM + 5 years experience in veterinary diagnostic bacteriology.

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POSITION	MINIMAL QUALIFICATIONS	PREFERRED QUALIFICATIONS
Virology	MS degree in microbiology and 2 years experience in veterinary diagnostic virology.	DVM and MS or DVM and PhD or PhD; Diplomate ACVM + 5 years experience in veterinary diagnostic virology.
Serology	MS degree in microbiology and 2 years experience in veterinary diagnostic serology.	DVM and MS or DVM and PhD or PhD; Diplomate ACVM + 5 years experience in veterinary diagnostic serology.
Molecular Diagnostics	MS degree in molecular diagnostics + 2 years, or BS certified Medical Technician + 5 years experience in veterinary molecular diagnostics.	DVM and MS or DVM and PhD or PhD + 5 years experience in veterinary molecular diagnostics.
Analytical Chemistry	MS degree in chemistry + 3 years experience, or BS degree in chemistry and 5 years experience.	MS or PhD Board Certified (ABT) + 5 years experience in chemistry.
Professional Staff		
Pathologists	DVM and MS or 2 years residency in pathology.	DVM and PhD; Diplomate ACVP + 5 years experience.
Clinical Pathologists	DVM and MS or 2 years residency in clinical pathology.	DVM and PhD; Diplomate ACVP + 5 years experience.
Diagnosticians	DVM with 2 years experience in diagnostic laboratory medicine.	DVM with advanced training in appropriate discipline and 5 years in diagnostic laboratory medicine.

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POSITION	MINIMAL QUALIFICATIONS	PREFERRED QUALIFICATIONS
Technical/Clerical Staff		
Laboratory Technicians Histotechnology Bacteriology Clinical Path Toxicology Serology Virology Molecular Diagnostics	High school + 2 years experience; or comply with existing state or university policy.	BS/MT/VT/HT/HTL as appropriate and 2 years experience.
Technician Medical Records	High school + 2 years experience or Associates Degree and certification.	BS + 2 years experience and certification.

*Or equivalent /comparable veterinary degree.

**Or equivalent/comparable science degree.

Appendix 2

Glossary of Terms

Accreditation: A process by which an authoritative body (accreditation body) gives formal recognition that an organization or person is competent to carry out specific tasks as outlined in accreditation requirements.

Accuracy: The level of agreement between a test value and the expected value for a reference standard, control, or known activity or titer; closeness to the true value.

Assessment: A process of collecting and analyzing data in a systematic way to determine the compliance of an organization with specific accreditation requirements.

Audit finding: The result(s) of the evaluation between collected audit evidence and audit criteria.

Calibration: The process of adjusting the accuracy of a piece of equipment to a NIST calibrated standard.

Competence: The demonstrated ability to get the correct result by possessing the required skill, knowledge, qualification or capacity.

Continuous improvement: A set of recurring activities that an organization carries out in order to enhance its ability to meet requirements. Some of these activities may include audits, management reviews, corrective and preventive actions, analyzing data and setting objectives.

Control chart: A chart with upper and lower control limits on which values of some statistical measure for a series of samples or subgroups are plotted. Control charts may be used to evaluate shifts and trends within a controlled process (e.g. test method).

Corrective action: The steps taken to reduce or eliminate the cause of an existing nonconformity or other undesirable situation. Corrective actions prevent *recurrence* of nonconformities. See also Preventive Action. Note: An initial correction is the immediate step taken to fix a detected nonconformity or get a process back under control prior to conducting the root cause analysis of a corrective action.

Document: From AAVLD Requirements pg. 23 - “**NOTE:** In this context “document” means any information or instructions, in any format or medium, that have direct bearing on or affect the quality of test results, and includes not only the quality manual, policy, procedures, and instructions, but also test methods, worksheets, forms, international standards, and regulations.”

Effectiveness: The state of having produced a decided on or desired effect. The extent to which planned activities are realized and planned results achieved.

Guideline: A document stating recommendations or suggestions.

Improvement: The positive effect of a process change effort.

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Internal (first party) audit: An on-site inspection of a process or quality system to ensure compliance with specific requirements. The auditors who conduct first party audits are employees of the organization being audited.

Management system: The organizational structure, responsibilities, procedures, processes and resources for implementing policy and achieving objectives.

Management review: An evaluation of the suitability, adequacy, and effectiveness of an organization's quality policy and quality objectives, address resource needs and look for opportunities for improvement.

NIST (National Institute of Standards and Technology): An agency of the U.S. Department of Commerce that develops and promotes measurements, standards and technology.

Nonconformance (noncompliance): The failure to comply with a specified requirement.

Objective evidence: The evidence supporting the existence or verity of something. It may be obtained through observation, measurement, test, or other means.

Policy: An overarching plan (direction), used for the basis of making decisions, and for achieving an organization's goals.

Precision: The aspect of measurement that addresses repeatability or consistency when an identical item is measured several times - precise does not equal accurate.

Preventive action: Action taken to remove the cause of a potential nonconformance or undesirable situation. Preventive actions prevent *occurrence* of nonconformities. See also Corrective Action.

Process: A set of interrelated work activities characterized by a set of specific inputs that make up a procedure for a set of specific outputs.

Process control: The method for keeping a process within accepted boundaries by minimizing variation.

Quality assurance: A planned program consisting of the actions necessary to provide confidence that a test or testing activity conforms to established technical requirements.

Quality control: The operational activities used to ensure that quality standards are being met.

Quality management system: A set of interrelated or interacting elements that organizations use to implement and direct quality planning, quality control, quality assurance, and quality improvement.

Quality manual: A document specifying the quality management system of an organization. A Quality Manual may vary in detail and format in order to suit the size and complexity of an organization.

Quality policy: An organization's general statement of its beliefs about quality, how quality will come about and its expected result. It should define top management's commitment to quality and describe an organization's basic intent.

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Record: Any and all written materials that provide proof of compliance with the quality system and evidence that a specified activity has been performed. They may be in hard copy or electronic form and should be attributable to an individual.

Reliability: The ability of an item to perform a required function under stated conditions for a stated period of time.

Repeatability: The variation in measurements taken by a single person or instrument on the same item and under the same conditions (e.g. running a sample in triplicate).

Reproducibility: The ability of a test or method to be accurately reproduced, or *replicated*. (e.g. running a sample for a given method on two different days or by two different analysts).

Root cause: The initiating reason for the presence of a defect or problem. When removed or corrected, the nonconformance is eliminated.

Root cause analysis: The process of problem solving used to identify the underlying or initiating source of a nonconformance.

Sample: material that is derived from a specimen and used for testing purposes.

Sensitivity (diagnostic): proportion of known infected reference animals that test positive in the assay (infected animals that test negative are considered to have false-negative results).

Specification: The requirements to which a given service must conform, usually stated in a document.

Specificity (diagnostic): proportion of known uninfected reference animals that test negative in an assay (uninfected reference animals that test positive are considered to have false-positive results).

Specimen: material submitted for testing, e.g., carcass, whole blood, serum, and urine.

Trend: The measure of a variable's tendency, over time, to increase, decrease or remain unchanged. It is typically represented graphically or through statistical means.

Traceability: The ability to identify and trace the history, distribution, location, and application of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties.

Validation: The act of confirming, through objective evidence, that the requirements which define an intended use or application have been met. The process through which a test method is confirmed to be fit for the intended purpose.

Verification: The process of comparing the accuracy of a piece of equipment to a NIST calibrated reference standard.