District, state or regional veterinary diagnostic laboratories

H.S. Gosser & L.G. Morehouse

Veterinary Medical Diagnostic Laboratory, University of Missouri, P.O. Box 6623, Columbia, Missouri 65205, United States of America

Summary
The district, regional or state laboratory is the local laboratory to which veterinarian practitioners usually submit samples, and consequently these laboratories are usually the first to observe a suspected disease problem. In most countries, these laboratories are under the jurisdiction of the State or region in which they are located. In the United States of America (USA), most veterinary diagnostic laboratories are State-associated and operate under the aegis of either the State Department of Agriculture or a university. The national laboratory provides reference assistance to the State laboratories. In the USA, the national laboratory (the National Veterinary Services Laboratories) acts as a consultant to confirm difficult diagnoses and administer performance tests for State-associated laboratories.

District, state or regional laboratories need to share information regarding technological advances in diagnostic procedures. This need was met in the USA by the formation of the American Association of Veterinary Laboratory Diagnosticians (AAVLD) in the late 1950s. Another requirement of district, state or regional diagnostic laboratories is a method to confirm quality assurance, which was fulfilled in the USA by an accreditation programme established through the AAVLD. The Accreditation Committee evaluates laboratories (on request) in terms of organisation, personnel, physical facilities and equipment, records, finance and budget. Those laboratories which meet the standards as established in the ‘Essential Requirements for Accreditation’ are given accreditation status, which indicates that they have the expertise and facilities to perform tests on food-producing animals for shipment in national or international commerce and on companion, laboratory or zoo animals. While confidentiality of test records is most important, it is becoming necessary to release certain types of animal disease test information if a country is to participate in the exportation of animals and animal products. As district, state and regional laboratories operate under many different administrative entities (i.e., universities, State governments and the Federal government), various checks at different administrative levels provide safeguards and reduce the possibility of faulty disease reporting.

Keywords
Accreditation – American Association of Veterinary Laboratory Diagnosticians – Diagnosis – Laboratories – Performance testing – Veterinary services.

Introduction
The local diagnostic laboratory is usually the laboratory to which most veterinarians and producers will go first if they are in need of diagnostic testing. These laboratories may be prefecture, provincial, regional, district, departmental, State or university laboratories, are usually supported by tax funds and are often also supported by user fees. In most countries, local diagnostic laboratories report to district, state or regional animal health authorities; however, in a few countries they report to the Federal (or national) government. The laboratory staff of these State laboratories may vary in size from 3 to over
150 people. Such laboratories play a key role in the diagnosis of infectious diseases and will usually be the first to see a suspected problem.

As the authors are most familiar with the veterinary diagnostic laboratory system in the United States of America (USA), this will be used as an example of the local level of laboratory support. The authors believe that the system operated in the USA includes the main components found in many other countries. For simplicity, this laboratory system will be referred to as the State laboratory system in this paper, although the authors are aware that in many countries other names are used for this system.

The veterinary diagnostic laboratory system in the USA today is essentially a consortium of State-associated, university and private (commercial) laboratories that are bound together by State-Federal regulatory rules and national standards set by the national laboratory, the National Veterinary Services Laboratories (NVSL) in Ames, Iowa. The NVSL establishes and monitors quality control on testing procedures involving movement of animals in intrastate, interstate and international trade. The procedures and standards are developed co-operatively by scientists and diagnosticians working under the aegis of Federal and State governments, universities and private commercial laboratories. These activities are developed under the umbrella of the American Association of Veterinary Laboratory Diagnosticians (AAVLD), which attracts its members from the aforementioned entities and whose 22 different committees can draw on the broadest possible range of talent and expertise to be found in the USA, be it from State, Federal government, private or university sources.

Each State has certain responsibilities to its citizens, including the provision of animal health programmes and the monitoring and diagnosis of zoonotic diseases. Therefore, for each State to fulfil its obligations, State-associated laboratories have been developed at which most animal disease diagnostic work and disease monitoring programmes are performed. More than likely, veterinary practitioners and laboratory diagnosticians will be the first to observe and diagnose outbreaks of foreign animal diseases. For the past fifty years, the co-operative agreements between the USA State governments and Federal government have been effective, and with the increase in global commerce, the State-associated laboratories will play an even more important role in testing for infectious diseases in animals destined for exportation and importation.

**History/background**

The history of the development of the veterinary diagnostic laboratory services reflects general developments in veterinary medicine. The following is a history of the development of this service in the USA: the authors believe there was a similar development in other countries. Veterinary diagnostic laboratory services in the USA can be traced to a time before the turn of this century, when responsibility for the laboratory diagnosis of animal diseases of concern to the Federal government often fell to the Pathology Division of the Bureau of Animal Industry (BAI) of the United States Department of Agriculture (USDA). The first pathology laboratory of the BAI was established in 1883, and its Animal Pathology Division was formed in 1891 (2). The laboratory service of this division was expanded in subsequent years to offer diagnostic services to the Meat Inspection Division of the BAI and also to the Inspection and Field Investigation Divisions. The BAI was abolished in 1954, and its responsibilities were delegated to specific Federal agencies (5). The BAI disease control function and many associated diagnostic services were assigned to the Animal and Plant Health Inspection Service, under whose authority the NVSL now functions.

Through the years leading up to (and for a time following) World War II, diagnostic laboratory efforts of the Federal agencies were often limited to those regulatory co-operative programme diseases for which the Federal and State governments had a clearly defined responsibility. A broader range of diagnostic service responsibilities evolved in those States which had statutory responsibility for a wider range of diseases. The laboratory support for this responsibility fell to the State departments of agriculture and to the early colleges of veterinary medicine, or the departments of veterinary science that were their forerunners.

In the 1940s and 1950s, the demand for State and regional diagnostic laboratories continued to grow as farmers and animal owners began to seek assistance in the diagnosis and control of diseases such as rabies, classical swine fever (hog cholera), anthrax and blackleg. Food and working animals were of the most economic importance, and therefore many of the early diagnostic laboratories expended most of their resources in these areas. Also, improved infrastructure, such as paving farm-to-market roads, and the fact that more and more farmers either owned or had access to trucks, made diagnostic laboratories more accessible to many farmers. In addition, there was an increase in the export of meat products: as a consequence, the value of livestock increased and animal owners became more interested in the well-being of their animals (C.S. Roberts, personal communication).

Federal disease control and eradication programmes were another driving force for the development of State-associated laboratories in the USA. Programmes to detect brucellosis and tuberculosis were established, and the Federal and State governments developed co-operative agreements to monitor livestock for these diseases. Typically, the Federal government provided equipment and expendable supplies and the State supplied personnel and facilities for these laboratories, which dealt primarily with serology testing (H.A. McDaniel, personal communication).
These State-associated laboratories (in the USA as well as in other countries) also provided important surveillance for diseases such as foot and mouth disease, contagious bovine pleuropneumonia, bovine babesiosis and New World screwworm infestation; all of these diseases have been eradicated from the USA. As the demand for veterinary services grew, so the need for improved diagnostic capabilities increased. Standardisation of tests, the types of facilities required and the use of qualified personnel became of greater importance if diagnostic credibility was to be maintained. In the mid-1950s, a group of laboratory diagnosticians in the USA met and decided to form a group specifically to address the needs for quality veterinary diagnostic medicine, and thus the AAVLD was formed. The group elected to hold its annual meetings in conjunction with the United States Livestock Sanitary Association.

Organisation

The State animal disease diagnostic laboratory system developed according to the evolution of the laboratories and specific needs of the entity to which they reported. In the USA, laboratories may be administered by a State Department of Agriculture, a university, an agricultural experiment station, a State Department of Health or by various combinations of such institutions. In most countries, local laboratories report to the local animal health authorities. One exception is that in England and Wales the local laboratories (Investigation Centres) report to the national laboratory, the Veterinary Laboratories Agency.

In the USA, local diagnostic laboratories are associated with the State Department of Agriculture or a university. The university-associated State diagnostic laboratory is found rarely in other countries. The association with the State Department of Agriculture is similar to that observed elsewhere. A description of both systems in the USA is given below.

In addition to these tax-supported laboratories there are private laboratories that perform testing on samples from food-producing and companion animals. These laboratories usually do not perform testing to support disease control programmes. The organisation and functions of private laboratories will not be discussed in this paper.

University-associated laboratories in the USA are found in many, but not all, States where veterinary colleges or departments of veterinary science are located, and the primary veterinary animal disease diagnostic laboratory is located in conjunction with the veterinary college, the department of veterinary science or the agricultural experiment station. Historically, animal disease research was conducted at these places and, before formal diagnostic laboratories were formed, farmers brought sick or dead animals to these research laboratories for diagnostic assistance. As the demand for diagnostic assistance increased, separate animal disease diagnostic laboratories were formed. In some States, research laboratories at agricultural experiment stations provided diagnostic services which led to the eventual formation of a diagnostic laboratory.

University-associated diagnostic laboratories are generally housed within the university complex and are staffed by members of the university faculty who are trained in specialised areas including clinical pathology, anatomic pathology, toxicology, bacteriology, virology, endocrinology and epidemiology. Often, faculty members have teaching and research responsibilities in addition to their diagnostic activities, and the laboratory technical staff usually have formal training and participate in continuing education programmes. Funding to support university-associated laboratories is derived from several sources, depending upon each university and laboratory. Funds may be derived through the university, the agricultural experiment station or the State Department of Agriculture, or may be derived directly from the State legislature; many laboratories derive part of their operating budgets from income produced through user fees.

State Departments of Agriculture

These State-associated laboratories in the USA often began as a co-operative agreement between the Federal government and State governments to operate laboratories for serological detection and monitoring of regulatory diseases, especially brucellosis, and for monitoring and diagnosing certain diseases such as anthrax, New World screwworm infestations, tick infestations, babesiosis, classical swine fever (hog cholera), vesicular diseases and other diseases which are threats to livestock. In several States, the State Department of Agriculture has developed separate animal disease diagnostic laboratories which have a diversely trained professional staff that provides animal disease diagnostic support for the animal industry. Most of these laboratories are staffed with pathologists, microbiologists, toxicologists and perhaps other specialists as needed in a particular geographical area. These laboratories in the USA and in many other countries are funded through their State Department of Agriculture, local animal health officials and in some countries by producer groups.

If both a State Department of Agriculture and a university laboratory exist in a given State, they usually serve different geographical areas within that State. Many State Department of Agriculture laboratories utilise both their university laboratories and the NVSL as referral sources and, in some States, the university laboratories may be supported in part by diagnostic service grants or contracts awarded by the relevant State Department of Agriculture.
As Federally mandated/sponsored eradication programmes in the USA for brucellosis and Aujeszky's disease (pseudorabies) are winding down, and tuberculosis, while not eradicated, is certainly less common than thirty or forty years ago, State Departments of Agriculture are diverting funds to other animal disease programmes and in general are broadening their diagnostic capabilities.

**Specialised laboratories**

A few States in the USA have specialised laboratories that support animal industries unique to that State or area, such as poultry or aquaculture. These laboratories have a well-trained professional and technical staff that is aware of specific disease problems in the individual industries.

**Management and laboratory personnel**

Directors of animal diagnostic laboratories are well trained and have considerable experience as well as an intense interest in diagnostic work. Most of the laboratories have a professional staff trained (and often certified) in specialised areas such as pathology, microbiology, toxicology, poultry medicine and epidemiology. The technical staff personnel are well trained and many, especially technical supervisors, have relevant degrees from a college or university. Both professional personnel and technical supervisors are encouraged to attend annual continuing education seminars and conferences. Other countries also have these specialised laboratories.

Administrative attention is a strength of State veterinary diagnostic laboratories. In the USA, university-related laboratories are headed by a director, dean of their veterinary college or the chair of the veterinary science department. When protocol dictates, the State veterinarian — who is often the Federal area veterinarian-in-charge — and the Director of the NVSL may provide guidance. The Federal area veterinarian-in-charge may relate to university laboratories in providing guidance on matters of diseases that have an impact on Federal regulatory programmes. While the State veterinarian has responsibility for regulatory programme diseases at the State level, the Federal area veterinarian-in-charge has responsibility for regulatory programmes on a given multi-State level. Diseases that fall in these categories are often targeted by State-Federal co-operative programmes and the Federal area veterinarian-in-charge is responsible for the Federal component of such a programme.

Administration of the State Department of Agriculture laboratories is provided by the laboratory director, the State veterinarian and the commissioner of the State Department of Agriculture. When necessary, the Federal area veterinarian-in-charge and Director of the NVSL provide input.

Though veterinary diagnostic laboratories operate under many different administrative entities in the USA, i.e., universities, State governments and the Federal government, their reports of disease outbreaks are usually rapid and accurate, and, while the possibility exists for inaccurate or faulty disease reporting, various checks by these entities provide independent levels of administrative oversight that minimise the chance of this occurring and that have worked well to date. In other countries, the mechanisms for interaction between the State diagnostic laboratory and the Federal animal health officials may be different, but in most cases there is a similar disease-reporting relationship.

**American Association of Veterinary Laboratory Diagnosticians**

The AAVLD was developed to meet a need in the USA. (The authors are not aware of any identical organisation in other countries but the need for such an organisation was probably present in other countries and may have been met by a similar but less formal organisation.) This need is reflected in the fact that the AAVLD has members in many different countries. As will be discussed later, the World Association of Veterinary Laboratory Diagnosticians was developed for veterinary laboratory diagnosticians of all countries.

In the USA, the rapidly increasing demand for veterinary laboratory services that evolved in the immediate post-World War II era and into the 1950s was to influence the manner in which these services were delivered. By the early 1950s, the need for standardised methods of arriving at accurate diagnoses became increasingly apparent. Standards for facilities, equipment and training of scientists in diagnostic laboratory medicine were lacking. Rapidly changing livestock and poultry industries and technological advances of the time (i.e., fluorescent antibody procedures, cell culture techniques, advances in analytical chemistry methodology and immunoelectron microscopy, to mention a few), were instrumental in emphasising these needs. It was from this background that the idea of an organisation of veterinary laboratory diagnosticians was formed (4).

In 1957, a group of veterinary diagnosticians met and founded the Conference of Veterinary Laboratory Diagnosticians, whose name was later changed to the American Association of Veterinary Laboratory Diagnosticians. The AAVLD was positioned to fill a unique role in its close working relationship with the United States Livestock Sanitary Association (now United States Animal Health
Association: USAHA), an organisation of State and Federal regulatory officials and representatives of the livestock and poultry industries. Many AAVLD members were drawn from State, Federal, and university laboratories and many of those members held dual membership with the USAHA and served on committees of both organisations. These groups met annually and, out of this relationship, many of the standards for laboratory methodology were developed and recommended for acceptance by the USDA. Objectives or purposes of the AAVLD were established and remain recommended for acceptance by the USDA. Objectives or purposes of the AAVLD were established and remain guidelines for the association today. They are as follows:

a) 'Exchange information on diagnostic techniques used by different laboratories.' During the past forty years, scientists from laboratories across the USA and from other countries have given over 1,300 scientific presentations at national meetings. Information is also disseminated through a peer-reviewed international journal, the *Journal of Veterinary Diagnostic Investigation*, published by the AAVLD, and through proceedings, abstracts and newsletters. In recent years, data generated in diagnostic laboratories have been represented in the USDA/Animal and Plant Health Inspection Service publication, the *Dx Monitor*. The *Journal of Veterinary Diagnostic Investigation* now has a world-wide distribution.

b) 'Development of uniform methods and means of arriving at an accurate diagnosis'.

c) 'Standardisation of diagnostic methods with allowance for differentiation between a practical or tentative diagnosis and an accurate fully proven diagnosis.' These objectives have been - and will continue to be - moving targets, and will remain amongst the major responsibilities of this organisation as it continues its important role of consultation to USAHA and USDA. Nonetheless, the work of the AAVLD committees on procedures for laboratory diagnosis of diseases of livestock, poultry, companion animals, wildlife, aquatic animals and laboratory animals is well documented in newsletters, proceedings, abstracts and the *Journal of Veterinary Diagnostic Investigation*, as well as in a number of separate publications or monographs.

d) 'Exchange of information on administrative problems and the solutions used by different laboratories.' At the annual AAVLD meeting, the Laboratory Administrators meet as a group and review various laboratory business topics. Information reporting, waste disposal, laboratory safety, standardisation of laboratory methods, qualifications for laboratory technicians and the use of computers for database management are examples of subjects considered.

e) 'Collection and distribution of information from each laboratory regarding their strengths or special facilities and experiences in the diagnosis of certain diseases.' Distribution of information is needed regarding the specific strengths or special abilities of given laboratories for diagnosis of certain animal diseases or identification of selected infectious diseases, parasites or toxins, i.e., who can do it best at the least cost? Within certain groups or disciplines in the AAVLD, such as the Analytical Toxicology Advisory Committee, the Serology Committee or the Pathology Committee, means to employ referral of specimens, second opinions on test results, check tests and the sharing of information have been determined. This 'alliance' or sharing of technology and expertise greatly enhances laboratory services through both credibility of test results and cost savings.

f) 'Establish standards for facilities and equipment which could be considered adequate for satisfactory operation of diagnostic service laboratories.'

g) 'Establish standards of education and training qualifications for laboratory personnel.' These objectives were carried out in the early 1970s with the formation of a Veterinary Laboratory Accreditation Committee which was composed of AAVLD members from all regions of the USA.

The AAVLD has met jointly with the USAHA for the past forty years, and has presented its own independent scientific programme which has dealt specifically with the diagnosis of animal diseases. In 1997, the AAVLD comprised 950 members from 32 countries around the world.

**American Association of Veterinary Laboratory Diagnosticians accreditation**

In the 1970s, the AAVLD saw the need to establish what would now be referred to as a quality assurance programme. Parts of this accreditation programme are currently in use in other countries to help ensure that the test results obtained at State veterinary diagnostic laboratories are valid. This programme has had a significant impact on the development of diagnostic laboratories in the USA, with more than 36 accredited laboratories in the programme today. More than 200 laboratories in the USA are listed in the USDA Directory of Diagnostic Laboratories; however, many of these laboratories would not fit the requirements of an accredited, comprehensive, full-service, all-species AAVLD laboratory. Many such laboratories are species-specific laboratories, i.e. poultry, aquatic, wildlife, etc., or are limited in other ways, for example, the range of diagnostic tests performed, (i.e., clinical chemistry, serology, etc.). However, this does not infer that the specialised activities in which they are engaged are not performed in a prompt and competent manner.

In the 1970s and 1980s, at least eighteen new veterinary laboratories were built and accredited along guidelines recommended by the AAVLD through its accreditation programme, and three have been built in the 1990s so far (4). Other laboratories have made major changes in physical facilities and equipment, and have upgraded the training of personnel to fulfill standards for accreditation. The Accreditation Committee has published a booklet entitled 'Essential Requirements for an Accredited Veterinary Medical
Diagnostic Laboratory' which defines the qualities to be met before a laboratory can become accredited (1). The fully accredited, full-service veterinary medical diagnostic laboratory must meet standards for physical facilities and equipment as well as expertise in the disciplines of pathology, parasitology, bacteriology, virology, serology and toxicology. These laboratories have expertise for dealing with all species, whether it be monitoring the health of food-producing animals for shipment in national or international commerce or working with companion animals, laboratory animals or zoo animals. The goals and philosophy of the Accreditation Committee include the following:

a) to provide a mechanism for objectively accrediting diagnostic laboratories and subsequent evaluation of accredited laboratories on a periodic basis so that they maintain accreditation

b) to continuously emphasise the importance of excellence in veterinary diagnostic service to the public

c) to evaluate and modify the accreditation process periodically to increase the quality assurance and the efficiency and effectiveness of veterinary diagnostic laboratories

d) to maintain cognisance of current technological advances in diagnostic veterinary medicine and the impact of legislative mandates and other regulatory actions on laboratory testing and on the intrastate, interstate and international movement of animals

e) to promote adequate training of specialists whose services are an integral part of diagnostic laboratories

f) to encourage innovative approaches to veterinary diagnostic medicine, including techniques, equipment and facilities

g) to encourage administrators of diagnostic laboratories to acquire diagnosticians with appropriate training and experience who are dedicated and innovative in accomplishing the goal of providing vigilant, accessible and accountable veterinary diagnostic service to the public

h) to encourage administrators of diagnostic laboratories to acquire facilities suitable and adequate to provide the services requested and provide a pleasant and safe workplace for all employees

i) to encourage and require appropriate quality assurance and quality control documentation of activities (1).

During the accreditation review of a laboratory by the Accreditation Committee, the Committee examines the following essential requirements to determine whether the laboratory complies with the regulations and is qualified to be accredited (1):

- organisation
- personnel
- physical facilities and equipment

- records
- finance and budget.

Although the accreditation process does not guarantee valid results for any given laboratory test, it does imply that this particular laboratory has the personnel, facilities, equipment and quality assurance programmes in place to perform creditable testing. The frequency and depth of on-site visits following initial accreditation will be carried out as circumstances indicate, but at no less than five-year intervals, at which time they may be fully reaccredited, provisionally reaccredited or accreditation may be withdrawn. In some instances, laboratories may be visited as often as annually by members of a national AAVLD Accreditation Committee. These committees are guided by factors such as NVSL test scores, in-house quality assurance, qualification of personnel, facilities and instrumentation. In addition, most accredited laboratories exchange specimens with other laboratories for comparative analyses, primarily serology and chemistry at this time. A very important aspect of the accreditation process is that through the years, the Accreditation Committee has worked with numerous unaccredited laboratories to elevate them to accredited status. In some instances, this process has taken several years due to budgetary constraints; however, the quality of veterinary diagnostic testing has been markedly elevated in many laboratories across the USA because of their desire to become accredited.

The World Association of Veterinary Laboratory Diagnosticians

Although the goal was not specifically listed in the original objectives of those who first envisioned the AAVLD, the Association has been instrumental in founding the World Association of Veterinary Laboratory Diagnosticians (WAVLD), whose aims are to disseminate diagnostic laboratory information, to discuss new techniques and procedures, to assist in whatever way possible with development of high-standard, full-service laboratories in the many countries of the world, and to encourage and promote international symposia for veterinary laboratory diagnosticians.

The Office International des Epizooties (OIE) has contributed significantly to the success of the WAVLD. An officer of the OIE serves as a member of the WAVLD Board of Directors. The OIE served as co-host for the Vth International Symposium of WAVLD in Lyons, France. A document entitled 'Harmonisation of Laboratory Techniques' was prepared following the WAVLD Vth International Symposium in Buenos Aires in November 1994 and was presented in an OIE/Grupo Interamericano de Coordinación en Salud Animal (GICSA) meeting in Lima, Peru, in 1995. This document was then prepared as a laboratory guide and was distributed by the Food and Agriculture Organisation to various countries.
Partnership with the Federal laboratories

There is a need for a high level of co-operation between State diagnostic laboratories and Federal laboratories in every country. In the USA, this co-operation has characterised their relationship since laboratories were formed, many of which began through Federal-State co-operative agreements. The NVSL has been a consultant and confirmatory resource for unusual diseases are diagnosed which pose a threat to either laboratories. When foreign or unusual diseases are diagnosed which pose a threat to either the livestock or poultry industries, the NVSL takes an active role and Federal animal health officials relegate special task forces to control and eradicate the diseases.

Historically (and still today), co-operative arrangements have existed between the USDA and agricultural experiment stations, departments of veterinary science and colleges of veterinary medicine to study animal diseases and to develop diagnostic tests and disease prevention measures. In other countries, similar arrangements have developed between the Federal government and State diagnostic laboratories. Brucellosis, equine infectious anaemia, coccidiosis, bluetongue, salmonellosis, Aujezsky's disease, transmissible gastroenteritis of swine, scrapie, contagious equine metritis and porcine reproductive and respiratory syndrome (PRRS) are just some of the infectious diseases studied co-operatively with the USDA and university research groups, including laboratory diagnosticians. Often, the diagnosticians are the first to recognise emerging diseases, as was the case when canine parvovirus enteritis was first recognised in the late 1970s and PRRS in the late 1980s, and many of these diagnosticians have been actively involved in research into emerging diseases.

Performance tests for regulatory and other important, highly transmissible diseases are administered annually in the USA by the NVSL, to determine which State laboratories have the personnel and facilities to credibly perform certain diagnostic tests necessary for the interstate and international movement of livestock, birds and wildlife. Similar quality assurance programmes have been established by some other countries to ensure that regulatory testing results are valid. However, in some countries this testing is limited to the Federal laboratories.

In the USA, co-operative efforts are close between the State-associated laboratories and special Federal laboratories such as the National Fisheries Laboratories (which is operated by the United States Fish and Wildlife Service) and the National Wildlife Laboratories (affiliated with the United States National Biological Survey). Often, samples are received by State-associated laboratories which are then referred to the appropriate Federal laboratory. Also, the Southeastern Co-operative Wildlife Disease Study in Athens, Georgia, is used as a reference laboratory for diseases which occur in native wildlife.

Confidentiality

Traditionally, veterinary medical diagnostic laboratories have operated under the confidentiality guidelines used by other professional services, including medical and legal services, i.e., access to laboratory records is limited to those within the laboratory personnel-referring veterinarian-owner(agent) relationship. In the USA and many other countries, individuals wanting access to laboratory records must present a legal order before being allowed to view or have copies of records. This procedure has served laboratories well during the years as individual client information was protected, although anonymous test results and diagnoses were often released as part of monthly or annual reports.

With expanding global commerce and the signing of multi-nation trade agreements, and especially with the process of regionalisation, it is becoming necessary to release certain types of animal disease test information in order to participate in exportation of animals and animal products. Protocols to release information about the presence of certain diseases have been established, and within the USA information is reported to the State veterinarian, who then prepares a report which is made available to the USDA and countries that require this information. To meet World Trade Organisation requirements, similar programmes are being set up in other countries.

Reporting formats and interpretation of test results

Timely reporting of test results has always been a priority for diagnostic laboratories. At present, most diagnostic laboratories have computerised databases which greatly facilitate reporting procedures. Also, many laboratory instruments, such as automated enzyme-linked immunosorbent assay readers, are interfaced with computers and test results do not have to be entered manually into computers.

Once test results have been completed, they can be reported in a variety of ways, depending on the urgency of the reports. Telephone calls regarding test results are used if speed is crucial or if explanation is necessary to the submitting veterinarian. Many computers are programmed to automatically fax results as soon as the test data are complete; this method is equally as fast, if not faster in most instances, than reporting by telephone. Manual faxing is used by many
laboratories, especially if individual reports must be signed by a supervisor. Finally, the postal service is commonly used to send reports.

To address the subject of interpretation of test results, the AAVLD Serology Committee meets at annual AAVLD meetings and considers such topics as guidelines for serology interpretations, continuous quality improvement and the establishment of sensitivity, specificity and predictive values for many serological tests. At present in the USA, interpretation of laboratory tests is left up to individual laboratories and the personnel performing the tests. Each test interpretation depends on the judgement of skilled staff, and as some test results are subjective, there can be slight differences of interpretation among various laboratories (3). To minimise differences which may vary from laboratory to laboratory, staff are encouraged to follow OIE guidelines and NVSL protocols where applicable; also, scientific papers which discuss test methodologies and interpretation of results are published in the *Journal of Veterinary Diagnostic Investigation* and other peer-reviewed journals. These publications also provide additional reference information.

The NVSL performance tests, which are conducted annually with participating laboratories, also help to establish uniform performance and interpretation of tests. Before test results will be accepted for regulatory purposes, participating laboratories must demonstrate their ability to perform tests according to set standards. Also, the AAVLD Serology Committee distributes panels of tests for diseases other than those included in the NVSL performance tests to interested laboratories. While there are no 'pass or fail' criteria for these tests, individual laboratories can compare their results with those of other laboratories (3).

**Trends**

While veterinary diagnostic medicine has improved during the past thirty years as a result of new technologies and methodologies, better facilities and more highly trained personnel, the attention of laboratories has usually been focused on the single animal, i.e., defining the problem, determining the most effective course of treatment and preventing reoccurrence of the disease. The trend toward larger farms de-emphasises the individual animal, and instead gathers information regarding the entire herd, flock or farm. This is often referred to as 'population medicine.' The use of computers to manage large databases, as are often generated in diagnostic laboratories, enables diagnosticians to track information from individual farms and regions, and to assess the information with respect to disease trends, emerging diseases and similar data. Computers can also display this information in easily readable and easily interpreted charts, graphs and similar presentations. In the future, epidemiologists should play a larger role in the evaluation of disease problems and interpretation of laboratory tests as they pertain to the entire herd, flock or farm, and not just to individual animals. In fact, many laboratories in the USA currently either have, or are planning to employ, an epidemiologist on their staff.

Veterinary diagnostic laboratories continue to meet new challenges in the animal industry, such as the recent popularity of llamas, ratites and potbellied pigs and attempts to domesticate certain wild animals, including the American bison, elk and deer. Likewise, more attention is being placed on aquaculture as this industry expands to meet consumer demands. As the public raises expectations regarding the validity of medical tests, so too will State veterinary medical diagnostic laboratories be expected to improve quality assurance programmes. Immunohistochemistry techniques to identify many infectious agents, as well as neoplasms, the polymerase chain reaction for amplification of minute amounts of DNA, DNA sequencing and recombination techniques for fingerprinting of infectious agents, and advances in analytical techniques and instrumentation for greater specificity and sensitivity are examples of this trend.

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**Laboratoires vétérinaires de diagnostic au niveau du district, de la région et de l'État fédéré**

H.S. Gosser & L.G. Morehouse

**Résumé**

Les laboratoires de district, de région ou d'État sont des établissements de proximité auxquels les vétérinaires praticiens admettent habituellement leurs prélèvements ; ces laboratoires sont donc les premiers à découvrir un problème sanitaire. Dans la plupart des pays, ces laboratoires relèvent de l'État fédéré ou
dédiés à la région dans lesquels ils sont situés. Aux États-Unis d’Amérique, la plupart des laboratoires vétérinaires de diagnostic sont associés à l’État fédéré et travaillent sous l’autorité du Département de l’agriculture de l’État fédéré ou bien d’une université. Le laboratoire national impose ses normes de référence aux laboratoires de chaque État fédéré. Dans ce même pays, le laboratoire national (National Veterinary Services Laboratories) est appelé à confirmer les diagnostics difficiles et à évaluer la performance des laboratoires associés à l’État fédéré.

Les laboratoires de district, d’État fédéré ou de région doivent échanger des informations sur les progrès technologiques en matière de diagnostic. C’est pour répondre à ce besoin qu’a été créée, à la fin des années 1950, l’Association américaine des laboratoires vétérinaires de diagnostic (American Association of Veterinary Laboratory Diagnosticians : AAIVLD). Il fallait également une méthode pour évaluer la conformité de ces laboratoires aux exigences d’assurance qualité ; l’AAIVLD a ainsi mis en œuvre un programme d’accréditation. Le comité d’accréditation évalue ces établissements (sur demande) sur le plan de l’organisation, du personnel, des installations et des matériels, ainsi que de la tenue des registres, de la gestion financière et du budget. Ceux qui satisfont aux normes définies (Essential Requirements for Accreditation), reçoivent le statut de laboratoire accrédité, reconnaissant leur compétence et leur capacité pour procéder à des analyses concernant les animaux de boucherie avant leur départ de l’élevage ou leur exportation, ainsi que les animaux de compagnie, de laboratoire ou de parc zoologique. Certes, la confidentialité des résultats des épreuves est de la plus haute importance, mais il est indispensable de rendre publics certains types d’informations sur les épreuves effectuées lorsqu’un pays entend exporter des animaux et des produits d’origine animale. Comme les laboratoires de district, d’État fédéré et de région relèvent de différentes entités administratives (universités, gouvernements d’État fédéré et gouvernement fédéral), des contrôles sont effectués à plusieurs niveaux, ce qui constitue autant de garanties et réduit le risque d’erreurs dans les déclarations.

**Mots-clés**


Laboratorios veterinarios de diagnóstico municipales, regionales o estatales

H.S. Gosser & L.G. Morehouse

**Resumen**

El laboratorio municipal, regional o estatal es el laboratorio de ámbito local al que los veterinarios suelen enviar sus muestras. Por tal razón, esos laboratorios son en general los primeros en observar la existencia de un posible problema sanitario. En la mayoría de los países, dichos laboratorios están bajo la jurisdicción del estado o región en el que se encuentren. En los Estados Unidos de América, muchos laboratorios veterinarios de diagnóstico están asociados al estado y adscritos al Departamento de Agricultura del estado o a una universidad. El laboratorio nacional presta asistencia a los laboratorios de estado, proporcionándoles sobre todo materiales de referencia. En Estados Unidos, el laboratorio nacional (National Veterinary Services Laboratories) ejerce de
consultor a la hora de confirmar diagnósticos de especial dificultad y ejecuta pruebas de evaluación del funcionamiento para los laboratorios asociados al estado.

Es necesario que los laboratorios municipales, regionales o estatales compartan información sobre los progresos técnicos que tienen lugar en el campo de los protocolos de diagnóstico. En Estados Unidos se dio respuesta a esa necesidad mediante la creación de la Asociación Americana de Técnicos de Laboratorio Veterinario de Diagnóstico (American Association of Veterinary Laboratory Diagnosticians: AAVLD) a finales de los años 1950. Los laboratorios municipales, regionales o estatales están obligados asimismo a disponer de un método que les permita confirmar la garantía de calidad, exigencia que se vio satisfecha en Estados Unidos gracias a un programa de acreditaciones creado a través de la AAVLD. Previa solicitud del laboratorio interesado, el Comité de Acreditaciones evalúa la organización, el personal, las instalaciones, el material, los registros, la financiación y el presupuesto del establecimiento en cuestión. Los laboratorios que se ajustan a las normas establecidas en los «Requisitos Esenciales de Acreditación» acceden a la categoría de establecimiento acreditado, lo que significa que poseen los conocimientos e instalaciones necesarios para realizar pruebas sobre el ganado antes de su traslado nacional o internacional, y sobre los animales de compañía, de laboratorio o de zoológico. Aunque el respeto a la confidencialidad de los registros de pruebas reviste la mayor importancia, es cada vez más necesario que un país dé a conocer ciertos datos sobre pruebas de diagnóstico zoosanitario si desea poder exportar animales o productos de origen animal. El hecho de que los laboratorios municipales, regionales o estatales trabajen adscritos a entidades administrativas de muy diversa índole (universidades, gobiernos estatales o Gobierno Federal) facilita la realización de controles a distintos niveles administrativos, lo que a su vez ofrece mayores garantías y reduce la posibilidad de error a la hora de comunicar resultados.

**Palabras clave**

**References**


