

Veterinary laboratories revisited



Tim Jagger

Tim Jagger looks at how veterinary laboratory services have developed over the past 14 years, and how they are being integrated in practice.

Tim Jagger qualified from the University of Edinburgh in 1985. He gained practical experience in mixed practice in the UK and Southern Africa before completing an MSc in tropical veterinary science. He has worked as a veterinary clinical pathologist since 1994 and was awarded a fellowship of the Royal College of Pathologists in veterinary clinical pathology in 2009. He joined IDEXX laboratories in 2003 and reports on haematology, clinical chemistry, endocrinology, cytology and microbiology cases.

IN 1999, in an article in *In Practice*, I compared the advantages and disadvantages of external and in-house laboratories for conducting diagnostic testing (Jagger 1999). Since then a lot has changed. In the intervening 14 years, the comparison between external and in-house laboratories has become largely redundant, with practice laboratories having become much more sophisticated and reliable. External laboratories, particularly commercial laboratories, continue to offer a cost-effective alternative to in-house testing, but have increasingly taken on the role of reference laboratories, with improved integration with practice laboratory services. Commercial laboratories have also undergone a quiet revolution, with better turnaround times and a reduced reliance on postal collections. This article highlights some of these changes, leaning heavily on the author's experience in a commercial laboratory.

Types of services

External laboratories can largely be categorised into:

- Laboratories offering a single discipline for a number of animal species (eg, histology, endocrinology, virology, molecular diagnostics);
- Laboratories offering a complete range of disciplines for a single species (eg, pigs, poultry, horses);
- Laboratories offering a complete range of disciplines for a number of animal species.

Most tests are performed on-site by the external laboratory but some tests are subcontracted to other laboratories. Examples of tests that are subcontracted out include those that are rarely requested (not economical to perform on-site) and those that are better performed in speciality laboratories (eg, serological testing for *Myasthenia gravis* at the Comparative Neuromuscular laboratory, UCSD). A speciality laboratory may belong to the same company as the external laboratory (an example in my company is the subcontracting of diagnostic and genetic testing to the IDEXX Molecular Diagnostic Laboratory in Ludwigsburg, Germany).

A responsible external laboratory will indicate in its directory of services which tests are subcontracted to other laboratories in the UK and abroad (commonly termed 'referral tests'). These tests will fall outside the accreditation of the external laboratory and turnaround times are typically longer than for on-site tests.

Generally speaking, the convenience to a practice of submitting samples to one external laboratory, often for a diverse collection of tests, outweighs the advantages in turnaround time achieved by submitting samples directly to multiple speciality laboratories.

Integration with practice laboratories

Effective integration with practice laboratory services is a challenge but one which is being met increasingly by the commercial laboratories. Integration may take the form of:

- Telephone consultations for practice laboratory results;
- Discounted follow-up testing;
- Free or discounted continuing professional development (CPD);
- External quality assessment (EQA) schemes.

Telephone consults may be restricted to advice on the interpretation of results and recommendations for further testing by veterinary clinical pathologists. However, the increasing availability of internal medicine specialists has led to the development of comprehensive consulting services with advice on case management and therapeutics.

In addition to volume discounts for external laboratory services, a laboratory may offer discounted testing where this complements in-practice laboratory testing. This is most likely where the company providing the external laboratory services is also responsible for supplying the practice laboratory equipment and consumables.

Free or discounted CPD may be in the form of veterinary nurse training, clinical pathology club events and support for BSAVA and BVA territorial divisions.



A complete endocrinology testing service uses multiple analytic platforms; here a chemiluminescent immunoassay analyser is being loaded, but radioimmunoassay facilities are also likely to be required

Increasingly, the internet is being used to reach a wider audience of veterinary surgeons and veterinary nurses through broadcast 'webinar' events. Such events can be archived offering an 'on-demand' library of CPD for clients of a laboratory. Veterinary laboratories continue to be important sponsors of national and international veterinary congresses.

External quality assessment or EQA schemes (see later section) are an essential component of quality management systems for external laboratories. Such EQA schemes are less accessible to smaller practice laboratories. My own company has developed an EQA scheme for its UK customers over the past 14 years. In the absence of such a scheme, practices can still meet their obligations under the RCVS Practice Standard Scheme by submitting samples to an external laboratory for duplicate testing.

Innovation

In addition to their role as reference laboratories, external laboratories have a crucial part to play in innovation and the development of new laboratory tests and services. This requires a commitment to research and development that goes beyond the adaptation and validation of human assays and test systems. Over the past decade, testing has become commercially available in fields as diverse as:

- In vitro allergy testing;
- Cardiac biomarkers;
- Canine and feline pancreatic lipase testing;
- Polymerase chain reaction (PCR) testing for infectious disease;
- PCR testing for genetic disorders;
- Minimum inhibitory concentration (MIC) antimicrobial susceptibility testing;
- Immunohistochemistry;
- Speciality endocrine testing.

Quality of work

A less exciting aspect of the operation of external laboratories is the development and maintenance of a comprehensive quality management system. The

maintenance of quality is integrated into a laboratory's operations at every level. Without this commitment to quality, external laboratories could not truly describe themselves as reference laboratories.

Quality procedures include but are not limited to:

- Accreditation by external authorities;
- External quality assessment (EQA) scheme participation;
- Internal quality control;
- Internal audit;
- Use of customer feedback and survey results.

Accreditation is tangible proof that a laboratory's operations have been vetted and approved by an external authority. A statement of accreditation will usually appear in the laboratory's literature. Types of accreditation include:

- **UKAS BS EN ISO/IEC 17025:2005** – This is the most popular form of external accreditation for veterinary diagnostic laboratories in the UK and it is administered by the United Kingdom Accreditation Service (UKAS). Accreditation to this standard provides assurance that a laboratory is technically competent, operates a quality system and is able to generate technically valid results. The list of tests covered by the accreditation form a schedule, published by UKAS, that is freely available to view.
- **UKAS ISO 9001:2000** – This level of certification does not test technical competence but focuses on a laboratory's quality management system. Strictly speaking, it is a form of certification rather than accreditation.
- **GLP** – Good Laboratory Practice accreditation is awarded by the UK GLP Monitoring Authority and accredits the conditions under which laboratory studies are planned, performed, monitored and recorded. It is of particular value in regulatory studies due to its acceptance by drug regulatory authorities.

There is no legal obligation for veterinary diagnostic laboratories to pursue accreditation and there is a significant cost in doing so. However, in commissioning services from a non-accredited laboratory, veterinary surgeons should be prepared to critically appraise the quality of services offered by the laboratory.

EQA schemes compare results from different laboratories using standardised test materials supplied by an external agency. These schemes may be human orientated (NEQAS, RIQAS), veterinary orientated (VETQAS) or may involve inter-laboratory proficiency testing between multiple laboratories operated by the same company. EQA schemes include endocrinology, clinical chemistry, urine chemistry, full blood counts, blood film evaluation, serology, small and large animal bacteriology, mycology, antimicrobial susceptibility testing, faecal parasitology, CEM testing and histopathology block and slide preparation.

Internal quality control procedures, popularly called QC, make use of externally supplied reference materials to detect and minimise analytical error. Occasionally, retained samples or sample pools with known results will substitute for reference materials. In principle, results of analyses not supported by a QC check within an acceptable range will not be reported



Microbiology is a highly skilled and often manual discipline; here Rappaport broth cultures are plated out to identify *Salmonella* species infections

to clients. QC data will also be analysed on a monthly basis to detect emerging trends and other analytical problems.

Internal audits ensure continuing compliance with standard operating procedures maintained by the laboratory and with the accreditation standard. Audits may cover a single activity or a group of activities. To be effective, audits should be conducted by trained personnel, usually independent of the area audited. Results are reviewed at departmental and management levels, and corrective actions are planned and implemented where necessary.

Customer feedback may be in the form of compliments, complaints, other customer issues and responses to customer surveys. Customer complaints are invaluable in identifying non-conforming work. An effective quality management system will capture customer feedback and instigate root cause analysis and corrective actions where appropriate. Customer surveys are predominantly a marketing tool used to identify areas for improvement and to measure the success of prior improvements. However, they may also identify operational areas requiring corrective actions.

Communication

An external laboratory, offering a comprehensive range of tests of the highest quality and with a commitment to innovation, would still do little business if it did not meet the needs of practices for ease of submission of samples, rapid analysis and timely reporting of results.

The past 14 years have seen improvements in all areas of communication between practices and external laboratories with developments in relation to: courier collection; turnaround times (TATs) and reporting of results; off-site consulting; and telemedicine. These have been driven by an increased customer focus allied to improvements in IT services.

Courier services have expanded considerably to create a nationwide network of courier collections, guaranteeing overnight delivery and next-day testing. The ease of use of these services has improved with the

innovative use of sample boxes secured outside veterinary practices.

Improvements to IT services have ensured that all aspects of a laboratory's operations can be measured and monitored. Nowhere has this been more important than in measuring TATs – the time taken to process samples from receipt at the laboratory to signing off on results for transmission back to the practice. Changes to working practices for technical and veterinary staff have led to significant improvements in TATs, such that samples couriered overnight are typically assayed and reported before midday. Samples from local courier services are typically assayed and reported before close of business on the same working day. Increased efficiency of electronic fax and e-mail services and integration of results into practice management software has ensured efficient and timely delivery of results back to the practices.

It is now practical and efficient for veterinary pathologists working off-site to read cytology and histology cases and to interpret laboratory results. Similarly, internal medicine consultants working off-site can contribute fully to the provision of consulting services. IT improvements mean that work stations for off-site workers connected across the internet are as efficient and quick as work stations connected directly to laboratory servers. This has greatly increased the flexibility of pathology and consulting services. For laboratory clients this is a seamless process.

Telemedicine services are an exciting development already popular in the USA and are gaining acceptance in the UK, as their contribution to case management and patient care is realised. Telemedicine services are available principally in radiology and cardiology. They make use of improvements in IT services to bring specialist input directly into the practice.

Specialist veterinary input

The final piece of the jigsaw of services offered by external laboratories is that of veterinary input into test interpretation and case management.

Veterinary surgeons employed by external laboratories are comprised predominantly of anatomical veterinary pathologists (dealing with veterinary histopathology and morbid anatomy), veterinary clinical pathologists (haematology, clinical chemistry, cytology) and internal medicine specialists. There are, in addition, veterinary surgeons that do not fit these categories directly, but have experience and postgraduate qualifications in other disciplines such as veterinary microbiology and molecular diagnostics.

Anatomical pathologists in the UK have for some time been able to study for postgraduate qualifications in veterinary pathology either through the Royal College of Pathologists or European College of Veterinary Pathology.

In 1999, there were no formal postgraduate qualifications in veterinary clinical pathology awarded in the UK or Europe. Since then, the European College of Veterinary Clinical Pathology has been recognised and offers diplomate status to successful candidates. In addition, the Royal College of Pathologists offers



Cytology is a growing discipline; here fluid cytology samples are processed



Fastidious anaerobic bacteria are readily killed by exposure to atmospheric oxygen. Here anaerobic culture plates are examined within an anaerobic cabinet

Fellowship through a two part examination. Both bodies require candidates to have entered into a recognised residency programme.

Internal medicine specialists often have diplomate status of an appropriate European college or may hold certificates or diplomas awarded by the RCVS. In addition, veterinary surgeons may apply to be included in the RCVS or European Board of Veterinary Specialisation (EBVS) lists of recognised specialists in

veterinary pathology, clinical pathology or appropriate areas of internal medicine.

Postgraduate speciality qualifications are not limited to those awarded by British and European colleges. Veterinary surgeons working for UK veterinary diagnostic laboratories are almost as likely to be diplomates of the American Colleges of Veterinary Pathology or Veterinary Internal Medicine as they are to be board certified by the European or British colleges. This brings a truly international aspect to the provision of veterinary laboratory services in the UK.

Summary

External veterinary laboratories in the UK act as quality assured reference laboratories and are increasingly being integrated with in-practice laboratory services. They also offer rapid turnaround times supported by highly qualified veterinary pathologists and internal medicine specialists, and a commitment to provide new and innovative laboratory services in the future.

Reference

JAGGER, T. (1999) Home or away? The veterinary laboratory. *In Practice* 21, 152-154