



UNIVERSITY OF
LIVERPOOL

School of
Veterinary Science

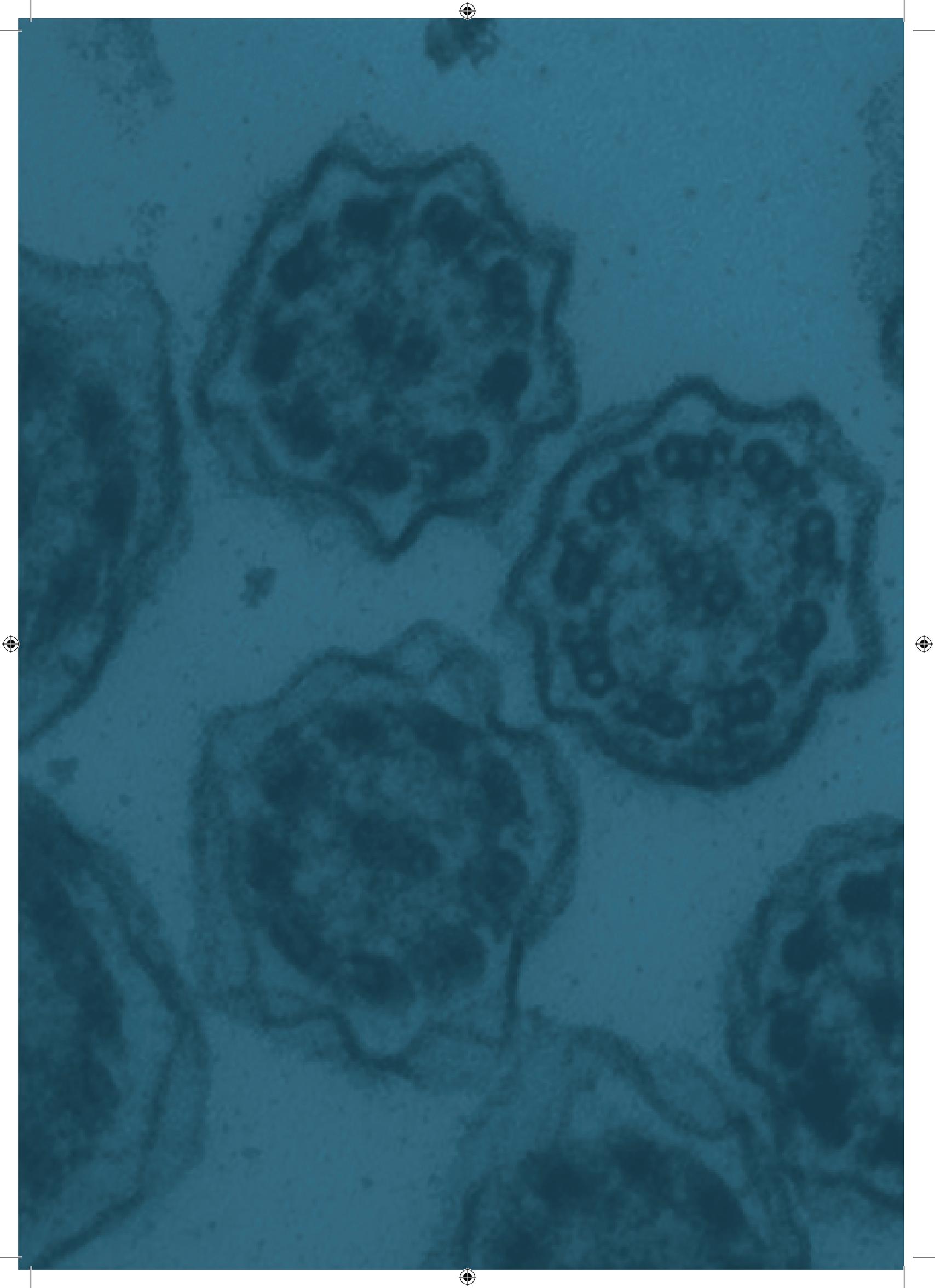
Veterinary Laboratory Services

Services in Diagnostic Pathology and Microbiology
available to Veterinary Surgeons in General Practice

2016



LIFE CHANGING
World Shaping





Veterinary laboratory services

Leahurst Campus

April 2016

Dear Fellow Veterinary Surgeons

Please find enclosed our updated brochure and price list detailing the diagnostic services offered by the Veterinary Laboratory Services of the School of Veterinary Science at the University of Liverpool.

The VLS incorporates the diagnostic pathology service, which offers a full range of services including post mortem examinations, histopathology, electron microscopy cytology and immunohistology diagnostic services. Diagnostic microbiology and parasitology services are also available. The service is open to veterinary surgeons in private practice in addition to University of Liverpool veterinary hospitals.

Many of our postmortem cases are of a forensic nature and we have particular expertise in this area.

In addition to our standard immunohistology service of tumour phenotyping and infectious agent identification, we run also a tumour grading and prognostic evaluation service. Electron microscopy and specific parasitology examinations can also be undertaken.

Furthermore, the laboratories provide extensive services for research within the University and external institutions. They are subject to external quality assurance.

Please contact us if there is any aspect of the service which you wish to discuss.

We aim to provide a rapid, high quality diagnostic service at competitive rates. We greatly value our interaction with clinicians and we welcome further discussion on cases of interest.

Your professional collaboration and feedback provides valuable teaching material for future generations of veterinary surgeons.

Further information including submission forms can be found on our website:

www.liverpool.ac.uk/vetpathology/index.htm

Telephone enquires may be made on: **0151 795 6294**

With best wishes.

Richard Blundell BVetMed MSc PhD Dipl.ECVP FHEA MRCVS
Lecturer in Veterinary Pathology
Head of Diagnostic Veterinary Pathology Service

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Veterinary Pathology Diagnostic Services

Introduction to Pathology Services

The Pathology Group offers a Diagnostic Pathology Service, incorporating postmortem examinations (including histopathology, microbiology, virology, transmission electron microscopy and other specific examinations; specific work-up of legal and insurance cases), histopathological, cytological and immunohistological examinations. It also provides a Research Pathology Service, comprising histopathological, immunohistological, immunofluorescence, molecular biological (in situ hybridisation) and ultrastructural studies.

The material submitted to the Pathology Service is used for both undergraduate teaching and postgraduate training in veterinary pathology.

The Pathology Group comprises qualified veterinary pathologists, residents and PhD students. A team of necropsy technicians, histology technicians and secretaries provides support services to the group.

Members of staff

Dr Richard Blundell

BVetMed MSc PhD Dipl.ECVP FHEA MRCVS

Lecturer in Veterinary Pathology

Head of Diagnostic Pathology Service



Richard Blundell completed his veterinary degree at the Royal Veterinary College London, then after a year in practice undertook an MSc in neuroscience at the University of Edinburgh. After some time locuming, Richard completed three years of training in

veterinary pathology in a residency programme at the University of Edinburgh, followed by a PhD in virology also at the University of Edinburgh. Richard joined the University of Liverpool in 2010, became a diplomate of the European College of Veterinary Pathologists in 2013 and an RCVS specialist in veterinary pathology in 2016.

Richard has specific expertise in molecular diagnostic approaches and is involved in the further development of our microbiology service. His research interests are centred on infectious disease.

Selected publications – see VLS website

Dr Lorenzo Ressel

DVM PhD Dipl.ECVP FHEA MRCVS

Senior Lecturer in Veterinary Pathology

Head of Immunohistology and Electron Microscopy Services



Lorenzo Ressel has a veterinary degree from the University of Pisa where he also gained his PhD with a dissertation on PTEN protein expression and its prognostic implications in canine and feline mammary tumours. He became a diplomate of the

European College of Veterinary Pathologists in 2015 and an RCVS specialist in veterinary pathology in 2016.

Lorenzo has a keen interest in tumour pathology and is very experienced in a wide range of immunohistology and immunofluorescence techniques. He joined the group in November 2011 and has since then developed the Diagnostic Immunohistology Service, to assist in grading and prognostic evaluation for a number of companion animal tumours. He is author of more than 25 peer reviewed papers on tumour biology, biomedical research and immunohistological techniques.

Selected publications – see VLS website

Dr Julian Chantrey

BSc BVM&S PhD FRCPath Dipl.ECZM FHEA MRCVS

Senior Lecturer in Veterinary Pathology

Head of Zoo and Wild Animal Pathology Service



Julian Chantrey has a veterinary degree from the University of Edinburgh. He gained his PhD in wildlife epidemiology at the University of Liverpool and then underwent residency training in veterinary pathology at the University of Cambridge and

the Royal Veterinary College in London. He started working for the University of Liverpool's Veterinary Pathology Diagnostic Service in 2003.

Julian is a Fellow of the Royal College of Pathologists (FRCPath) and became an RCVS specialist in veterinary pathology (zoo and wildlife) in 2016; his main interest is wildlife and zoo animal pathology and infectious disease epidemiology, especially of poxviruses.

Selected publications – see VLS website

Dr Gail Leeming

BVetMed MPhil PhD FRCPath MRCVS

Lecturer in Veterinary Pathology



Gail Leeming has a veterinary degree from the Royal Veterinary College London. After four years in mixed practice, she undertook a Petsavers funded residency in veterinary

pathology in Liverpool. An MPhil project during her residency developed Gail's research interest and she subsequently undertook a PhD on the pathogenesis of gammaherpesvirus and other respiratory virus infections in Liverpool. In 2010, she took up her lectureship in Veterinary Pathology, becoming a Fellow of the Royal College of Pathologists (FRCPath) in 2011 and an RCVS specialist in veterinary pathology in 2016.

Gail has a particular interest in molecular methods of diagnostic pathology and the pathogenesis of respiratory viral infections.

Selected publications – see VLS website

Dr Emanuele Ricci

DVM PhD MRCVS



Lecturer in Veterinary Pathology

Emanuele Ricci has a veterinary degree from the University of Pisa where he also gained his PhD with a dissertation, entitled "Immunohistochemical characterisation of the

immune response in brain of lambs experimentally infected with *Toxoplasma gondii*".

Emanuele has specific expertise in neuropathology and neuromuscular diseases. He joined the group in June 2012. His current main research interest is the neuropathology of domestic animal diseases, with a focus on inflammatory processes in the brain.

Selected publications – see VLS website

Dr Ranieri Verin

DVM PhD Dipl. ECZM Dipl. ECVP MRCVS



Lecturer in Veterinary Pathology

Ranieri Verin has a veterinary degree from the University of Pisa where he also obtained his PhD with a dissertation on Porcine circovirus type 2 (PCV2) antigen localisation and post-

weaning multisystemic wasting syndrome (PMWS) in free-ranging wild boar (*Sus scrofa ssp scrofa*) in Italy. Ranieri's research mainly focuses on wildlife pathology and diseases of free ranging wild mammals. Ranieri is Diplomate of the European College of Zoological Medicine (Dipl. ECZM) in the wildlife population health speciality. He joined the group in September 2013 and since then he has been involved in running the diagnostic histopathology and necropsy service. Ranieri became a Diplomate of the European College of Veterinary Pathologists and an RCVS specialist in veterinary pathology (zoo and wildlife) in 2016.

Selected publications – see VLS website

Trainees

Within the veterinary pathology group are two residents undertaking their training in diagnostic pathology.



Josep Monné Rodriguez

DVM MRCVS

Resident in Veterinary Pathology



Hayley Crosby

BVMS MRCVS

Resident in Veterinary Pathology

Honorary Members of Staff

Veterinary Pathology currently has one honorary member of staff who is involved in the training of residents and collaborative research. They also provide specific diagnostic expertise.

Professor Anja Kipar

Dr.med.vet.habil. Dipl. ECVP FTA Pathologie MRCVS

Professor of Veterinary Pathology, University of Zurich

Pathology services

The full list of services and fees is available on the VLS website:

www.liverpool.ac.uk/vetpathology/index.htm

Postmortem examinations

A complete examination will include the gross post-mortem examination and histopathological examination, with further tests such as bacteriological culture and parasitological examinations performed often. These examinations are carried out at the pathologists' discretion and prior authority is not requested from the submitting veterinary surgeon for routine procedures. We will usually discuss the need for non-routine extra tests, particularly if samples are submitted to external laboratories.

An estimate of the cost may be made from the prices outlined on the current "Services and Fees" document, available on the VLS website, but the final cost cannot be confirmed until the report is completed. Disposal of large animal carcasses is not included; an invoice from E. Clutton and Sons (Marchwiell) Ltd. will be submitted directly to you.

Gross post mortem examination

Gross post mortems are charged according to species or body weight – for current full price list please refer to VLS website.

- A preliminary gross report will be available usually within a week to ten days following the post-mortem.
- We estimate a final reporting time of 4 -6 weeks for uncomplicated cases. We will keep you informed if complications arise which result in a longer reporting time.
- Legal / insurance cases may take up to 2 months to report due to their additional requirements.

NB: Farm animal submissions are accepted by the **Leahurst Surveillance Centre**; staff can be contacted on **0151 794 6120, 07979 247256** or at court@liverpool.ac.uk.

Postmortem histopathology

Tissues are examined histologically as part of the routine, full post-mortem examination. The number of blocks and any special stains used are at the pathologists' discretion and will vary according to the size of the animal and the findings at the gross examination. Additional charges will be made where immunohistological examinations are performed. In exceptional cases where the cost may be higher, we will inform you beforehand.

Legal cases

As a leading Institution in UK in veterinary forensic pathology, we provide detailed post mortem examination and final report that will be suitable to be used as evidence. The charging of the post-mortem examination and further diagnostic tests are as above, but legal cases will incur additional costs pertaining to the additional work involved.

As part of our detailed protocol, the post mortem report will be accompanied by a PDF file containing a representative selection of photographs illustrating both panoramic and closer views of body regions, organs and specific lesions when present. Furthermore, the comment with the interpretation of findings and answers to specific questions, when submitted, will be present along with a "lay language" interpretation of specific medical terminology.

All communications concerning legal cases, including additional information given at a later date, should be made in writing and those communications will become part of the case file.

If a report is required specifically to be presented as a court compliant expert witness report, please let us know and that can be produced, although there will be an additional clerical fee.

Advice on postmortem submissions

- Prior to submitting a carcase, please contact the pathology office on 0151 795 6294, or at vpserve@liv.ac.uk to make the arrangements; also you are welcome to speak to a pathologist to discuss the case and what to expect from our service.
- For the best results, examination of a chilled carcase as soon as possible after death is optimal.
- Frozen carcases may be examined after thawing; this is acceptable although the freeze-thaw process does result in artefacts, which may impair aspects of the examination.
- Animal carcases will only be accepted for post-mortem examination with completed post-mortem examination submission form and a signed agreement to a post mortem Examination consent form.
- Please give as much clinical history as possible in the space provided.
- In order for the post-mortem to be carried out on the same day, large animal carcases must be delivered by 3.30 pm and small animal carcases by 4.00 pm. We reserve the right to conduct post-mortem examinations on the following day where carcases are delivered after these times. This is of particular importance on Friday afternoons as there is no post-mortem service at weekends.
- There is no routine out of hours or weekend service. In exceptional circumstances, work may be performed outside of normal office hours at the pathologist's discretion, by prior arrangement and on a case-by-case basis; in these cases there will also be an out of hours surcharge of £100.
- Individual Cremation. Animals submitted for post mortem examination cannot be released to the owner after the necropsy, but we are permitted to release carcases for individual cremation to a licensed carrier. Arrangements for this have to be made by the referring veterinary surgeon / owner. The Veterinary Pathology secretary can advise you on this procedure.

Histopathology

For current full price list please refer to VLS website.

Standard histopathology service

Surgical biopsies are examined for histopathological diagnosis. Reports are normally sent 1 – 2 days after the tissue is received depending on the degree of fixation. Please remember that specimens need to be a sufficient volume of formalin to fix properly and that all pots should be securely packaged to prevent leakage.

In certain types of tumour, where there is an established grading scheme available in the literature we will apply that grading scheme if requested for a small additional fee.

Same day rapid histopathology service

We can provide a same day rapid histopathology service for samples that reach us by 11.00 a.m. or morning postal delivery. Samples will undergo a rapid embedding process, provided they are sufficiently formalin-fixed. The result will be available before the end of the day and will be reported via email or verbally by telephone, with a formal written report the following day. Sample size permitting, the tissue will be split and a sample of conventionally processed, embedded, cut and stained tissue will be examined, since this may reveal more subtle changes that may not be preserved with the rapid embedding. The final written report will consider the results of both specimens. Please ensure that samples reach us by 11.00 a.m. or by morning postal delivery and mark submission forms clearly as "Rapid". It is helpful if you notify us as early as possible that you are submitting a "rapid" sample.

Cytology

For current full price list please refer to VLS website.

Cytological examination of fine needle aspirates, fluid smears and pellets is available

Immunohistology

For current full price list please refer to VLS website.

We offer a range of diagnostic immunohistology services, for the identification of tumour cell origin, prognosis and tumour grading and the demonstration of infectious agents. This service is available to other pathology services in which case paraffin-wax blocks are submitted. We may also recommend immunohistological staining on other biopsy submissions or post-mortem histology samples to aid diagnosis. We also offer a tumour grading and prognostic evaluation service.

Grading and prognostic evaluation of canine and feline neoplasms

We offer tumour grading and prognostic evaluation for a number of companion animal tumours, based on the combination of immunohistological stains and a quantitative approach: canine mast cell tumours, canine and feline mammary carcinomas, canine oral and dermal melanomas and canine osteosarcomas. The results of the immunohistological prognostic assessment, alongside with morphological and clinical data, can provide useful information for the prognosis of the neoplasm and facilitate the decision for specific treatment options.

The evaluation is based on research based, state of the art methodological approaches and scoring systems and it is reported with scoring results and a comprehensive comment.

Electron microscopy (Transmission EM)

For current full price list please refer to VLS website.

We offer a diagnostic electron microscopy service for the diagnosis of conditions such as ciliary dyskinesia and Ehlers-Danlos syndrome.

Diagnostic packages

For current full price list please refer to VLS website.

Equine muscle histopathology

We offer a diagnostic histopathological service for equine myopathies, such as the polysaccharide storage myopathy (EPSSM), but also for the diagnosis of other myopathies and inflammatory processes.

A combination of regular and special stains (H and E, PAS reaction, PAS with diastase treatment) has been shown to be sufficient for the morphological diagnosis of EPSSM. At the same time, the histological specimens can be evaluated for inflammatory or other degenerative processes, including equine motor neuron disease.

We will examine formalin-fixed muscle biopsies, using the HE stain and the above-mentioned special stains.

Intra vitam diagnosis of Feline Infectious Peritonitis

We have developed a diagnostic protocol that can confirm FIP based on the combined cytological and immunocytological examination of body effusions of suspected FIP cases. We ask you to collect a sample of effusion fluid, which you may submit directly to us which will be processed in our laboratory.

You may also prepare 3 air-dried cytological specimens (smears) from the fluid, and the remaining fluid spun down in a 1.5 ml, pointed Eppendorf tube to form a cell pellet. The supernatant then needs to be discarded and replaced by formalin for fixation. We ask you to submit all of the above if possible i.e. fluid, smears and fixed pellet.

We will undertake a cytological examination and will examine the smears and pellet for the presence of Feline Coronavirus (FCoV) antigen. Demonstration of the latter within macrophages in the exudates allows for a definite diagnosis of FIP.

We are hoping to be able to provide a rapid (48 hour) delivery of this service. Please contact us for details.

Diagnosis of canine ciliary dyskinesia

The diagnosis of ciliary dyskinesia in dogs relies on the ultrastructural examination of ciliated epithelium. We have established a diagnostic protocol for this condition that is based on the transmission electron microscopical examination of glutaraldehyde fixed biopsies of the tracheal mucosa or testicle. For the diagnostic approach, the tissue needs to be fixed with glutaraldehyde which we can provide. Therefore, we ask you to contact the Department prior to sampling to discuss the technical approach. Also, be aware that this diagnostic service is technically very elaborate, accordingly, please allow a reporting time of at least 2 weeks.

Additional services

Oncology

We are able to submit samples, particularly those which have been previously submitted to us, to external laboratories for lymphoma clonality testing (PARR PCR) and KIT exon mutations.

Immunohistology

We offer a range of diagnostic immunohistology services, for the identification of tumour cell origin, prognosis and tumour grading and the demonstration of infectious agents.

Immunohistology protocols for diagnostic purposes

Markers of cellular antigens	
Marker	Demonstration/identification of
CD45R	Pan-B cell marker (cat)
CD79a	B cell marker (dog, horse)
CD20	B cells
PAX-5	Early B cells marker
MUM-1	Late B cells marker mainly plasma cells
CD3	Pan-T cell marker (most species)
CD11d (canine)	Macrophages in splenic red pulp and bone marrow; neoplastic cells in haemophagic histiocytic sarcomas
CD18 (canine)	Macrophages, histiocytes and their neoplasms
Iba-1 (canine and feline)	Microglia and Macrophages, histiocytes and their neoplasms
CD117 (c-Kit)	Mast cells, interstitial cells of Cajal
Mast cell Tryptase	Mast cells
Desmin	Smooth muscle cells and their neoplasms
α -Smooth muscle actin	Smooth muscle cells and their neoplasms
Factor VIII-related Ag	Endothelial cells and their neoplasms
GFAP	Astrocytes and their neoplasms
Myoglobin	Striated muscle cells and their neoplasms
Melan A	Melanocytes and their neoplasms
PNL-2	Melanocytes and their neoplasms
MHC II antigen	Antigen-presenting cells and eg.activated microglial cells
Myeloid/histiocyte Ag	Neutrophils, monocytes, recently blood-derived macrophages (all species)
Neurofilament	Neurons and their neoplasms
Pan-cytokeratin	Epithelial cells and their neoplasms
Cytokeratin-7	Epithelial cells of ductal origin and other epithelial cells
High-Mol. Weight CK	Basal epithelial cells and other epithelial cells
E-Cadherin	Epithelial cells
S-100 protein	Schwann cells and melanocytes and their neoplasms
Synaptophysin	Neuroendocrine (and ganglion) cells and their neoplasms
Chromogranin A	Neuroendocrine
Vimentin	Mesenchymal cells and their neoplasms
Ki-67	Proliferating cells
PCNA	Proliferating cells
Cleaved caspase-3	Apoptotic cells

Markers of infectious agents	
Avian Bornaviruses	Diagnosis of Avian Proventricular Dilatation Disease
Bornavirus	Diagnosis of Bornavirus infection in horses and other species
Feline Coronavirus	Diagnosis of FIP [NB: This can also be performed on body fluid smears or fluid pellets; see page 9]
Feline Calicivirus	Confirmation of FCV involvement
Feline Herpesvirus	Confirmation of FeHV-1 involvement
Feline Leukaemia Virus	Diagnosis of FeLV infection
Feline/Canine Parvovirus	Confirmation of parvovirus involvement
Canine Distemper Virus	Diagnosis of distemper
Adenovirus	Diagnosis of canine infectious hepatitis and adenovirus infections in other species
Toxoplasma gondii	Diagnosis of toxoplasmosis
Neospora caninum	Diagnosis of neosporosis
Anaplasma phagocytophilum	Diagnosis of tick borne fever (sheep), ehrlichiosis (horses)
Helicobacter sp.	Diagnosis of Helicobacter infection
Entamoeba histolytica	Diagnosis of Entamoeba infection (primates, reptiles)

NB: We regularly establish new diagnostic immunohistology protocols that can expand our service. For research purposes, several other markers (especially for mouse leukocytes) are used. Information is available on request. Additionally, our immunohistological service includes the testing and establishment of immunohistological protocols for any antibody provided by our collaborators and clients.

Please refer to the most updated submission form or contact us (vpserve@liverpool.ac.uk) for further information.

Notes for the submission of diagnostic material

Tissue biopsy samples

When submitting tissue samples for examination, please supply full relevant clinical information. This will enable us to be of greatest clinical assistance to you and, at the same time, will allow us to make the most use of the material for teaching and for compiling a properly accessioned collection of pathology material.

Relevant clinical details include:

- anatomical site (accurately described)
- duration of lesion
- clinical description of lesion: rate of growth, ulceration, inflammation, infection, etc.
- evidence (positive or negative) of metastasis
- history of previous surgery (with relevant histology reference number)
- size of lesion (when portions only are submitted)
- history of recent oestrus (particularly important in assessment of mammary tissue).

Please **always** indicate:

- age, breed, sex of patient
- owner's name and address
- name of veterinary surgeon, practice title and address.

Electron Microscopical Examinations

Please contact the Office on **0151 795 6294** and ask for the specific fixatives and fixation techniques **before** collecting the samples. The fixatives can be sent to you in advance.

NB: Samples submitted to the our diagnostic service may be used in teaching and research at the University.

If you would like to exclude submitted material from teaching and research, please let us know at vpserve@liverpool.ac.uk

Diagnostic Microbiology Services

The Microbiology Laboratories offer a Veterinary Diagnostic Microbiology Service, which is based at Leahurst and covers both bacteriology and mycology analyses as well as a range of diagnostic PCRs for the identification of infectious agents.

The Microbiology Diagnostic Service processes a wide variety of clinical samples from companion, farm and exotic animals as well as tissues from animals submitted for postmortem investigations. We aim to provide a fast and reliable service for veterinary hospitals and practices and therefore we inform the clinician as soon as we have any relevant information to report.

Along with general aerobic, anaerobic and microaerophilic cultures we also screen, when necessary, for specific pathogens such as *Mycoplasma* spp, *Bordetella* spp, enteropathogenic *E coli*, *Clostridium difficile*. Where appropriate, samples are screened for methicillin resistant staphylococci (MRSA, MRSP), extended spectrum β -lactamase producing bacteria (ESBLs) and vancomycin resistant enterococci (VRE). Antibiotic susceptibility testing is available generally by disc diffusion as well as determination of Minimum Inhibitory Concentration (MIC) for effective therapeutic usage. By default, we perform an MIC test for every isolate which is assessed as being clinically significant.

The Microbiology Laboratory takes part in the Veterinary Laboratory Agency Quality assurance scheme which ensures proficiency testing for veterinary laboratories.

All suspected MRSA strains are also tested by PCR for confirmation. Furthermore, we have expanded our diagnostic PCR panel by introducing strangles and *Leptospira* PCR (differentiation of pathogenic and non-pathogenic serovars). In addition, recently we have developed a PCR for the identification of *Clostridium perfringens* enterotoxin.

The material obtained by the Microbiology Service is also used for undergraduate training in infectious diseases and clinical microbiology. At the same time, all material submitted for diagnostic microbiological examination creates a great resource for research and publication in veterinary clinical microbiology.

The Microbiology Group comprises a veterinary microbiologist and four full time technicians. Microbiology staff work closely with other diagnostic and research staff in the School of Veterinary Science, in particular with the Diagnostic Pathology Service and the University Teaching Hospitals.

If you want to discuss your needs in diagnostic bacteriology/mycology, please feel free to contact our veterinary microbiologist, Dr Dorina Timofte, by email d.timofte@liverpool.ac.uk or by phone **0151 794 6118**.

Dr Dorina Timofte

DVM, PhD, MRCVS; Veterinary Microbiologist

Lecturer in Diagnostic Bacteriology Head of Microbiology Diagnostics Service



Dorina Timofte is a veterinarian who qualified (DVM) from Iasi University, Romania in 1991. She undertook her postgraduate studies in microbiology working on *Campylobacter* species isolated from farm animals. In 1998, Dorina was awarded a PhD and subsequently she was appointed Lecturer in Microbiology at the Faculty of Veterinary Science, Iasi where she worked until June 2004 when she moved to Liverpool. In 2009, Dorina took responsibility for providing the clinical bacteriology/mycology diagnostic service. She is also involved in the veterinary undergraduate microbiology teaching at the School of Veterinary Science in Liverpool. She continues to publish her research in several areas of veterinary clinical microbiology and antimicrobial resistance.

Selected publications – see VLS website

Microbiology services

For current consultation fees, please refer to Veterinary Microbiology Diagnostics Service and Fees on VLS website.

Bacteriology

Swab (culture, ID, sensitivity)
Blood culture (culture, ID, MIC) 1X
Blood culture (as above) 2 to 3 samples, same case
BAL/tracheal wash (culture, ID, sensitivity); screening includes <i>Bordetella sp</i>
BAL X2 (same case)
Synovial fluid (culture, MIC)
Abdominal/pleural (also other fluid specimens)
Liver tissue biopsy/bile (culture, ID, MIC)
Urine (culture, identification, MIC for cysto samples)
MRSA/MRSP screen (<i>culture only</i>); per swab
for 2 swabs/same case
for 3 swabs/same case
Skin and ear (bacterial and fungal culture)
Fresh tissue biopsy (bacterial and fungal culture)
Faecal culture (<i>Salmonella, Campylobacter, Cl. perfringens</i> screen and susceptibility testing where appropriate)
Salmonella screen only

Mycology

Skin scraping/hair microscopy
Skin fungal (dermatophytes; microscopy and culture)
Skin and ear (bacteriology and mycology)

Cryptococcus

A) India Ink stain only
B) India Ink + antigen test
C) Culture, Identification
D) A+B+C

Diagnostic PCRs

Equine Herpesvirus
EHV 2 and 5 (2-4 tissues from the same case)
EHV-1 and -4
<i>Streptococcus equi ssp. equi (strangles)</i>
Submission of 2 samples from same case (eg. left/right guttural pouch wash)
Submission of 10 or more samples (per sample)
MRSA/MRSP (<i>Staphylococcus aureus/pseudintermedius</i>)
Campylobacter species identification
Species ID for <i>C. jejuni</i> , <i>C. coli</i> , <i>C. upsaliensis</i> , <i>C. fetus</i> , <i>C. lari</i>
Mycobacteria (fresh tissue)
PCR only
PCR with sequencing
<i>Clostridium perfringens</i> CPE (Cl. enterotoxin typing)

Diagnostic PCR for mycobacteria

We have established a diagnostic PCR protocol to identify *Mycobacterium spp* in fresh tissues and will expand this to examine other samples (such as water) as well. The tests are performed by the Diagnostic Bacteriology Service.

Diagnostic PCR for Selected Infectious Agents

We have established diagnostic PCR protocols for selected infectious agents and constantly develop this new service which can be used to confirm/exclude an infection. The tests are performed by the Diagnostic Bacteriology Service. For most protocols, fresh tissue/samples are needed, but some can also be applied retrospectively to confirm/exclude an infection, using the paraffin block that served for the histopathological examination. We currently offer diagnostic PCRs for the following infectious agents:

Orthopoxvirus

Leptospira

Streptococcus equi subsp equi (strangles)

*Neospora caninum**

*Toxoplasma gondii**

*These tests are performed by our colleagues in the Parasitology Group.

If you are interested in any of these services and have further queries, please contact our office on **0151 794 4265/4258** or via email to **vpserve@liverpool.ac.uk**.

Mycoplasma diagnostic services

For fees please refer to VLS website

Molecular diagnosis

PCR for <i>M. gallisepticum</i>, <i>M. synoviae</i> or <i>M. meleagridis</i>
Single sample
Pool of three samples
Strain typing by gene sequencing
(ie sequencing of the <i>mgc2</i> gene for <i>M. gallisepticum</i> , <i>vlhA</i> gene for <i>M. synoviae</i>)
Initial PCR, including DNA extraction*
PCR as above and products sequencing & analysed
PCR, sequencing & analysis if DNA samples provided
*This is for samples where there is no PCR product so the investigations cannot be taken any further.
16-23S rRNA intergenic spacer region for unknown mycoplasmas
[DNA extraction, PCR, sequencing and analysis across 3 areas]

Culture for isolation of mycoplasma sp.

Broth culture
Plate culture

Immunofluorescence test to identify mycoplasma isolated

Each unknown culture and each control

NB: There is a minimum charge of £27.60 because even one test sample requires three controls.

Mycoplasma Diagnostic Service

The primary aim of this service is to provide support for the commercial poultry industry and to veterinarians and small poultry flock owners. We offer a rapid diagnostic service and support for the avian breeder and flock owners for early prevention of spread of mycoplasma between birds or flocks.

The Mycoplasma Diagnostic Service also offers its service for feline and canine clinical cases. The service is based on culturing of avian, companion animal and livestock *Mycoplasma sp.*, with subsequent further identification by immunofluorescence, PCR and sequencing. The service benefits from the specialist input of Emeritus Professor Janet Bradbury who has recently retired but remains very much involved in the Service activity.

Samples submitted for either culture or PCR should be collected and transported in accordance with the requirements specified below.

Mycoplasma Diagnostic Service

Procedure: Swabbing for mycoplasma culture / PCR, using a special mycoplasma broth that can be ordered through the service (Cynthia Dare: 0151 794 6014).

1. Before taking your sample, dip the swab into the provided mycoplasma broth and drain off excess by aseptically pressing the swab on the side of bottle.
2. Collect the specimen using the pre-wet swab and immediately return the swab to its original tube to retain the moisture content. Please do not send samples in the broth solution.
3. Ship swabs with a 'cool pack' [cool pack enclosed for freezing]. This is essential for maximum chance of successful mycoplasma isolation.

Send swabs to our laboratory using a carrier or 'special next day delivery' service, ensuring that samples do not arrive on Saturday or Sunday.

Enclose a note stating whether you require isolation and/or PCR [Mg, Mm or Ms].

Excess broth may be stored at -20°C for future use.

Members of Staff contributing to the Microbiology Services

The School has particular research strengths in infectious diseases and a range of colleagues provide their expertise to expand and improve the Diagnostic Microbiology Services.

Professor J M Bradbury, BSc, MSc, PhD

Dr P Wigley, BSc PhD

Professor N Williams, BSc (Hons), PhD

Emeritus Professor (Mycoplasmology)

Reader (Bacteriology, Immunology)

Professor of Bacterial Zoonotic Diseases

Parasitology and Entomology Services

Dr John McGarry is a Lecturer in Parasitology and member of the European Veterinary Parasitology College.

Dr John McGarry

PhD; Parasitologist



John McGarry has more than 30 years broad experience in diagnostic work publishing in the areas of dog lungworms, ticks and tick-borne diseases, forensic entomology and wildlife parasitology.

John works closely with the veterinary pathologists, contributing to their diagnostic service and in particular to their forensic pathology.

Specialist provision for pathology services includes:

Identification of dipteran and other arthropod indicators of companion animal neglect, age-grading the life cycle stages towards assessment of post mortem interval and interpretation for forensic purposes. Specimens/samples for submission should be placed immediately in 70% alcohol when removed.

Identification of mature/immature stages of helminths and arthropods (gross specimens or in histological sections) from any host species. Gross specimens/samples should be submitted in 70% alcohol.

Selected publications – see VLS website

Parasitology and entomology services

For fees please refer to VLS website

Parasite identification (preserved in 70% alcohol, in tissue sections/tissue digests)
Identification of dipteran and other insects (preserved in 70% alcohol),
Arthropod identification, age grading and assessment of postmortem interval; professional opinion and report writing
Identification of medical arthropods

Other parasitology services

Veterinary Laboratory Services work closely together with other specialist parasitology services in the School of Veterinary Science, namely TEST-A-PET and Diagnosteq. The laboratories function also as one-stop shops, ensuring that samples are forwarded to the other laboratory, when requested.

The Liverpool Veterinary Parasitology Diagnostics (LVPD) is the diagnostic service provided by the Veterinary Parasitology group in the School of Veterinary Science for the serodiagnosis of protozoan parasites of dogs and cats and also receives faecal and tissue samples, skin scrapings and individual worms and ectoparasites, including samples from wildlife and exotics. For further information, see the LVPD website: www.liverpool.ac.uk/testapet. The Diagnostic Pathology Service works closely with this service. Samples submitted to the VLS Diagnostic Pathology or Microbiology Service can be forwarded to Test-A-Pet for further testing, if required, and vice versa.

Samples should be sent direct to:

Liverpool Veterinary Parasitology Diagnostics (LVPD)
University of Liverpool
Liverpool Science Park IC2
146 Brownlow Hill
Liverpool
L3 5RF

Tel: **0151 794 1178** (Laboratory and general enquiries), **07970 247 376** (Clinical advice) Email: lvpd@liverpool.ac.uk

Diagnosteq is a service set up in the Equine Division of the School of Veterinary Science to assist in the management of parasite diseases in horses. Diagnostic tests include faecal egg counts and tapeworm antibody test. For further information, see the Diagnosteq website: www.liv.ac.uk/diagnosteq. Equine faecal samples submitted to the Diagnostic Microbiology Service can be forwarded to Diagnosteq for further testing, if required, and vice versa.

Samples should be sent direct to:

University of Liverpool
School of Veterinary Science
Equine Division
Leahurst Campus
Neston
Wirral
CH64 7TE

Tel: **0151 794 6184**; Email: diagnostic@liverpool.ac.uk

One-stop shop for diagnostic services

All Veterinary Laboratory Services work closely together and with TESTAPET and Diagnosteq. Each laboratory functions also as a one-stop shop, ensuring that samples are forwarded to the other laboratories, when requested.

If you have any further queries about the various Services provided by the School of Veterinary Science, please refer to our website www.liverpool.ac.uk/vets/diagnostic_services.htm.

Policy statement on the Diagnostic Pathology Services available in Veterinary Pathology, University of Liverpool

1. We are committed to a high quality professional service that seeks to meet the needs of practice.
2. All work is carried out under veterinary supervision and interpretation of results is by veterinarians who are trained and experienced in the laboratory disciplines.
3. Diagnostic laboratory work is performed by full-time qualified technicians and we work closely with University veterinary clinical staff, so that we maintain current, active contact with clinical work.
4. We participate in independent external quality assurance programmes in bacteriology and histology.
5. Trainees' work is overseen by senior, qualified pathologists and their reports are checked before being signed off.
6. All reports are signed by the senior pathologist and where applicable, also the trainee who is responsible for the case and who makes the diagnosis or suggests the clinical implications. In urgent surgical pathology cases the pathologist can telephone the referring veterinary surgeon as soon as the slides have been read (normally the day after receipt of the specimen). No extra charge is made for this service. The typed comprehensive report is immediately faxed or provided via email. Final, signed copies are sent by post.
6. The diagnostic pathology service is a valuable regional resource, the income from which is used to support academic and veterinary professional work that is no longer funded by the University system.
7. Your use of this service helps to support your regional veterinary school.

Notes on the use of the diagnostic pathology and microbiology services

The services are available on the basis of the following understanding:

1. This is a consultancy service available to veterinary surgeons in general practice.
2. Reports are issued to referring veterinary surgeons, who can then discuss the results with owners in the light of their own clinical knowledge of the case.
3. Reports include a note of the consultation fee to be paid to the University of Liverpool. Requests for payment will be made to veterinary surgeons by the Finance Office on a monthly basis.
4. Enquiries about monthly accounts submitted by the Finance Office should be directed to the Veterinary Laboratory Services Office, Tel. **0151 795 6294** (direct line) and **not** to the Finance Office, **which has no details of individual reports.**
5. Submission forms are available from this office, but can also be found online at **www.liverpool.ac.uk/vetpathology**.
Office hours are from 9am to 5pm Monday to Friday. At other times messages can be left on our answering machine **0151 795 6294**.
6. Submission forms should be used when submitting specimens so that clinical information can be easily transcribed onto report forms. Please supply as much clinical information as possible: this enables us to provide a service that is clinically useful and helps us to accumulate pathological and microbiological data from a documented clinical background.
7. A list of currently available diagnostic items and fees is included. We are pleased to discuss with veterinary surgeons any investigations not listed.
8. Pathology diagnostic responsibilities are divided between the Liverpool and Leahurst laboratories, according to the list overleaf. **Please ensure that specimens and requests are directed to the appropriate laboratory** so that they can be handled promptly.

Submission of Samples*

The main address for all samples submitted to Veterinary Laboratory Services at the following address:

**Veterinary Laboratory Services
University of Liverpool
Leahurst Campus
Chester High Road
Neston,
CH64 7TE**

Post mortem cases and other diagnostic pathology specimens should be addressed to:

Veterinary Pathology Diagnostic Service

[Plus main campus address]

Tel: **0151 795 6294**; Fax: **0151 795 6295**

Email: **vpserve@liverpool.ac.uk** (also for general enquiries to Veterinary Laboratory Services).

These include:

- Necropsies**
- Samples for histological examination (postmortem samples and surgical biopsies from all animals)
- Cytological specimens
- Effusions (> 1ml; diagnosis of feline infectious peritonitis)
- Samples for scanning and transmission electron microscopy
- Specimens for immunohistological examinations

Diagnostic microbiology specimens should be addressed to:

Microbiology Diagnostic Service

[Plus main campus address]

Tel: **0151 794 6118**

Email: **vetbact@liverpool.ac.uk**

Specimens for the Mycoplasma Diagnostic Service should be addressed to:

Mycoplasma Diagnostic Service

[Plus main campus address]

For the attention of: **Cynthia Dare**

Tel: **0151 794 6014**

NB: For samples that are submitted for several tests, each address can be used.

Please note:

***It is a legal requirement that all specimens must be securely packaged.**

**** Postmortem examinations – please contact the Office to make arrangements 0151 795 6294.**

Website

The School of Veterinary Science has a website containing details of its diagnostic services and hospitals. This includes the range of services available as well as useful contacts and links to further related topics including our research.

Visit: **www.liv.ac.uk/veterinary-science/clinical-services**.



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