



Animal &
Plant Health
Agency



Livestock & Wildlife Disease Diagnosis at APHA

Guidance on sample and test selection

Version 9, August 2026

Published by the APHA Surveillance Intelligence Unit & Species Expert Groups

Surveillance Intelligence Unit Contacts

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Species Expert Groups:

- [Small ruminants](#)
- [Pigs](#)
- [Cattle](#)
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Introduction

This guide is intended to assist veterinary practitioners with sample and test selection for diagnosis of common clinical presentations in livestock and wildlife. It provides general and species-specific guidelines compiled by Animal and Plant Health Agency (APHA) Species Expert Group members and other veterinary colleagues.

Defra provides significant financial support to enable subsidised disease testing through APHA, with the aim of detecting of new and (re)emerging livestock and wildlife disease threats. The types of threat include:

- novel or exotic pathogens and diseases
- new presentations of known diseases
- occurrence of diseases in novel species
- new or exotic strains of pathogens which are endemic to Great Britain
- significant changes in endemic disease trends
- newly emerging or concerning antimicrobial resistances
- threats to food safety or public health

Disease testing may be carried out on samples submitted from live or dead animals, or through post-mortem examination (PME) of whole carcasses submitted to [APHA's scanning surveillance network](#). The network is comprised of APHA Veterinary Investigation Centres (VICs), APHA Lasswade (poultry only) and surveillance pathology partners (SPPs) at independent institutions.

Veterinary staff assist in all aspects of disease investigation with expertise in gross pathological findings, test selection, and interpretation of results.

Where the details in this guidance do not provide sufficient information, or where assistance is needed to investigate complex, unusual or problematic outbreaks of disease, please contact your local Veterinary Investigation Officer (VIO) or veterinary pathologist, even if you do not send samples to APHA.

Submission of carcasses for post-mortem examination

[Submission of whole carcasses](#) or selected viscera, for example whole plucks, often provides more information than submitting separate samples. Thorough accompanying clinical history is vital to enable targeted testing and provides the best chance of reaching accurate diagnoses. Dialogue with your designated PME provider prior to submission is necessary and we require a fully completed submission form before a PME can take place.

PME involves gross external and internal examination of carcasses. Diagnoses may be reached during this examination or may rely on further testing of samples. In most cases, the cost of investigation is the same to the submitting veterinarian and is not affected by the number of tests added (the exception being investigations subject to full economic cost).

To submit carcasses for PME, [find](#) and [contact](#) your nearest PME facility. [Search the farm postcode](#) to find out whether free carcase collection is available and complete a submission form for the appropriate species:

- [Cattle](#)
- [Pigs](#)
- [Sheep and goats](#)

- [Poultry and gamebirds](#)
- [Other farmed mammals](#), for example, rabbits, deer, alpacas and llamas

Selection criteria for post-mortem examination

Discussion with your PME provider is necessary prior to submissions for PME.

- Carcasses should be as fresh as possible
 - Animals dead for more than 24 hours are less likely to be of diagnostic value and may not be accepted
 - Animals dead for more than 48 hours will not be accepted
- Carcasses which have been frozen may not be accepted
- In outbreaks, a maximum of three mammalian and 5-10 bird carcasses of the same species may be submitted together from a single disease incident on each farm

Submission of live animals

Occasionally, it is advisable to submit live animals for clinical examination followed by PME, for example, to investigate enteric or nervous disease. Submission of a combination of live affected and freshly dead birds may be appropriate for flock health investigations in poultry and game birds.

Submission of a live animal **must** be discussed with veterinary staff at the time the PME is agreed. It is not possible where an APHA-funded carcass collection service is being used as fallen stock collectors are not able to transport live animals. The decision must consider current welfare in transport legislation in [England](#), Scotland and [Wales](#) which states that no unnecessary suffering or ill treatment should be caused by transporting the animal. To ensure the wellbeing of any live animals, the herd or flock veterinary practitioner should agree to its transport and ensure supervision for the journey in line with the current legislation.

Notifiable diseases

The Animal Health Act 1981 stipulates that anyone involved with livestock health and production must report suspicion of notifiable disease immediately.

- In England, call the Defra Rural Services helpline on 03000 200 301
- In Wales, call 0300 303 8268
- In Scotland, call the [local APHA field office](#)

Information on notifiable diseases of farmed livestock (including clinical signs and pathology) is available on [GOV.UK](#) and through the [World Organisation for Animal Health](#).

Suspected or confirmed poisoning in food animals

Please discuss all cases of suspected or confirmed poisoning in food animals with a VIO, as voluntary measures to control contamination of the food chain may be requested. In rare circumstances, statutory controls may be required under the Food & Environmental Protection Act (FEPA).

Submission of samples for disease testing

Information about available tests and packages, including test and sample types and costs is detailed in the [Disease Surveillance Tests price list](#). You can use the online [Animal Disease Testing Service](#) (ADTS) to submit individual samples for diagnostic testing. Following

registration of a practice, the service generates free postage labels to send samples to the correct laboratory and enables result to be checked online.

Alternatively, multiple samples can be sent to a single laboratory with a paper submission form. This may increase test turnaround time as samples will then be distributed to the correct testing location. We recommend choosing a laboratory that performs at least one of the tests required as indicated in [our guidance](#).

To submit samples for disease testing:

- Refer to the [current test list](#) for test specifics and prices
- Access [ADTS online to submit samples](#) OR submit samples with a paper submission form (above) [to a single laboratory](#) (longer test turnaround time)

Surveillance data outputs

The surveillance information you provide is recorded in the Veterinary Investigation Diagnosis Analysis (VIDA) database, together with diagnoses reached. VIDA is a national database, comprising all diagnostic submissions to APHA, SRUC Veterinary Services and the network of non-APHA surveillance pathology partners.

Diagnoses follow strict criteria which are updated in-line with progressing diagnostic techniques and understanding of disease processes. The database enables monitoring of diagnoses, clinical syndromes and disease trends, as well as epidemiological features associated with these. Submissions in which a diagnosis is not reached (DNR) after reasonable testing are scrutinised for evidence of new or re-emerging threats.

The Species Expert Groups analyse and share these data back to the relevant sectors via [animal disease surveillance reports, publications and dashboards](#).

Surveillance initiatives

Animals and samples submitted to APHA's scanning surveillance network for subsidised testing are tested at the discretion of the VIO and Species Expert Group. This may include enhanced surveillance for both notifiable and non-notifiable diseases. In some cases, these activities are important so that the UK can prove freedom from notifiable diseases, including brucellosis and Aujeszky's disease.

Confidentiality

APHA does not release information to any non-government third party linking a specific premises to a non-statutory (not governed by legislation) disease investigation nor information which indicates the presence of a non-statutory disease on that premises.

Sampling by discipline

Histopathology

Sampling

- Tissue samples should not be more than 1cm thick
- Collect several samples from the same tissue/organ, including samples of the junction between grossly lesioned and normal tissue
- Samples should be immersed in 10-20 times their volume of fixative as soon as possible
- The recommended fixative for most cases is 10% neutral buffered formalin
- Brain is best fixed whole allowing the pathologist to select appropriate sites
- Collect intestinal samples as soon as possible after death (ideally within 30 minutes), from several sites of small and large intestine. Immersion fixation of gut tubes 1-2 cm in length is satisfactory but avoid crushing with forceps. Gentle agitation of the sample in the fixative will help displace food material and allow fixative to enter the lumen

If these guidelines are followed, primary fixation of most samples takes 24-48 hours. This time will be extended if the fixative is cold (below 5°C). Whole brains take longer to fix – please discuss with your local VIC.

Packing and sending

Send samples in an appropriately sized container with a wide opening. Material must be properly packaged and packaging must conform to [postal regulations for packaging of pathological material](#).

Urgent cases can be sent immediately if the container is filled with fixative so that primary fixation occurs in transit. If non-urgent, tissue can be initially fixed for 48 hours then sent in a reduced volume of fixative. This method is particularly appropriate for brain.

Bacteriology

Types of samples

- Portions of fresh tissue in clean containers are suitable if not autolysed or contaminated, are submitted same day or by overnight post and are kept cool during transport
- Purulent material is preferable to swabs
- Faecal matter, rather than just swabs, is essential if tests other than basic bacteriology are required
- For anaerobic culture, fill the container to approximately 80% full. It is not recommended to exclude all air as containers can burst in transit
- Charcoal swabs are suitable for aerobic and anaerobic culture, but where anaerobes are the target organism, commercial transport media are available that are aimed specifically at anaerobe preservation. Please discuss with your local VIC
- Plain swabs are required for fluorescent antibody testing (FAT)
- Plain swabs with wire or plastic stems (not wooden) are required for PCR tests

Sampling for aerobic bacteriology (TC0101)

- Tissues to be sampled should be as fresh as possible

- Sear the surface of organs with a flame or heated scalpel blade prior to incision with a sterile scalpel and swab the incised surface
- In cases of serositis (pleurisy, pericarditis, arthritis etc), rub the swab on the lesioned serosal surface, rather than dipping the swab in fluid exudate

Sampling for anaerobic bacteriology (TC0528)

- Follow similar guidelines as for aerobic bacteriology
- For diagnosis of clostridial enterotoxaemia:
 - Send a minimum of 1ml of small or large intestinal contents with no added preservative
 - Submit for *Clostridium perfringens* toxin ELISA (TC0035) and specify which toxins to test for
- For clostridial myositis or black disease in cattle or sheep, or *Clostridium novyi* infection (hepatitis) in pigs:
 - Take four impression smears from the cut surface of affected muscle or liver,
 - Air-dry and fix with acetone/methanol (ratio of 75:25)
 - Send in slide box for clostridial FAT (TC0032) OR submit a portion of whole lesioned tissue in a sealed airtight container

Isolation times

- Initial isolation of most bacterial pathogens in cultures occurs after 24 hours incubation following initiation of cultures at the laboratory. Some exceptions are:
 - *Glaesserella parasuis* – minimum of 2 days
 - *Salmonella* spp. by enrichment – minimum of 2 days
 - *Campylobacter* spp – up to 7 days
 - *Brucella* spp – minimum of 4 days
 - *Mycobacterium avium* paratuberculosis (Johne's) – up to 16 weeks
 - *Avibacterium* spp and other avian *Pasteurellaceae* – minimum of 2 or 3 days
- Full identification of bacterial pathogens usually takes from one day to a week but can occasionally be longer for some pathogens or where there is contamination
- Fastidious organisms such as *Mycoplasma*, *Brachyspira*, *Campylobacter* species and *Leptospira* serovars may require specialist techniques. Please contact your local APHA VIC to discuss testing for these pathogens

Antimicrobial sensitivity

- Antimicrobial sensitivity will be initiated, if requested, once the pathogen has been obtained in pure growth, which may require subculture
- Disc diffusion antimicrobial sensitivity testing (TC0401) takes 24 hours in most cases
- Minimum inhibitory concentrations (MICs) can be undertaken for some pathogens for selected antimicrobials – please contact your local APHA VIC for more information

Mastitis examinations (TC0544)

- Misleading results are obtained if milk samples are contaminated
- Follow this procedure to avoid contamination:
 - Wash and dry your hands thoroughly
 - Wash teat to be sampled only if obviously dirty; dry immediately
 - Discard first two draws of milk

- Clean end of teat:
 - Use small piece of cotton wool, dampen with surgical spirit (80% spirit/20% water)
 - Rub end of teat with “swab” until visibly clean
 - Repeat using a second swab, make sure swab appears clean after use. If not, repeat using another clean swab; last swab should be spotless after wiping
- To take sample:
 - Open sterile sample bottle – keep lid clean by holding it facing downwards in crook of little finger; do not allow lid to touch teat
 - Hold sample bottle at an angle to teat
 - Discard a further draw of milk
 - Collect 1-3 streams of milk to fill sample bottle to at most half-full
 - Immediately replace lid carefully
- Label sample bottle – include cow’s number, quarter, date, name of farm and farmer

Mycology

- Request fungal culture (TC0101 Sabouraud’s medium) on the submission form
- Fluids (e.g. fetal stomach contents) can be examined for fungal hyphae by direct microscopy (TC0580)
- For ringworm (dermatophyte) culture (TC0080), submit hair plucks – dermatophyte cultures take up to four weeks

Serology

General

Serology is used to detect whether animals have been exposed to a particular pathogen. It is used in the diagnosis of disease and for monitoring the pathogen status of a group or herd/flock.

If animals are vaccinated against the pathogen in question, serology may not hold value if antibody produced to vaccine cannot be distinguished from that produced to field infection. Only a few DIVA (differentiation of infected from vaccinated animals) vaccines are available for veterinary use (e.g. gE-deleted IBR vaccine).

The possibility of detecting maternally derived antibody must be borne in mind in young animals; these may persist up to eight months of age (calves). Maternal antibodies interfere with interpretation and cannot be distinguished from antibody produced in response to active infection of the animal.

Diagnostic serology

- Sample several affected animals
- Single serology:
 - presence of antibody indicates exposure to the pathogen only and does not indicate how recently the exposure occurred
 - negative results rule out involvement of some pathogens
 - presence of antibody may be useful diagnostically if the animal(s) were supposed to be free from the pathogen
- Paired serology:
 - Involves testing sera from the same animals during acute and convalescent periods
 - detects seroconversion (seronegative to seropositive) or a significant rise in titre

- establishes a temporal association of seroconversion and disease
- acute samples must be collected within the three to four days of clinical signs occurring or animals will already have seroconverted
- recommended sampling interval can vary but should not be less than two weeks
- is not usually useful in reproductive disease investigation as maternal seroconversion has usually already occurred by the time disease manifests
- Cohort serology:
 - used where conventional paired serology is problematic e.g., in pigs or poultry with no individual identification
 - sera are collected from groups of pigs or poultry at different ages within one management system
 - assists in assessing the timing of exposure

Monitoring serology

Healthy animals may be tested for antibody to a pathogen to establish the status of a group or herd/flock with respect to that pathogen, so long as the animals are not vaccinated (unless a DIVA vaccine is used). The aim of the monitoring needs to be clear and is usually either:

1. to detect presence of pathogen – here the detection of a single seropositive animal is sufficient
2. to estimate prevalence of pathogen – here an estimate of the proportion of animals exposed to infection is needed and this usually involves testing a larger number of animals

In both situations, the numbers of animals tested from an epidemiological group depends on several factors including the suspected prevalence of infection, the degree of confidence needed in the results and the number of animals in the group. Epidemiological sample size [calculation tables](#) and [tools](#) assist to establish the numbers of animals that should be sampled and tested for given group sizes, confidences and prevalence.

The number of animals which are tested is also influenced by the logistics of sampling, cost of the tests and the sensitivity and specificity of serological tests available.

Parasitology

Fresh faeces

- Submit in a wide mouthed, screw capped container sealed with insulation tape
- Submit 3g minimum (approximately 8-10 pellets) for individual faecal egg count (TC0060), 40g for fluke egg examination (TC0061), and 50g for lungworm larvae examination (TC0062)
- Faecal egg counts for camelids (TC0860) require a minimum of 4.5g of faeces
- To monitor faecal egg counts in sheep (the composite faecal egg count, TC0668), submit 10 x 3g (minimum) separate faecal samples from each group. These will be pooled at the laboratory
- Monitoring fluke egg counts in cattle and sheep (TC0689): submit 10 x 5g (minimum) separate faecal samples from each group. These will be pooled at the laboratory.

Blood

For blood parasites (TC0256) submit 2ml whole blood in EDTA tube.

Skin

For skin parasites (TC0081) send multiple scrapings and scabs, with hair/feathers (for mange/feather mites) or plucked underlying hair or clipped fleece (for ringworm). Send fresh undamaged specimens of ticks, lice and fleas. All samples should be submitted in screw-capped containers. Please do not submit the scalpel blade.

For examination of skin scrapes for non-burrowing ectoparasites, for example sheep scab *Psoroptes ovis*, take scrapings using a scalpel blade. Expose the edge of the lesion and take the skin scraping with the scalpel blade held at around 45°. Do not use liquid paraffin as this will suffocate the mites. For burrowing ectoparasites, deep scrapes (i.e., enough to draw blood) should be submitted.

Virology

Ruminant respiratory viruses

PCR tests permit rapid identification of IBR, PI3, and RSV in both affected live animals and carcasses. If collecting tissue samples only, submit both fresh and formalin-fixed samples that can be subject to microbiology testing and histopathology respectively.

Animal selection

- Select recently affected animals
- Animals with mucopurulent nasal discharge are less likely to yield virus
- Broncho-alveolar washings (BAL) and guarded intranasal brush swabs are the preferred samples
- Nasal or ocular swabs are suitable for IBR but are unlikely to detect PI3 or RSV.
- Plain swabs must be used, but do not use swabs with a wooden stem
- Samples must be submitted as soon as possible after collection, certainly no longer than the day after collection

Carcasses

- Submit intact fresh carcasses, whole plucks or portions of lung tissue and trachea
- For the latter, collect two or three blocks of lung tissue (2cm cubes) from the junction between healthy and affected tissue
- Tracheal and/or bronchial swabs may also be collected
- Tissues or swabs should be sent to APHA within 24 hours

Isolation of viruses from field cases is not routinely undertaken, is time-consuming and often difficult as some mammalian respiratory viruses survive poorly in transport. When virus isolation is required, it may be necessary for the samples to be submitted in virus transport medium (VTM). Consult APHA before submission.

Other mammalian viral diseases

- Sample as advised under the specific species sections
- Where swabs are submitted, avoid use of swabs with wooden stems
- For enteric viruses send intestinal contents or faeces, without VTM, rather than swabs
- For viral skin diseases, send deep scrapings, fresh biopsies or aspirated fluid (if available) in screw-topped containers.

Sampling by species and disease conditions

Avian – poultry, game birds and waterfowl

Refer to [Sampling by Discipline](#) sections for general information. In many cases, PME is necessary for investigation. The following testing guide is not exhaustive. Discussions with a VIO or avian pathologist prior to submission is encouraged. Accompany submissions with a fully completed [avian submission form](#). This includes a good clinical history with affected bird age, morbidity and mortality patterns, information on medication and the vaccination programme as well as the type of husbandry system. For PME, consider submitting a batch of birds that comprises some that have recently died and live affected birds (if they are fit to travel, welfare is not compromised and the PME centre has accepted the submission).

Recommended batch sizes for PME submissions of birds are:

- Up to 10 birds if they are less than 2 weeks old (TC0021)
- Up to 5 birds if they are more than 2 weeks old (TC0001)

Acutely affected and untreated birds which have died recently are ideal candidates for PME, noting that autolysis occurs rapidly, particularly with chicks. Carcasses should not be frozen.

For brain histology, fix one half of a sagittal section of the head with the brain in situ. Retain the other half of the brain fresh (unfixed) for other tests.

For bacteriology, specialist avian pathogens may require a minimum of 2-3 days to achieve satisfactory growth, followed by identification. Definitive identification of some pathogens (such as *Avibacterium paragallinarum*) may require additional molecular testing.

Parasitic infections caused by motile protozoa (*Spironucleus* – formerly *Hexamita*, and *Trichomonas/Tetratrichomonas*) are particularly prevalent in game birds. Submission of live birds is needed to establish diagnosis of intestinal motile protozoan infections.

Serology can be useful on a flock basis for some diagnoses, particularly some viral infections where virus isolation is difficult. This can include paired (cohort) serology. An accurate flock vaccination history is essential for interpretation. Note that for some serology tests (*Mycoplasma gallisepticum*, *M. meleagridis* and *M. synoviae* RSA), only fresh serum samples can be used; frozen or haemolysed sera are not suitable.

Avian virology

Pools of tissue from each bird (brain and trachea in one pool; liver, lung, kidney and spleen in a second; intestinal tract in a separate pool) are useful for general virus isolation tests. Lymphoid tissue may also be required as a separate pool (thymus, spleen and/or bursa) depending on the investigation.

Use plastic or wire-stemmed swabs for virus isolation and/or PCR testing, not wooden stemmed swabs which can interfere with PCR tests. Some viruses target specific organs that may be useful to sample, for example:

- Trachea, caecal tonsils, kidney, reproductive tract for IBV infections
- Spleen for haemorrhagic enteritis virus detection in turkeys and marble spleen disease in pheasants
- Bursae for infectious bursal disease (Gumboro)
- Brain for viruses causing encephalitis
- Skin/oropharyngeal samples for pox viruses
- Intestinal contents may be examined by electron microscopy (EM) when looking for enteric viruses or PAGE for rotavirus

Increased mortality

Condition/causes	Sample types and recommended tests	Further information
Systemic disorders	Carcases for PME. Fresh tissues or charcoal swabs for primary bacterial culture (TC0101) and anaerobic bacterial culture (TC0528). Fixed tissues for histopathology (PC0006).	PME enables full diagnostic investigation of possible causes. Aseptic cultures from spleen, liver and heart valves (if abnormal) often useful.

Wet litter, abnormal faeces and caecal cores

Condition/causes & age	Sample types and recommended tests	Further information
Bacterial, parasitic, viral (all ages)	Carcases for PME. <i>Brachyspira</i> (avian intestinal spirochaetosis) culture (TC0331). Carcases for PME. Primary bacterial culture (TC0101). <i>Clostridium</i> spp – Anaerobic bacterial culture (TC0528). Fixed intestine, gizzard and proventriculus for histopathology (PC0006).	Live or freshly dead birds. For <i>Brachyspira</i> culture, fill the pot to 80% and seal with waterproof tape. Samples should preferably be received within 24 hours of being collected. Live or freshly dead birds. Fix material for histopathology as soon as possible.
Salmonellosis (diagnostic sampling for all ages)	Faeces and organs (spleen liver, caecum) for <i>Salmonella</i> culture (TC0025).	S. Pullorum and S. Gallinarum differ from other salmonellas in that they are best isolated from tissues. Serological tests available for S. Pullorum and Gallinarum.
Haemorrhagic enteritis virus of turkeys (all ages)	Fixed spleen for histopathology (PC0006). Fresh spleen for virus detection HEV/MSD AGIDT (TC0910).	-
Intestinal parasitism (all ages)	Faeces, caecal contents or intestinal contents for worm egg/coccidial oocyst count (TC0060) and worm identification (microscopy - TC0580; parasite ID - TC0616).	-
Viral enteritis (all ages)	Fresh intestine for virus isolation in tissue culture (TC0819).	Please discuss with an avian pathologist at APHA Lasswade before submitting.

Avian

Viral enteritis (chicks/poults)	Faeces or caecal contents for rotavirus PAGE (TC0582).	-
Viral enteritis (young birds)	Faeces or caecal contents for electron microscopy (TC0317).	-
Conditions of game birds (all ages)	Intestinal contents from freshly dead birds for microscopy for protozoa (TC0580).	Live or freshly dead birds necessary. Fixed intestine can also be of value for histopathology.

Lameness/recumbency

Condition/causes	Sample types and recommended tests	Further information
Lameness disorders	Carcases for PME. Fixed tissues for histopathology (PC0006). Fresh tissues (e.g., tendon, muscle, tibiotarsus, femoral head, skin), or charcoal swabs for primary bacterial culture (TC0101).	Tissues and swabs must be taken aseptically. Histopathology of growth plates (such as proximal tibia) required for rickets.
Viral involvement	Fresh tissues (e.g., tendon) for virus isolation in tissue culture (TC0819).	E.g., reovirus.
Mycoplasmal involvement	Fresh tissue (e.g., tendon, femoral head) or swabs (e.g., joint) for <i>Mycoplasma</i> DGGE/PCR (TC0672). Clotted blood for <i>Mycoplasma</i> serology (rapid slide agglutination - RSA). RSA test codes are TC0306/TC0308 (individual) and PC0932 (flock).	Samples for <i>Mycoplasma</i> detection should preferably be sent in <i>Mycoplasma</i> transport broth. RSA is for <i>M. gallisepticum</i> and <i>M. synoviae</i> . Minimum of 10 birds necessary for flock screen. Serum must be freshly taken and not haemolysed or frozen. RSA is not recommended for use in game birds. Western immunoblotting (TC0749) is also available.

Unevenness/poor condition in poultry

Condition/causes	Sample types and recommended tests
Enteric disorders, systemic infections & nutrition	Carcases for PME. Other testing as indicated by history and findings.

Loss of production in layers (i.e., egg drop, reduced egg quality)

Condition/causes	Sample types and recommended tests
Systemic infections and other causes	Blood – clotted for <i>Mycoplasma</i> serology (see lameness/recumbency), egg drop syndrome '76 HAIT (TC0908). Oropharyngeal and cloacal swabs for infectious bronchitis (see respiratory disease).

Conditions of the skin and feathers

Condition/causes	Sample types and recommended tests	Further information
Ectoparasites (mites, lice)	Whole parasites in ethanol, and in plain universal with damp cotton wool for ectoparasite microscopy (TC0081).	Correct identification of mite species is important in planning control measures.
Poxvirus	Fixed tissue for histopathology (PC0006). Fresh tissue for electron microscopy (TC0317). Virus isolation for pox virus (TC0817).	'Dry' pox form refers to lesions on skin, 'wet' pox to lesions in oral cavity.

Swollen head and upper respiratory disorders

Condition/causes	Sample types and recommended tests	Further information
Infectious coryza and other bacterial causes	Sinus swabs (or choanal cleft swabs in live birds) for primary bacterial culture (TC0101).	Take swabs aseptically. Use plain plastic or wire stemmed swabs pre-moistened in sterile distilled water, or charcoal transport swabs.
Mycoplasmosis	Conjunctival and tracheal swabs for <i>Mycoplasma</i> DGGE/PCR (TC0672). Clotted blood for <i>Mycoplasma</i> serology (see lameness/recumbency).	Ideally send swabs in <i>Mycoplasma</i> transport broth and sample several birds. Pooling swabs can reduce costs.
Avian meta-pneumovirus (aMPV, ART, TRT)	Oropharyngeal swab for aMPV RT-PCR (single swab - TC0786; pool of up to 5 swabs - TC0397). Clotted blood for ELISA (TC0940).	Do not use wooden swabs.

Avian

Infectious bronchitis (IB) and IB virus-like gamma coronaviruses	Oropharyngeal and cloacal swabs for IB virus RT-PCR (single swab - TC0787; pool of up to 10 swabs - TC0887). Clotted blood for IB HAIT single strain (TC091).	Do not use wooden swabs for PCR. Positive IB virus PCR results are followed up by sequencing of S1 gene to identify strain. 755/03, D1466, D274 are the strains currently available for HAIT. Interpretation of IB serology requires IB vaccination history. Paired serology recommended.
Respiratory cryptosporidiosis	Carcases or fresh or fixed heads for histopathology (PC0006).	<i>C. parvum</i> recognised in red grouse and occasionally other species.

Respiratory disorders

Condition/causes	Sample types and recommended tests	Further information
Infectious laryngo- tracheitis (ILT)	Fixed trachea for histopathology (PC0006). Fresh trachea for virus isolation in tissue culture (TC0819). Clotted blood for ILT SNT (TC0812).	Confirmatory diagnosis of ILT may be difficult in chronic stages. May also cause upper respiratory tract disease.
Gapeworm (syngamosis)	Carcases for PME. Fixed tissue for histopathology (PC0006).	There may be lung pathology to diagnose. Some <i>Syngamus</i> -like species parasitise the bronchi.
Bacterial and fungal pneumonia	Fresh lung or lung swabs for primary bacterial culture, fungal culture (TC0101). Fixed lung for histopathology (PC0006).	Causes include <i>E. coli</i> , <i>Ornithobacterium rhinotracheale</i> (ORT) and other <i>Pasteurella</i> -like organisms.

Nervous disorders

Condition/causes	Sample types and recommended tests	Further information
Bacterial encephalitis, listeriosis	Brain swab for primary bacterial culture (TC0101) and <i>Listeria</i> culture (TC0663). Fixed brain or peripheral nerves for histopathology (PC0006).	Aseptic sampling is essential for culture. For brain histopathology: fix one half of a sagittal section of the head with the brain <i>in situ</i> . Retain the other half

Avian

		of the brain fresh (unfixed) for other tests. Nerve histopathology can be useful even if no gross lesions are observed.
Marek's disease, avian encephalomyelitis	Fixed brain or peripheral nerve for histopathology (PC0006).	Brain and nerve as above.
Enterococcal encephalitis, crazy chick disease (vitamin E deficiency)	Fixed brain for histopathology (PC0006).	Brain as above.

Neoplasia

Condition/causes	Sample types and recommended tests	Further information
Viral disease (Marek's disease; rarely avian leukosis virus or other oncogenic viruses)	Carcases for PME or fresh tumour tissue. Fixed tumour, liver, spleen and nerve for histopathology (PC0006).	Retain fresh tissues frozen in case required for molecular testing, especially if unusual tumour distribution.

Infectious diseases of pheasants

Condition/cause	Sample types and recommended tests	Further information
Coronavirus Nephritis	Carcases for PME. Fixed kidney for histopathology (PC0006). Fresh caecal tonsil or swab for IBV RT-PCR (single swab or sample - TC0787; pooled swabs - TC0887).	Fresh kidney tissue can also be used for IBV PCR. Do not use wooden swabs.
Marble spleen Disease	Carcases for PME. Fixed spleen for histopathology (PC0006). Fresh spleen for virus detection HEV/MSD AGIDT (TC0910).	-

Infectious diseases of waterfowl

Condition/causes & age	Sample types and recommended tests	Further information
Duck viral enteritis (DVE) Duck viral hepatitis (DVH) Goose parvovirus (GPV)	Carcases for PME. Fixed tissues for histopathology (PC0006). Cloacal swabs or fresh tissues for PCR testing: • DVE PCR (TC0233) • DVH PCR (TC0234) • Goose Parvovirus PCR (TC0235) Fresh tissues for virus isolation in duck/goose eggs (TC0820). Clotted blood for DVE SNT (TC0906), DVH SNT (TC0907) and GPV AGIDT (TC0302).	Please contact the laboratory to discuss tissues of choice for histopathology. Do not use wooden swabs for PCR.

Duck septicaemia (*Riemerella anatipestifer*)

Condition/cause & age	Sample types and recommended tests	Further information
Duck septicaemia (<i>Riemerella anatipestifer</i>)	Carcases for PME. Swabs for primary bacterial culture (TC0101).	Aseptic swabs of brain tissue are particularly useful.

Cattle

Abortion and stillbirth

There is a statutory requirement to [report all bovine abortion cases to APHA](#) for brucellosis surveillance. Since the incursion of bluetongue virus serotype 3 (BTV-3) to England in 2024, consideration of BTV as a cause of abortion, stillbirth, and/or dummy neonates is advised. Bluetongue is a notifiable disease. Clinical suspicion must be [reported to APHA](#).

Investigation of cattle herd infertility requires a systematic approach. Where available, whole fetus, placenta, +/- maternal serum are the samples of choice. Please discuss individual herd problems and laboratory testing with a Veterinary Investigation Officer (VIO).

When investigating suspected cases of bovine venereal campylobacteriosis, *Campylobacter* culture and identification from sheath washings and vaginal mucus samples requires a specific sampling kit and submission form. Samples for this test (TC0098) should be sent to APHA Starcross VIC, ensuring arrival within 24 hours of sampling. Please consult a VIO before submitting these samples.

TC0015 can be applied to whole fetuses with placenta submitted to a VIC or to a complete set of samples submitted from on-farm investigations. This abortion package includes several test codes per sample type. Individual test codes can also be selected.

SCREEN 1 – standard testing (most common abortion causes)

Sample type	Recommended tests	Further information
Fetal stomach contents (FSC)	Bovine abortion package (TC0015): • Primary bacterial culture (TC0101) • <i>Campylobacter</i> culture (TC0026) • Wet preparation for fungi (TC0850)	FSC sample of choice for bacteriology. Cultures can be conducted on fetal lung or liver if no FSC is available. Placenta not generally suitable for culture due to gross contamination.
Placenta	Bovine abortion package (TC0015): • MZN smear (TC0033) • Wet preparation for fungi (TC0850)	MZN and wet preparation for fungi can be carried out on FSC if no placenta available.
Fresh fetal brain (brainstem is sample of choice)	Bovine abortion package (TC0015): • <i>Neospora</i> PCR (TC0852) • Schmallerberg PCR (TC0905)	Fixed heart should also be taken to confirm pathology associated with <i>Neospora</i> infection – detection alone by PCR is not sufficient to diagnose abortion. SBV PCR used in cases with typical arthrogryposis.
Fresh fetal thymus or spleen	Bovine abortion package (TC0015): • BVD PCR (TC0655)	-

Cattle

SCREEN 2 – additional testing, added as appropriate on a case-by-case basis to confirm diagnoses from Screen 1 or for less common causes of abortion.

Sample type	Recommended tests	Further information
Other fresh fetal tissues	Kidney – <i>Leptospira</i> PCR (TC0856) Liver – BoHV-1 PCR (TC0019)	-
Fixed fetal tissues	Histopathology (PC0006)	Fixed heart required for <i>Neospora</i> confirmation. Fixed thyroid useful to investigate goitre. Other fixed lesioned tissues as noted.
Maternal blood – clotted	Bovine abortion/stillbirth serology package A (PC0387): • <i>L. hardjo</i> bovis MAT (TC0456) • <i>N. caninum</i> ELISA (TC0175) Bovine abortion/stillbirth serology package B (PC0405): • BVD ELISA (TC0390) • IBR iELISA (TC0367) • <i>L. hardjo</i> bovis MAT (TC0456) • <i>N. caninum</i> ELISA (TC0175) • <i>L. hardjo</i> ELISA (TC0638)	Vaccination history required for interpretation. Single serology mainly useful as a monitoring tool in unvaccinated herds. MAT and ELISA for <i>L. hardjo</i> may be useful in abortion as IgM may have fallen by the time of the abortion and MATs detect active early infection.

Digestive/enteric disorders

The tests listed below are for postal samples on faeces. They are also included in the PME test code where appropriate.

Condition /causes and age category	Sample types	Recommended tests	Further information
1- to 5-day-old calves for: <i>E. coli</i> (K99 +ve), <i>Salmonella</i> , <i>cryptosporidia</i> , rotavirus, and coronavirus	Faeces or large intestinal contents (5g)	Enteric package for 1 – 5-day-old calves (PC0069): • Primary bacterial culture (TC0101) & <i>E. coli</i> adhesin test (TC0829) • <i>Salmonella</i> culture (TC0025) • Cryptosporidia smear (TC0492) • Rotavirus Ag ELISA (TC0583) • Coronavirus Ag ELISA (TC0186)	Individual components can be selected.
6- to 21-day-old calves for: <i>Salmonella</i> , <i>cryptosporidia</i> ,	Faeces or large intestinal contents (5g)	Enteric package for 6 – 21-day-old calves (PC0070): • <i>Salmonella</i> culture (TC0025)	Individual components can be selected.

Cattle

rotavirus, and coronavirus		• Cryptosporidia smear (TC0492) • Rotavirus Ag ELISA (TC0583) • Coronavirus Ag ELISA (TC0186)	
>22-day-old calves for: <i>Salmonella</i>, and endoparasitism	Faeces or large intestinal contents (10g)	Enteric package for young ruminants (TC0071): • <i>Salmonella</i> culture (TC0025) • Worm egg/coccidial oocyst count (TC0060)	Individual components can be selected.
>22-day-old calves for: Endoparasitism and fasciolosis	Faeces or large intestinal contents (50g)	Worm egg count and examination for fluke eggs (PC0064): • Worm egg/coccidial oocyst count (TC0060) • Fluke egg examination (TC0061)	Composite worm egg (TC0668; 10 x 3g) and fluke egg (TC0689; 10 x 5g) examinations are available but are usually used for monitoring rather than diagnostic purposes.
Adult cattle for: <i>Salmonella</i>, fasciolosis, and Johne's disease	Faeces or large intestinal contents (40g) and blood – clotted	Enteric package for adult cattle (PC0073): • <i>Salmonella</i> culture (TC0025) • Fluke egg examination (TC0061) • MAP Ab ELISA (TC0366)	Johne's disease testing is carried out by serology (ELISA). Additional tests such as faecal PCR (TC0693) can be requested for additional charge but require more faeces.
Adult cattle for: Fasciolosis	Faeces (40g+) Blood – clotted	Fluke egg examination (TC0061) 40g faeces Fluke egg herd screen (TC0689) 10 x 5g faeces Fluke Ab ELISA (TC0678)	Fluke eggs indicate presence of adult fluke, usually detectable 10-12 weeks post-infection and up to 21 days post-treatment. Antibodies detectable 2-3 weeks following exposure and remain high for several months post-treatment. Most informative in first season grazing animals to indicate exposure during the current grazing season.
Adult cattle for: Johne's disease	Faeces or large intestinal contents (5g) Blood – clotted	MAP PCR (TC0693) MAP culture (TC0713) MAP Ab ELISA (TC0366)	PCR can be conducted on pools of up to 5 samples. Confirmatory test is culture but long turnaround time. ELISA may identify infected animals earlier than faecal tests. Repeat testing of animals not showing a clear positive is recommended 1-3 months later.

Cattle

			Milk and blood ELISA should not be performed between 6 and 10 weeks of a tuberculin skin test.
All ages for: Winter dysentery (coronavirus-associated diarrhoea)	Blood – paired clotted	Paired ELISA Ab test (TC0176)	Usually seen in housed adult dairy cattle. Typically, has high morbidity but low mortality with spontaneous recovery in a few days. Paired testing advised as results from a single sample are difficult to interpret.
All ages for: Persistent BVD infection and mucosal disease	Blood –clotted	BVD Ag ELISA (TC0772) and Ab ELISA tests (TC0390) In calves ≤ 30 days old, use BVD PCR (TC0655)	-
All ages for: Acute BVD infection	Blood – clotted	Paired BVD Ab ELISA (TC0390) BVD PCR on acute serum (TC0655)	Diagnosis of acute infection by antibody ELISA requires paired acute and convalescent sera collected 3 weeks apart.
All ages for: Enteric disorders	Tissues or organs package from on-farm PME	Carcase viscera including tests for examination and/or test allocation by a VIO, excluding disposal (TC0005)	Discuss with a VIO prior to submission.

III thrift

The tests listed below are for postal samples. They are also included in the PME test code where appropriate.

Condition/ causes	Sample types	Recommended tests	Further information
Adult, pre- and post- weaned: endoparasitism and fasciolosis	Faeces or large intestinal contents (50g) Blood – clotted	Worm egg count and examination for fluke eggs (PC0064): - Worm egg/coccidial oocyst count (TC0060) - Fluke egg examination (TC0061) Fluke Ab ELISA (TC0678)	Individual components may be selected. Composite worm egg (TC0668; 10 x 3g) and fluke egg (TC0689; 10 x 5g) examinations available but usually used for monitoring rather than diagnostic purposes. Presence of fluke eggs indicates presence of adult fluke, usually detectable 10-12 weeks post-infection and up to 21 days post-treatment. Antibodies detectable 2-3 weeks following exposure and remain high for several months post-treatment. Most informative in first season grazing animals to indicate exposure in current grazing season.

Cattle

Adult: Johne's disease	Faeces (5g) Blood – clotted	MAP PCR (TC0693) MAP culture (TC0713) MAP Ab ELISA (TC0366)	PCR can be carried out on a pool of up to 5 samples. Culture is gold standard confirmatory test but long turnaround time. ELISA may identify infected animals earlier than faecal tests. Repeat testing is recommended 1-3 months later for unclear positives. Blood ELISA should not be performed within 6 and 10 weeks of a tuberculin skin test, respectively (or results interpreted with caution).
Trace element deficiency	Carcase	PME	Contact VIO for sampling advice other than PME, e.g. liver copper and selenium assays (or other trace elements) on liver or blood samples.
Persistent BVD infection and mucosal disease	Blood – clotted	BVD Ag ELISA (TC0772) and Ab ELISA tests (TC0390)	In calves ≤ 30 days old, use BVD PCR (TC0655).

Respiratory disorders

The tests listed below are for postal samples. They are also included in the PME test code where appropriate.

Condition/ Causes	Sample types	Recommended tests	Further information
Bacterial respiratory pathogens	Guarded long NP swab or BAL samples or charcoal lung swab	Primary bacterial culture (TC0101) from on-farm samples	Sear lung surface, incise and swab with a charcoal swab, or use a sterile scalpel, to avoid contamination. Send samples to arrive at laboratory next day. Sensitivity testing is run if a pathogen is isolated.
Viral respiratory pathogens	Nasopharyngeal swab or BAL samples or fresh lung	Respiratory virus multiplex PCR BoHV-1, PI3, BRSV (TC0019)	Use plain (not wooden) swabs. Avoid sampling in chronic phase. For PME samples, include fresh trachea. Nasopharyngeal (NP) swabs generally preferred over nasal as sample more representative of significant pathogens.

Cattle

Package A for: IBR, RSV, PI3, BVD	Blood – paired, clotted	Bovine respiratory disease serology package A (PC0384): • IBR iELISA (TC0367) • RSV ELISA (TC0379) • PI3 ELISA (TC0376) • BVD ELISA (TC0390)	Paired acute and convalescent sera collected 2 -3 weeks apart. Ensure blood tubes are fully filled. Individual components may be selected. An IBR gE-deleted iELISA is also available (TC0860).
Package B for: IBR, RSV, P13, BVD, <i>Mycoplasma bovis</i> and <i>Histophilus somni</i>	Blood – paired, clotted	Bovine respiratory disease serology package B (PC0385): • IBR iELISA (TC0367) • RSV ELISA (TC0379) • PI3 ELISA (TC0376) • BVD ELISA (TC0390) • H. somni CFT (TC0364) • M. bovis ELISA (TC0400)	Paired acute and convalescent sera collected 2 -3 weeks apart. Ensure blood tubes fully filled. Individual components may be selected. IBR gE-deleted iELISA also available (TC0860).
<i>Mycoplasma</i> spp.	Guarded long nasotracheal swabs or BAL samples or fresh lung	<i>Mycoplasma</i> DGGE/PCR (TC0672)	Use plain (not wooden) swabs. Sample in acute phase of disease.
Malignant Catarrhal Fever	Blood - heparin	OvHV-2 PCR (TC0747)	-
<i>Dictyocaulus</i> (lungworm)	Faeces (50g) Blood - clotted	Baermann examination (TC0062) <i>D. viviparus</i> Ab ELISA (TC0507)	Positive Baermann result indicates patent infection. Baermann examination will be negative in the pre-patent phase. Positive antibody ELISA result indicates exposure in current/recent grazing season, but not necessarily current patent infestation. Haematology (EDTA blood) can provide useful supportive evidence of relative or absolute eosinophilia.

Cattle

Respiratory disorders	Tissues or organs from on-farm PME	Carcase viscera for examination and test allocation by a VIO, excluding disposal (TC0005)	Discuss with a VIO prior to submission.
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Sudden death or downer cow

Anthrax should always be considered in cases of sudden death. Clinical suspicion must be [reported to APHA](#). Submission of a carcass for PME (TC0002) is the preferred diagnostic approach for sudden death (following triage for anthrax), especially where there is no suspected cause. Please discuss all cases of suspected or confirmed poisoning in food animals with a VIO, as voluntary measures to control contamination of the food chain may be requested. In rare circumstances, statutory controls may be required under the Food & Environmental Protection Act (FEPA).

Condition/causes	Sample types	Recommended tests	Further information
Systemic disorders	Carcass	PME	PME enables full diagnostic investigation of possible causes.
Hypomagnesaemia	Carcass	PME	Contact VIO for sampling advice other than PME.
Blackleg (<i>Clostridium chauvoei</i>)	Carcass Impression smears or muscle Fixed muscle lesion	PME FAT (TC0032) Histopathology (PC0006)	Carcass submission preferred. Four air-dried impression smears of cut surface of muscle or whole lesion can be submitted in a sealed container.
Lead poisoning	Carcass	PME	Please discuss all cases of suspected or confirmed poisoning in food animals with a VIO. Contact VIO for sampling advice other than PME.
Toxins and plant poisoning	Carcass and/or suspected substance	PME	History may be suggestive. Carcass submission preferred.
Botulism	Carcass	PME On-farm samples	May be a diagnosis of exclusion, following rule-out of other sudden death causes. Carcass submission preferred; discuss on-farm samples with a VIO.

Cattle

Nervous disorders

Investigation of fatal cases of nervous disease often requires examination of the whole brain. Submission of a carcase for PME is the preferred diagnostic approach. Testing for bovine spongiform encephalopathy (BSE) is required in all fallen cattle over the age of 48 months at an approved sampling site. BSE is a notifiable disease; clinical suspicion must be [reported](#).

Condition/causes	Sample type	Recommended test	Further information
Infectious causes e.g., listeriosis	Carcase Fresh brain	PME Carcase viscera package	Carcase submission preferred. Contact VIO for sampling advice other than PME.
Cerebrocortical necrosis	Carcase	PME	Carcase submission preferred. In the live animal, response to treatment may give an indication of diagnosis.
Hypomagnesaemia	Carcase	PME	Contact VIO for sampling advice other than PME.
Nervous acetonaemia	Carcase	PME	Contact VIO for sampling advice other than PME.
Lead poisoning	Carcase	PME	Please discuss all cases of suspected or confirmed poisoning in food animals with a VIO. Contact VIO for sampling advice other than PME.

Herd level milk drop

A systematic approach is required to investigate the many potential non-infectious and infectious causes of herd level milk drop in dairy herds. Laboratory investigations can be important. Please discuss individual herd problems and potential laboratory testing with a VIO. The table below lists some infectious causes to consider. Notifiable diseases, such as bluetongue, should also be considered. Paired serology can be helpful.

Condition/causes	Sample type	Recommended test	Further information
Herd level milk-drop (suspected infectious cause)	Blood – paired, clotted	Paired serology: • IBR iELISA (TC0367) • L. hardjo bovis MAT (TC0456) • L. hardjo ELISA (TC0638) • Schmollenberg ELISA (TC0865)	Contact VIO for sampling advice. (Results from a single sample are difficult to interpret, so paired advised.)
Herd level milk-drop with diarrhoea (suspected infectious cause)	Blood – paired, clotted Faeces	Paired ELISA Ab test for coronavirus (TC0176) <i>Salmonella</i> culture (TC0025)	Contact VIO for sampling advice. Coronavirus ELISA results from a single sample are difficult to interpret, so paired is advised.

Cattle

Other syndromes

The tests listed below are for postal samples. They are also included in the PME test code where appropriate.

Condition /causes	Sample types	Recommended tests	Further information
Mastitis	Milk	Milk culture (TC0544) <i>Mycoplasma</i> DGGE/PCR (TC0672)	Aseptic collection technique essential. Diagnosis of mycoplasmal mastitis is based on clinical history, milk appearance and exclusion of other bacterial causes.
Skeletal disorders	Carcase	PME	PME allows bones and joints to be examined and samples collected.
Nutritional myopathy – white muscle disease	Carcase Fixed tissues	PME Histopathology (PC0006)	Contact VIO for other sampling advice, e.g. on bloods.
Nodular skin disease	Fixed tissues (skin biopsies) +/- scab material	Histopathology (PC0006)	Suspicion of notifiable disease including enzootic bovine leukosis (EBL) and lumpy skin disease (LSD) must be <u>reported</u> .
Other skin disease (non-nodular) e.g., lice, dermatophilosis & dermatophytosis	Skin scrape, scab material, hair plucks +/- skin biopsies	Ectoparasite examination (TC0081) Bacterial culture (TC0101) Ringworm Culture (TC0080) Histopathology (PC0006)	Histopathology can be useful in more complex cases.

Small ruminants (sheep, goats)

Abortion and stillbirth

We encourage vets to take samples from aborted fetuses in the first instance. If abortions continue, submission of the fetus, placenta and maternal serum is recommended. Submission of a ewe may be advisable where there is maternal illness. VIOs are happy to offer advice on cases and sample collection. APHA's [sheep abortion sampling guide](#) can be printed and laminated for use on farm.

A summary of suitable samples for complete abortion investigation is below. Tests are added sequentially, first testing for EAE, then undertaking bacteriology and toxoplasma testing. Individual components can alternatively be selected. To test samples under TC0011 or TC0012, all samples listed should be obtained.

Sample types	Recommended tests	Further information
Placenta	Small ruminant abortion package (TC0011/12): • MZN smear (TC0033) • Toxoplasma gondii PCR (TC0858) • Wet preparation for fungi (TC0850)	MZN smear assesses for organisms consistent with EAE, Q fever, and <i>Brucella</i> . A positive result on a stained smear confirms EAE. Where Q fever is suspected on a stained smear, PCR will be actioned.
Fetal stomach contents (FSC)	Small ruminant abortion package (TC0011/12): • Primary bacterial culture (TC0101) • <i>Campylobacter</i> culture (TC0026) • Wet preparation for fungi (TC0850)	FSC is the sample of choice for bacteriology. Cultures can be conducted on placenta (if free from gross contamination), or fetal lung or liver if no FSC is available.
Fresh fetal brainstem	Small ruminant abortion package (TC0011/12): • Schmallerberg PCR (TC0905)	For fetuses with arthrogryposis.
Fresh fetal thymus or spleen	Small ruminant abortion package (TC0011/12): • Border disease virus PCR (TC0755)	Typically a second-line test where other causes of abortion have already been excluded.
Fetal tongue	Small ruminant abortion package (TC0011/12): • <i>Toxoplasma gondii</i> PCR (TC0858)	Use if no placenta is available. Less sensitive than placenta and the result is non-accredited.

Small ruminant

Fixed fetal tissues	Histopathology (PC0006)	Fixed lesioned tissue, placenta (cotyledons and intercotyledonary areas), heart, thyroid, lung, liver, kidney, and brain may be useful.
Maternal blood – clotted	<i>Chlamydophila abortus</i> Ab ELISA (TC0801)	-
	<i>Toxoplasma gondii</i> Ab LAT (TC0383)	-
	Border disease virus Ab ELISA (TC0292)	If seroprevalence is high or circulating virus is detected, consider a PI hunt.
	Border disease virus PCR (TC0755)	If seroprevalence is high or circulating virus is detected, consider a PI hunt.

Downer sheep

Condition/ causes	Sample type	Recommended tests	Further information
Systemic disorders	Carcases	PME	<i>Listeria</i> culture alone not sufficient for diagnosis as <i>L. monocytogenes</i> may be a contaminant.
Hypo-calcaemia or hypo-magnesaemia	Carcase	PME	Contact VIO for sampling advice other than PME.
Lead poisoning	Carcase	PME	Please discuss all cases of suspected or confirmed poisoning in food animals with a VIO. Contact VIO for sampling advice other than PME.
Toxins and plant poisoning	Carcase and/or suspected substance	PME	History may be suggestive. Carcase submission preferred.
Botulism	Carcase	PME On-farm PME samples	Carcase submission preferred. Botulism can be a diagnosis of exclusion following rule-out of other causes of sudden death. Contact VIO for sampling advice other than PME.

Enteric disorders

Condition /causes and age category	Sample types	Recommended tests	Further information
Enteric disorders (all ages)	Tissues or organs	Carcase viscera including tests, excluding disposal (TC0005)	Whole tissues or organs can be submitted from on-farm PMEs for examination and/or test allocation by a VIO.
<i>E. coli</i>, <i>Salmonella</i>, cryptosporidia, rotavirus (lambs / 1-5-day-old kids)	Faeces (5g)	Enteric package 1- 5-day old small ruminants including goats (PC0059): • Primary bacterial culture (TC0101) & <i>E. coli</i> adhesin test (TC0829) • <i>Salmonella</i> culture (TC0025) • Cryptosporidia smear (TC0492) • Rotavirus PAGE (TC0582)	Individual components may be selected. A composite worm egg count (TC0668; 10 x 3g) is available but is usually used for monitoring rather than diagnostic purposes.
<i>Salmonella</i>, cryptosporidia, rotavirus (lambs / 6-21-day-old kids)	Faeces (5g)	Enteric package 6- 21-day old small ruminants including goats (PC0066): • <i>Salmonella</i> culture (TC0025) • Cryptosporidia smear (TC0492) • Rotavirus PAGE (TC0582)	-
<i>Salmonella</i>, endoparasitism (lambs/ >3-week-old kids)	Faeces (10g)	Enteric package young ruminants (PC0071): • <i>Salmonella</i> culture (TC0025) • Worm egg/coccidial oocyst count (TC0060)	-

Small ruminant

<i>Salmonella</i>, fasciolosis, Johne's disease, endoparasitism (adults)	Faeces (40g)	Enteric package adult sheep and goats (PC0075): • <i>Salmonella</i> culture (TC0025) • Fluke egg examination (TC0061) • Johne's disease smear (TC0776) • Worm egg/coccidial oocyst count (TC0060)	Individual components may be selected. Fasciolosis and Johne's disease do not always present with diarrhoea. Adult sheep usually acquire immunity to enteric parasites.
Johne's disease	Faeces Blood - clotted	MAP PCR (TC0693) MAP culture (TC0713) MAP Ab ELISA (T0366)	Diagnosis in sheep may require PME as ELISA and faecal microscopy are less useful compared to cattle. PCR is not validated in non-bovines. Culture is gold standard confirmatory test but long turnaround time.

III thrift

Condition /causes and age category	Sample types	Recommended tests	Further information
Endoparasitism (young animals)	Faeces	Worm egg/coccidial oocyst count (TC0060)	Further information on investigation of anthelmintic resistance is available through SCOPS .
Border disease (young animals)	Blood – clotted	BDV Ab ELISA (TC0292)BDV PCR (TC0755)	Often a history of abortions/hairy shaker lambs earlier in the year.
Endoparasitism, fasciolosis (adults)	Faeces Serum	Worm egg count and fluke egg examination (PC0064) 40g faeces: • Worm egg/coccidial oocyst count (TC0060) • Fluke egg examination (TC0061) Fluke Ab ELISA (TC0678)	Individual components may be selected. PME may be indicated where worm egg counts are persistently high or wasting/scour is seen with low worm egg counts. Composite worm egg (TC0668; 10 x 3g) and fluke egg (TC0689; 10 x 5g) examinations are available but are usually used for monitoring rather than diagnostic purposes. Further information on investigation of anthelmintic resistance: SCOPS .

Small ruminant

Johne's disease (adults)	Faeces Blood – clotted	MAP PCR (TC0693) MAP culture (TC0713) MAP Ab ELISA (TC0366)	Diagnosis in sheep may require PME as ELISA and faecal microscopy are less useful compared to cattle. PCR is not validated in non-bovines. Culture is the gold standard confirmatory test but long turnaround time.
Maedi Visna (adults)	Blood – clotted	MV AGIDT (TC0373) MV Ab ELISA (TC1529)	-
Ovine pulmonary adenocarcinoma (OPA – adults)	Fixed tissues	Histopathology (PC0006)	-
Copper deficiency	Carcase	PME	Contact VIO for sampling advice other than PME.
Vitamin B12 (cobalt) deficiency	Carcase	PME	Contact VIO for sampling advice other than PME.

Locomotor disorders

Condition /causes and age category	Sample types	Recommended tests	Further information
Arthritis due to <i>Streptococcus dysgalactiae</i> (young animals)	Joint fluid or swab	Primary bacterial culture (TC0101)	Most commonly affects the carpal and tarsal joints. Use charcoal swabs.
Maedi Visna (adult)	Blood – clotted	AGIDT (TC0373) Ab ELISA (TC1529)	Sporadic cases in affected flocks. Nervous form of disease may present as uncoordinated gait.
Arthritis due to <i>erysipelas</i> (all ages)	Joint fluid or swab Blood – clotted	Primary bacterial culture (TC0101) SAT (TC0361)	Charcoal swabs recommended.
Nutritional myopathy	Carcase	PME	Contact VIO for sampling advice other than PME.

Small ruminant

Chronic lead exposure	Carcase	PME	Chronic low-level exposure in lead mining areas can cause osteoporosis and brittle bones, manifesting as stiffness and pathological fractures. Discuss suspected or confirmed cases with a VIO.
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Skin disorders

Condition /causes and age category	Sample types	Recommended tests	Further information
Orf (all ages)	Scab material	Electron microscopy (TC0082)	-
Bacterial (all ages)	Swab	Primary bacterial culture (TC0101)	-
Sheep scab, lice (all ages)	Skin scrape / wool pluck Blood – clotted	Ectoparasite examination (TC0081) Sheep Scab ELISA	Do not use liquid paraffin. Sample margin. Contact VIO for sampling advice.
Dermatophilosis (all ages)	Wool pluck	Stain and microscopy (TC0033) Primary bacterial culture (TC0101)	Sample abnormal wool.

Respiratory disorders

Condition /causes and age category	Sample types	Recommended tests	Further information
Respiratory disorders (all ages)	Tissues or organs	Carcase viscera including tests, excluding disposal (TC0005)	Whole tissues or organs can be submitted from on-farm PMEs for examination and/or test allocation by a VIO.
Maedi Visna (adult)	Blood – clotted Fixed lung	MV AGIDT (TC0373) MV Ab ELISA (TC1529) Histopathology (PC0006)	Histological changes may occur in other tissues including brain. Whole carcass submission may be preferred.
Ovine pulmonary adenocarcinoma (adult)	Fixed lung	Histopathology (PC0006)	-

Small ruminant

Pasteurellosis and other bacterial pneumonia (all ages)	Charcoal lung swab	Primary bacterial culture (TC0101)	<i>Pasteurella</i> and <i>Mannheimia</i> species most commonly. Sear surface of lung before incising and swabbing with a charcoal swab or use sterile scalpel to incise to avoid contamination. Send samples for culture to arrive at laboratory next day. Sensitivity testing is undertaken if a pathogen is isolated.
Mycoplasmosis (all ages)	Lung	DGGE/PCR (TC0672)	-

Nervous disorders

Scrapie is a notifiable disease. Clinical suspicion must be [reported](#).

Condition /causes and age category	Sample types	Recommended tests	Further information
Drunken lamb syndrome/ nephrosis (pre-/post-weaned)	Blood, carcase	PME	Two distinct age groups affected: 10-days to 4-weeks-old and 2-4-months-old. Studies suggest initial clinical signs are mainly due to metabolic acidosis in the younger age group, not due to kidney failure/nephrosis.
Louping ill (all ages)	Carcase Brain Serum	PME Histopathology (PC0006) HAIT (TC0391)	Carcase submission preferred. Louping ill is zoonotic.
Nervous disorders (all ages)	Carcase	PME	Certain diagnoses e.g., listerial meningitis, cerebrocortical necrosis, are best reached through submission of carcasses.
Hypocalcaemia, pregnancy toxaemia, hypomagnesaemia	Carcase	PME	listeriosis should also be considered. Consult VIO for sampling advice other than PME.
Lead	Carcase	PME	Blindness, convulsions and head pressing can be seen. Discuss suspected or confirmed cases with a VIO. Consult VIO for sampling advice other than PME.

Sudden death

Always consider and [report](#) clinical suspicion of anthrax.

Condition /causes and age category	Sample type	Recommended tests	Further information
Sudden death (all ages)	Carcase	PME	PME enables full diagnostic investigation of possible causes.
Clostridial enterotoxaemia/ pulpy kidney (all ages)	Small intestinal contents	<i>Clostridium perfringens</i> toxin test ELISA (TC0035)	Specify toxins to be tested. Send contents from affected portion of bowel – if not obviously affected pool contents from at least 3 ileal sites. Remove contents from intestine before sending.
Pasteurellosis (all ages)	Lung, liver	Primary bacterial culture (TC0101)	Culture of multiple organs advised to detect systemic distribution.
Toxins and plant poisoning (all ages)	Carcase and/or suspected substance/ plant	PME	History may be suggestive. Carcase submission preferred.

Mastitis

Condition /causes and age category	Sample type	Recommended tests	Further information
E.g., <i>Staphylococci</i>, <i>Pasteurellaceae</i>, coliforms (adult)	Milk	Primary bacterial culture (TC0101)	Consider inadequate nutrition of the ewes as underlying cause.

Pigs

Sampling of pigs

Veterinarians are encouraged to discuss diagnostic investigations with a VIO prior to submission of samples. You must speak to a VIO before submitting pigs for PME. Please provide a fully completed [porcine submission form](#) that includes a full clinical history as well as information on medication and vaccination.

For PME, consider submitting a batch of up to three pigs, typical of the clinical problem being investigated. It is sometimes appropriate to [submit pigs live](#), if they are fit to travel and their welfare is not likely to be compromised during transport. This should be discussed with the vet at the VIC or PME site before submission.

Test codes for PME submissions of pigs are:

- TC0017 – neonatal piglets
- TC0002 – all other age groups

Reproductive disease

Fetopathy e.g. abortion, stillbirth, weak piglets at birth:

Guidance for veterinarians investigating porcine abortions, stillbirths and mummified piglets is [available via GOV.UK](#).

Condition/causes	Sample type and recommended tests	Further information
Suspected infectious cause	Fetus/stillborn/weak piglets and placentas submitted for abortion/stillbirth investigation (TC0011 one litter, TC0012 two litters). If whole fetuses or stillborn piglets and placentas cannot be submitted, vets can follow guidance to examine and collect samples from abortion or stillbirth material.	Diagnostic testing at discretion of VIO to include testing for PRRS, leptospirosis, bacterial/fungal causes and heart histopathology.
Porcine Reproductive and Respiratory Syndrome (PRRS)	Fresh fetal thymus, spleen or lung, or maternal serum for PRRSV PCR (TC0718).	Detection of PRRS in abortion material may require multiple samples. Fetal tissue preferable but sometimes virus only detected in serum from aborting sow. PRRSV serology useful in sows if not vaccinated to show exposure but is only diagnostic if paired. Sows should be sampled at the time of abortion. Pooled PRRSV PCR (TC0918) is only validated for growing pigs, not adult pigs.
Porcine parvovirus (PPV)	Fresh fetal heart, fetal fluid e.g. pleural fluid for PPV HAIT (TC0375). PPV PCR is only available as part of whole litter abortion/stillbirth investigations.	Fetal serology by HAIT is only useful if fetuses are immunocompetent at ≥ 70 days gestation. Hearts of mummified fetuses can also be tested by PCR.

Pigs

Leptospirosis	Fresh fetal kidney for pathogenic <i>Leptospira</i> PCR (TC0856). Serum for <i>Leptospira</i> MAT to all 19 serovars, tested in 6 pools (TC0399). Paired serology is not usually useful in reproductive disease investigation as maternal seroconversion has often already occurred by the time disease manifests.	Autolysis may interfere with PCR. Histopathology (liver, kidney) can provide supportive evidence. Positive PCR results should be followed up with serology in recovered or in-contact pigs in the affected cohort to identify infecting serovar. Antibody titres fall rapidly so sample as soon as possible after clinical incident. Leptospirosis is zoonotic.
Swine influenza	Maternal nasal swabs (plain) for swine influenza PCR (TC0771). Maternal paired sera for swine influenza HAIT serology (TC0160).	Do not use wooden swabs. Consider if sows are showing transient pyrexia, malaise and/or respiratory signs alongside reproductive disease. Pigs sampled for virus must be in the first few days of infection. Testing for virus is free of charge (not serology). Serology not advised in influenza vaccinated pigs.
Erysipelas, other bacterial causes & fungi	Fetal stomach contents (liver is second choice) for primary bacterial culture (TC0101).	Collect from stomach using a plain vacutainer to limit contamination. Do not pool from different fetuses. Histopathology on placenta also useful to confirm fungal placentitis.
PCV2 or PCV3-associated fetopathy	Fetal heart (fresh and fixed) for histopathology (PC0006).	PCV-2 IHC and PCV3 ISH will be progressed if myocarditis identified.

Infertility (no fetopathy):

Condition/causes	Sample type and recommended tests	Further information
Common infectious causes	Maternal serum for serology: • PRRSV ELISA (TC0412) • PPV ELISA (TC0669) • Erysipelas SAT (TC0361) • Swine influenza HAIT (TC0160) • <i>Leptospira</i> ○ Bratislava (TC0451) or all 19 <i>Leptospira</i> serovars (TC0399) Maternal serum for PRRSV PCR (TC0718)	Many regular returns-to-service are physiological or managerial. Serology unlikely to achieve a diagnosis but can rule out pathogen involvement. Serology not advised for pathogens for which sows are vaccinated. Paired serology rarely possible as, by the time infertility manifests, the sow has seroconverted. It may be achievable by bleeding cohorts of sows or gilts at service and rebleeding. Testing for PRRSV virus in the weeks following vaccination may detect live vaccine virus – refer to datasheet.

Pigs

Enteric disorders

[Porcine epidemic diarrhoea \(PED\)](#) is [notifiable](#) in England and Scotland. Suspicion must be [reported](#). A PEDV/TGEV/ PDCoV PCR is completed on all diarrhoeic/enteropathy pig submissions at no charge.

All ages:

Condition/causes	Sample types and recommended tests	Further information
Enteric disorders	Carcases for PME. Tissues or organs from on-farm PMEs for examination and/or test allocation by a VIO (TC005 – excludes disposal).	A batch of three pigs is ideal. Submission of live pigs may be preferred if agreed by PME centre. Where possible, submit untreated pigs.
Salmonellosis	Intestinal contents or faeces for <i>Salmonella</i> culture (TC0025).	Rare in neonates and uncommon preweaning. <i>Salmonella</i> is zoonotic.
Transmissible gastro-enteritis including PED	Intestinal contents or faeces for PEDV/TGEV/ PDCoV PCR (TC0398). Paired sera for TGEV antibody ELISA (TC0488).	PED is notifiable . PCR is the method of choice for diagnosis.

1- to 5-day-old pigs:

Condition/causes	Sample types and recommended tests	Further information
<i>E. coli</i>, rotaviral enteritis	Faeces or intestinal contents (5g) for neonatal enteric package for 1–5-day-old pigs (PC0067): • Primary bacterial culture (TC0101) • Rotavirus PAGE (TC0582)	Individual components may be selected. Antimicrobial sensitivity testing and <i>E. coli</i> virulence gene PCR (TC0330) completed where appropriate. Clostridial toxins may be requested, subject to an additional charge per toxin. Hypogammaglobulinaemia test available on clotted bloods from piglets up to 1-week-old, subject to additional charge.
<i>E. coli</i>	Intestinal contents, faeces or charcoal swabs for primary bacterial culture (TC01010) and <i>E. coli</i> virulence gene PCR (TC0330) where applicable. Fixed intestine for histopathology (PC0006).	Histopathology required for diagnosis of disease due to attaching and effacing <i>E. coli</i> . Intestines must be fixed within minutes of death. Submission of live pigs may be preferred if agreed with PME centre.
Rotaviral enteritis	Intestinal contents or faeces (3g) for rotavirus PAGE (TC0582).	-

Pigs

Clostridium perfringens enterotoxaemia	Small intestinal contents (preferred) or faeces for <i>Clostridium perfringens</i> toxin (TC0035). State which toxins to be tested: • Type A – alpha only • Type B – alpha, beta, epsilon • Type C – alpha and beta • Type D – alpha and epsilon.	Types C and A (milder) are mainly diagnosed in pigs. Note that beta toxin is labile. Need 0.5ml intestinal contents per pig, do not pool. Confirming type A should include histopathology for supportive evidence.
Cryptosporidiosis	Intestinal contents or faeces for cryptosporidium smear and ID (TC0492).	Rarely diagnosed in pigs, zoonotic.
Coccidiosis	Intestinal contents or faeces (3g) for coccidial oocyst count (TC0702).	Absence of oocysts does not rule out diagnosis. Histopathology may be required. Oocyst speciation available at extra cost (TC0648).

6-day to 6-week-old pigs:

Condition/ causes	Sample type and recommended tests	Further information
<i>E. coli</i>, rotaviral enteritis, salmonellosis	Faeces or intestinal contents (5g) for pre- and peri- weaned enteric package (PC0068): • Primary bacterial culture (TC0101) • Rotavirus PAGE (TC0582) <i>Salmonella</i> culture (TC0025)	Individual components may be selected. Antimicrobial sensitivity testing and <i>E. coli</i> virulence gene PCR (TC0330) completed where appropriate. Coccidial oocyst count available at additional charge.
Bowel oedema	Distal small intestinal contents, charcoal swab of contents or faeces for primary bacterial culture (TC0101) and <i>E. coli</i> virulence gene PCR (TC0330) if applicable.	Nervous signs most frequently in recently weaned pigs. Due to Shiga toxin (stx2e) producing <i>E. coli</i> . Isolation of stx2e producing <i>E. coli</i> more likely from untreated cases. Brain histopathology can be supportive.

>6-week-old to adult pigs:

Condition/ causes	Sample type and recommended tests	Further information
<i>Brachyspira</i> spp, salmonellosis	Intestinal contents or faeces (10g) for grower-adult package: • <i>Brachyspira</i> culture (TC00331) • <i>Brachyspira</i> PCR (TC0495) • <i>Salmonella</i> culture (TC0025)	Individual components may be selected. Fill container with freshly voided faeces or LI contents to below brim (anaerobic). <i>Brachyspira</i> culture and PCR recommended together. In addition to <i>B. hyodysenteriae</i> (swine dysentery) and <i>B. pilosicoli</i> , these tests may detect other

Pigs

		uncommon <i>Brachyspira</i> species, e.g., <i>B. suanatina</i> , <i>hampsonii</i> . One <i>B. hyodysenteriae</i> isolate per submission sent for antimicrobial sensitivity testing and whole genome sequencing at no charge.
<i>Lawsonia intracellularis</i>	Fixed ileum for histopathology (PC0006). Fresh ileum for MZN smear (TC0033). Intestinal contents or faeces for <i>Lawsonia</i> PCR (TC0657).	Several forms exist (necrotic ileitis, proliferative enteropathy, haemorrhagic enteropathy). Very fresh material is required for MZN smears which can be insensitive. PCR alone is not diagnostic. Silver stains may be added where histopathology lesions are suggestive.
<i>Trichuris</i> or nematode colitis – <i>Hyoststrongylus</i> & <i>Ascaris</i> spp	Faeces for worm egg/coccidial oocyst count (TC0060)	Egg output can be low. <i>Hyoststrongylus</i> species associated with anaemia and ill thrift.
Gastric ulceration, intestinal torsion	Carcase for PME	PME enables full diagnostic investigation of possible underlying factors.

Respiratory disorders

Condition/ causes	Sample type and recommended tests	Further information
Respiratory disorders	Carcase for PME. Carcase viscera including tests, excluding disposal (TC0005).	Commonly involves multiple pathogens. Batch of up to three pigs/plucks ideal, from severe, untreated cases early in the course of disease.
PRRS	Fresh lung (or spleen, lymph node, serum) for PRRSV PCR (Individual – TC0718; pooled [up to 5 sera, rearing pigs only] – TC0918). PCR-positive tissue or serum for PRRSV ORF5 sequencing (TC0118). Paired sera for PRRSV Ab ELISA (TC0412). Fixed lung for histopathology (PC0006) and PRRSV IHC (TC1402).	Include PRRS vaccination history on the submission form. Testing in the weeks following vaccination may detect live vaccine virus – refer to vaccine data sheets. Sequencing differentiates vaccine-like virus strains from others. Serology can be useful in unvaccinated pigs. Multiple samples are recommended for lung histopathology. PRRSV IHC is progressed at no charge on subsidised diagnostic submissions if deemed appropriate. Otherwise charged.

Pigs

PCV2-associated respiratory disease	Fixed lymph node and lung for histopathology (PC0006) and PCV-2 IHC (TC1402).	If lymphoid lesions are seen with viral inclusions, PCV-2 IHC is not progressed by APHA as not necessary for diagnosis. Inguinal and mesenteric lymph nodes plus lesioned tissues are examined.
Swine influenza	Pooled tonsil, trachea and lung or plain nasal swabs for swine influenza PCR (TC0771). Paired sera for swine influenza HAIT (TC0160).	<u>Testing for virus is free of charge.</u> Pooled tissues from up to 3 pigs, or nasal swabs from up to 12 pigs are eligible. Serology is not eligible. Do not pool tissues from different pigs. Pigs sampled for virus must be in the first few days of infection. Do not use wooden swabs. Serology completed using four strains of swine influenza A virus and can be useful in unvaccinated pigs.
Enzootic pneumonia (<i>Mycoplasma hyopneumoniae</i>)	Fresh lung for <i>Mycoplasma</i> DGGE/PCR (TC0672). Fixed lung for histopathology (PC0006). Paired sera for <i>M. hyopneumoniae</i> Ab ELISA (TC0446).	DGGE-PCR also detects <i>M. hyorhinis</i> which can cause EP-like lesions. Histopathology is not diagnostic but aids interpretation of detection by DGGE/PCR, especially in vaccinated pigs. Sample the margin of lesioned and non-lesioned tissue in the cranioventral lobes. Serology useful in unvaccinated pigs.
Bacterial respiratory pathogens	Charcoal swab for primary bacterial culture (TC0101). <i>S. suis</i> serotyping by whole genome sequencing (TC4040) is completed on one isolate per subsidised submission at no extra cost. Can also be requested on more isolates or on non-subsidised submissions at extra charge.	E.g., <i>Pasteurella multocida</i> , <i>Streptococcus suis</i> , <i>Bordetella bronchiseptica</i> , <i>Actinobacillus pleuropneumoniae</i> , <i>Glaesserella parasuis</i> . Ideally sample freshly dead, untreated pigs. Sear surface of lung before incising and swabbing with a charcoal swab or use sterile scalpel to incise to avoid contamination. Send samples for culture to arrive at laboratory next day. Sensitivity testing complete where appropriate.
Glässer's disease (<i>Glaesserella parasuis</i>, Gps)	Charcoal swabs from up to 4 sites for bacterial culture for <i>G. parasuis</i> only (TC0103).	TC0103 allows up to four lesioned sites to be cultured for <u>just</u> Gps under one test code charge (e.g. lung, pleura, pericardium, joint). Sample severely affected, untreated, freshly dead pigs as Gps is difficult to culture. Sample lesioned serosal surfaces, rather than excess fluid (body cavity, joint).

Pigs

Progressive atrophic rhinitis	Plain swab for <i>Pasteurella multocida</i> toxin gene PCR (TC0704).	Now uncommon in GB pigs. Swab lesioned nasal chamber. Can be conducted on pools of up to 5 nasal swabs. Do not use wooden swabs.
Inclusion body rhinitis (porcine cytomegalovirus)	Fixed lesioned nasal turbinates and kidney for histopathology (PC0006).	Diagnosis of pre- and early post-weaned pigs. Diagnosis established by viral inclusions in turbinate mucosa. Systemic infection may cause lesions in other epithelial sites, e.g., kidney tubules.

Systemic disorders

Condition/ causes	Sample type and recommended tests	Further information
Systemic disorders	Carcases for PME.	Submit untreated pigs where possible. If euthanised for submission/ live affected pigs present, it is useful to obtain clotted and EDTA bloods.
Bacterial septicaemia	Carcases for PME. Charcoal swabs from systemic sites (liver, lung, brain) for primary bacterial culture (TC0101).	Sudden or rapid death, mainly post-weaning e.g., due to <i>E. coli</i> (colisepticaemia – pre-weaned pigs only), erysipelas, Gps, streptococci, pasteurellosis, <i>Klebsiella pneumoniae</i> . Batch of up to 3 pigs ideal. Antimicrobial treatment may affect culture results.
PRRS	Spleen, lymph node and serum for individual PRRSV PCR (TC0718) or pooled PRRSV PCR (TC0918 – pools of up to 5, rearing pigs only).	Consider testing in upsurges of other endemic disease, gastric ulceration and/or non-specific malaise. See also respiratory testing .
Iron deficiency anaemia	Carcases for PME.	Occurs in pre- and sometimes early post-weaned pigs. Diagnose by haematology or serum or liver iron estimation.
Systemic leptospirosis	Fresh kidney for pathogenic <i>Leptospira</i> PCR (TC0856). Paired sera for <i>Leptospira</i> MAT to all 19 serovars, tested in 6 pools (TC0399).	Diagnosis of pre- and early post-weaned pigs. Leptospire are zoonotic. Pigs may be jaundiced. Histopathology of liver and kidney may provide supporting evidence. Positive PCR results should be followed up with serology in recovered or in-contact pigs in the affected cohort to identify the infecting serovar. Antibody titres fall rapidly so sample as soon as possible after clinical incident.

Pigs

Porcine circovirus 2-associated disease including PMWS/PDNS	Carcases for PME. Fixed lymph nodes (inguinal and mesenteric) and lesioned tissue for histopathology (PC0006) and PCV2 IHC (TC1402) where appropriate.	Batch of up to 3 pigs ideal. Typically seen from six weeks old, occasionally younger pre-weaned pigs or young adults. Lesions of PDNS can resemble swine fever; suspicion must be reported . If lymphoid lesions are seen with viral inclusions, PCV-2 IHC is not necessary.
Polyserositis due to <i>Mycoplasma hyorhinis</i>	Plain swabs for <i>Mycoplasma</i> spp. DGGE/PCR (TC0672).	Most often affects pre- and post-weaned pigs. Polyserositis can include arthritis. Up to 3 swabs from lesioned serosal sites can be pooled from the same pig. Do not use wooden swabs.
<i>Glaesserella parasuis</i> (Gps) septicaemia and/or polyserositis (Glässer's disease)	Charcoal swabs from up to 4 sites for bacterial culture for <i>Glaesserella parasuis</i> only (TC0103).	Diagnosis mainly of post-weaned pigs. TC0103 allows up to four lesioned sites to be cultured for <u>just</u> Gps under one test code charge (e.g. lung, pleura, pericardium, joint). Sample severely affected, untreated, freshly dead pigs, as Gps is difficult to culture. Sample lesioned serosal surfaces, rather than excess fluid.
Toxicity	Carcases for PME.	The two toxicities most frequently diagnosed in pigs at APHA are coal tar (liver necrosis) and bracken (cardiomyopathy and acute heart failure).
Neoplasia	Lesioned tissues for histopathology (PC0006).	Individual pigs. Lymphoma most common neoplasia in pigs.

Circulatory disease

Condition/causes	Sample type and recommended tests	Further information
Endocarditis	Charcoal swab of valve lesion for bacterial culture (TC0101).	Erysipelas and <i>Streptococcus</i> spp are the two main causes.
Thrombocytopaenic purpura	Carcases for PME.	Signs include weakness, anaemia, skin haemorrhages and death of non-pyrexial pigs up to about 30 days old. Gilt litters not affected. Lesions can resemble swine fevers; suspicion must be reported .
<i>Mycoplasma suis</i>	Blood (EDTA) for <i>Mycoplasma</i> DGGE/PCR (TC0672).	Can pool EDTA bloods from up to 3 pigs. Haematology and bone marrow histopathology useful.

Pigs

Mulberry heart disease (MHD) and hepatosis dietetica (HD)	Carcases for PME. Fixed heart and lung (MHD) or fixed liver (HD) for histopathology (PC0006).	Usually presents as sudden death in post-weaned pigs (occasionally seen pre-weaning). Consider assessing cohort bloods for vitamin E and selenium – consult lab of choice for test and sample requirements. Differentials for MHD: acute pulmonary oedema form of PCVAD, bracken poisoning, fumonisin toxicity; and HD: coal tar toxicity, PCV2-associated hepatitis.
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Musculoskeletal disorders

Condition/ causes	Sample type and recommended tests	Further information
Musculo-skeletal disorders	Carcases for PME.	Identify affected limb(s) and indicate severity of lameness. Videos are a helpful diagnostic aid. Collect bloods prior to euthanasia where possible.
Bacterial arthritis	Carcases for PME (TC0017/TC0002). Charcoal joint swabs or fluid aspirates for primary bacterial culture (TC0101) or <i>Glaesserella parasuis</i> only (TC0103). Paired sera for <i>Erysipelothrix</i> sp. SAT (TC0361).	E.g., due to erysipelas, <i>Streptococcus suis</i> , <i>Glaesserella parasuis</i> . Seen in any age but particularly post-weaning. TC0103 allows up to four lesioned sites to be cultured under one test code charge. Isolating <i>Erysipelothrix</i> species from joints can be problematic.
Infectious synovitis due to <i>Mycoplasma</i> spp	Plain joint swabs or fluid aspirates for <i>Mycoplasma</i> DGGE PCR (TC0672).	Pool up to three swabs per pig. Do not use wooden swabs. <i>M. hyorhinis</i> : younger post-weaned pigs, may be part of polyserositis. <i>M. hyosynoviae</i> : older post-weaned/young breeding pigs. Histopathology is supportive.
Spinal abscess/ trauma	Carcases for PME. Charcoal swabs for primary bacterial culture (TC0101).	Histopathology and anaerobic cultures may also be useful.
Osteo-dystrophy	Carcases for PME. Growth plates for histopathology (PC0006).	Carcass submission preferred. Consult VIO for sampling advice other than PME or histopathology.

Pigs

Osteoporosis (lactational)	Carcases for PME.	Usually young sows with fractures peri-weaning. Large litters and excess activity post-weaning are risk factors.
Osteo-chondrosis dissecans, fractures	Carcases for PME.	Gross pathology often diagnostic. Bone analysis and histopathology may be considered if findings suggest osteodystrophy.

Nervous disorders

Condition/causes	Sample type and recommended tests	Further information
Nervous disorders	Carcases for PME.	Videos of typically affected pigs helpful. Submission of live pigs may be preferred if agreed by PME centre. Ideally submit untreated pigs. Consider method of euthanasia – barbiturate is ideal. Collect bloods prior to euthanasia where possible. Where toxicity or deficiency suspected, retain feed samples.
Congenital tremor (CT)	Carcases for PME.	Submission of live pigs may be preferred if agreed by PME centre. Clinical history and histopathology identify the type of CT. Classical swine fever is a cause of type A1. In CT outbreaks, consider grounds to report . APPV is the cause of CT type A2. Discuss APPV PCR with a VIO.
Bacterial meningitis	Carcases for PME. Carcass viscera including tests, excluding disposal (TC0005). Charcoal meningeal swabs for primary bacterial culture (TC0101).	<i>Streptococcus suis</i> and <i>Glaesserella parasuis</i> – main bacterial causes. Cultures must include chocolate agar plates for <i>G. parasuis</i> . Submission of head of affected pigs may enable diagnosis.
Salt poisoning (water deprivation)	Carcases for PME. Fixed brain for histopathology (PC006).	Pigs are particularly sensitive to water deprivation-induced salt poisoning. Submission of heads of affected pigs enables diagnosis of salt poisoning.
Fibro-cartilaginous embolism	Carcases for PME. Fixed spinal cord and brain for histopathology (PC0006).	Sporadic cause of spinal disease. Submission to a PME site to extract spinal cord recommended.

Pigs

Bowel oedema	Carcases for PME. Charcoal swab from terminal small intestine for primary bacterial culture (TC0101) and <i>E. coli</i> virulence gene PCR (TC0330) if appropriate.	Submission of live pigs may be preferred if agreed by PME centre. Caused by Shiga toxin-producing <i>E. coli</i> . Less ideal samples include small intestinal contents or faeces. Brain histopathology supportive and may be indicated where clinical signs/gross lesions not typical. Isolation of causative <i>E. coli</i> more likely from untreated, severe cases.
Middle/inner ear disease	Carcases for PME. Charcoal swabs for primary bacterial culture (TC0101). Plain swabs for <i>Mycoplasma</i> DGGE PCR (TC0672).	Disease can follow meningitis or swine influenza. Sectioning of cranium likely necessary to reveal lesions. Do not use wooden swabs for PCR.
Viral polioencephalo-myelitis (e.g., porcine sapelovirus)	Carcases for PME. Fixed brain and spinal cord for histopathology (PC0006 suspect lesions confirmed by IHC). Fresh spinal cord (1cm) and fresh brain (frontal cortex) for sapelovirus PCR (not available as commercial test).	Uncommon – PME enables investigation of differentials. Submission of live pigs may be preferred if agreed by PME centre. Aujeszky's disease and Teschen disease are causes of viral encephalitis and are notifiable. Consider need to report , especially if unresponsive to antimicrobial treatment. Sapelovirus, astrovirus and teschovirus PCRs can be done at discretion of VIO if histopathology, IHC, and other findings suggest involvement of neurotropic virus.
Paresis / paralysis associated with toxicity or deficiency	Carcases for PME. Fixed spinal cord and brain for histopathology (PC0006). Retain feed samples.	E.g., selenium or vitamins B5/6. Submission to a PME centre to remove spinal cord and brain recommended. Spinal cord lesions not pathognomic; further investigation needed.

Urogenital disorders

Condition/causes	Sample type and recommended tests	Further information
Cystitis & pyelonephritis	Carcases for PME. Fresh kidney or urine for primary bacterial culture (TC0101) and anaerobic culture (TC0528). Fixed kidney for histopathology (PC0006).	Diagnosis mainly of breeding females. Anaerobic culture is essential to isolate <i>Actinobaculum suis</i> . Collect urine samples as aseptically as possible. Histopathology allows diagnosis but not identification of causative organism.

Pigs

Skin disease

It is helpful for images of the skin condition to be sent to the PME centre. Vesicular lesions on feet or snouts/mouths of pigs should be [reported as suspect notifiable disease](#).

Condition/causes	Sample type and recommended tests
Exudative epidermitis	Charcoal swabs for bacterial culture (TC0101)
Ringworm	Hair plucks for microscopic examination (TC0081) and ringworm culture (TC0080 – this takes several weeks).
Swine pox	Fixed skin for electron microscopy (TC0082).
Ectoparasites, e.g. mange	Skin/ear wax scrapings for ectoparasite examination (TC0081).
Skin scald and transient mortality	Carcases for PME and retain feed samples. Several incidents investigated in grower and finisher pigs with no cause identified. Guidance available on case investigation .

Miscellaneous and exotic farmed species

The guidance below concentrates on conditions mainly seen in South American Camelids (SACs) and is not exhaustive. Tests for other farmed species such as deer, bison, buffalo should use the tables for cattle or small ruminants as appropriate. Discuss all cases of suspected or confirmed poisoning in food animals with a VIO as voluntary measures to control contamination of the food chain may be requested. In rare circumstances statutory controls may be required under the Food & Environmental Protection Act (FEPA).

Abortion and stillbirth

Submissions of whole fetus/stillborn, placenta and maternal clotted blood is preferred. The bovine abortion package covers most common infectious causes of abortion and stillbirth in SACs, though please note tests may not be validated in these species. Less common infectious causes of abortion affecting small ruminants e.g., *Toxoplasma gondii* can also be requested. EHV-1 PCR may be considered where clinically indicated. Please discuss with a VIO. Non-infectious causes of abortion should also be considered.

All tests listed below are available for use in SACs under the bovine abortion package TC0015. This package can be applied to whole fetuses submitted to a VIC or to samples submitted from on-farm investigations. Tests with an asterix (*) are not validated for use in camelids.

Sample type	Recommended test	Further information
Fetal stomach contents	Bovine abortion package (TC0015): • Primary bacterial culture (TC0101) • <i>Campylobacter</i> culture (TC0026) • Wet preparation for fungi (TC0850)	FSC – sample of choice for bacteriology. Cultures can be conducted on placenta (if free from gross contamination), or fetal lung or liver if no FSC available.
Placenta	Bovine abortion package (TC0015): • MZN smear (TC0033) • Wet preparation for fungi (TC0850) Upon request: • <i>Toxoplasma gondii</i> PCR* (TC0858)	MZN and wet preparation for fungi can be carried out on FSC if no placenta is available.
Fresh fetal brainstem	Bovine abortion package (TC0015): • <i>Neospora</i> PCR* (TC0852) • Schmallenberg PCR* (TC0905)	Fixed heart should also be taken to confirm pathology associated with <i>Neospora</i> infection – detection alone by PCR is not sufficient to diagnose abortion. SBV PCR is used in cases with typical arthrogryposis.
Fresh fetal thymus or spleen	Bovine abortion package (TC0015): • BVD PCR* (TC0655)	Antigen ELISA may not be a reliable means of demonstrating viraemia in SACs.

Miscellaneous and exotic farmed species

Fixed fetal tissues	Histopathology (PC0006)	Fixed heart is required for <i>Neospora</i> diagnosis. Fixed thyroid is preferable for investigating goitre. Other fixed lesioned tissues as required e.g., placenta for placentitis or villous hypoplasia.
Fresh fetal kidney	Pathogenic <i>Leptospira</i> PCR* (TC0856)	Where clinically indicated. Autolysis may interfere with the PCR test. Histopathology (liver, kidney) can provide supportive evidence. Leptospirosis is zoonotic.

Enteric disorders

Condition/causes & age	Sample types and recommended tests	Further information
<i>E. coli</i>, <i>Salmonella</i>, cryptosporidia, rotavirus (<7-day-old crias)	Faeces (5g) for enteric package 1- 5-day old small ruminants (PC0059): • Primary bacterial culture (TC0101) & <i>E. coli</i> adhesin test (TC0829) • <i>Salmonella</i> culture (TC0025) • Cryptosporidia smear (TC0492) • Rotavirus PAGE (TC0582)	Individual components may be selected. Rotavirus PAGE not validated for use in camelids.
<i>Salmonella</i>, rotavirus, cryptosporidia (7 to 21-day-old crias)	Faeces (5g) for enteric package 6- 21-day old small ruminants (PC0066): • <i>Salmonella</i> culture (TC0025) • Cryptosporidia smear (TC0492) • Rotavirus PAGE (TC0582)	Cryptosporidiosis has been recorded as the cause of diarrhoea and death in animals up to 8 months of age. Rotavirus PAGE not validated for use in camelids.
Giardia (>7-day-old crias)	Faeces (5g) for floatation (TC0491)	-
Endoparasitism (>3-week-old crias)	Faeces (5-10g) for camelid worm egg/coccidial oocyst count (TC0860) Differential fluorescent staining of <i>Haemonchus</i> eggs (TC0777)	Pooled sampling not recommended. Coccidiosis most common from 3-weeks to 3-months-of-age. Nematodiosis typically seen from 2-months-of-age. <i>Haemonchosis</i> often presents as severe anaemia.
Endoparasitism, fasciolosis (adult)	Faeces (40g) for camelid worm egg count and examination for fluke eggs (PC0864): • Camelid worm egg/coccidial oocyst count (TC0860) • Fluke egg examination (TC0061) Differential fluorescent staining of <i>Haemonchus</i> eggs (TC0777)	Acute and chronic fluke infections seen in camelids. Fluke eggs indicate presence of adult fluke, usually detectable 10-12 weeks post-infection and up to 21 days post-treatment in cattle.

Miscellaneous and exotic farmed species

Johne's disease (adult)	Faeces for MAP PCR* (TC0693) or MAP culture (TC0713)	Johne's disease may not present with diarrhoea in camelids until terminal. PCR is not validated in non-bovines. Culture is gold standard confirmatory test but has a long turnaround time.
Enteric disorders (all ages)	Carcase for PME (TC0020) Carcase viscera including tests, excluding disposal (TC0005)	Whole tissues or organs can be submitted from on-farm PMEs for examination and/or test allocation by a VIO.
Gastric ulceration (all ages)	Carcase for PME	Often seen with concurrent disease. Commonly affects C3.

III thrift/weight loss

Consider tuberculosis even in bovine TB 'low risk areas' as camelids are also susceptible to *Mycobacterium microti* (vole tuberculosis). Suspicion must be [reported](#).

Condition/causes & age	Sample types and recommended tests	Further information
Endoparasitism (young animals)	Faeces (5-10g) for camelid worm egg/coccidial oocyst count (TC0860) Differential fluorescent staining of <i>Haemonchus</i> eggs (TC0777)	Pooled sampling not recommended. Coccidiosis most common between 3 weeks and 3 months of age. Nematodirosis typically seen from 2-months-old. <i>Haemonchosis</i> often presents as severe anaemia.
Endoparasitism, fasciolosis (adult)	Faeces (40g) for camelid worm egg count and examination for fluke eggs (PC0864): - Camelid worm egg/coccidial oocyst count (TC0860) - Fluke egg examination (TC0061)	Acute and chronic fluke infections seen in camelids. Fluke eggs indicate presence of adult fluke, usually detectable 10-12 weeks post-infection and up to 21 days post-treatment in cattle. Consider differential fluorescent staining of <i>Haemonchus</i> eggs (TC0777) where indicated.
Johne's disease (adult)	Faeces for MAP PCR (TC0693) or MAP culture (TC0713) Serum for MAP Ab ELISA (TC0366) Fixed ileum and regional lymph node for histopathology (PC0006)	Weight loss is the main sign with diarrhoea terminally. Culture is gold standard confirmatory test but long turnaround time. Recommended to confirm positive ELISA results with PCR or culture. ELISA and PCR not validated for use in camelids. Histopathology can differentiate from intestinal neoplasia and TB.
Trace element deficiency (all ages)	Carcase for PME	Contact VIO for sampling advice other than PME, e.g. blood or tissue. Risk of vitamin D deficiency with keeping camelids in the UK (insufficient UV). Zinc-responsive

Miscellaneous and exotic farmed species

		dermatoses are seen in alpacas but may not be associated with blood zinc deficiency.
<i>Mycoplasma haemolamae</i> (all ages)	EDTA blood for <i>Mycoplasma</i> DGGE/PCR (TC0672)	Can cause anaemia, vague signs or no overt disease. Organisms can be detected on a fresh fixed blood smear but will detach from erythrocytes in stored samples and may be indistinguishable from stain precipitate.
Bovine viral diarrhoea (BVD – all ages)	Serum or tissue (spleen, thymus, lymph node) for BVD PCR (TC0655)	Antigen ELISA may not be a reliable means of demonstrating viraemia in SACs. PCR not validated for use in camelids.
Neoplasia (all ages)	Carcase for PME Fixed tissue for histopathology (PC0006)	Consult VIO for sampling advice.
Lungworm in deer	Faeces (50g) for Baermann examination (TC0062)	Generally presents as weight loss rather than respiratory signs. Rarely recorded in camelids. Positive Baermann result indicates patent infection. Baermann examination will be negative in the pre-patent phase.

Skin disorders

Condition/causes	Sample type and recommended tests	Further information
Skin parasites (<i>Chorioptes</i> , <i>Psoroptes</i> , <i>Sarcoptes</i> , <i>Demodex</i> , harvest mites, lice)	Skin scrapes and hair plucks for ectoparasite exam (TC0081)	Sample interdigital space and margins of affected areas for mites. Sarcoptic mange is zoonotic. <i>Demodex</i> is rare. Prevalence of lice unknown but likely to be low.
Bacterial	Charcoal swab or fresh tissue for primary bacterial culture (TC0101)	CLA and <i>S. aureus</i> – rare in SACs; more common in camels.
Dermatophilosis	Hair pluck with crust for stain and microscopy (TC0033) or primary bacterial culture (TC0101)	Rare in SACs.
Dermatophytosis/ringworm	Hair pluck for microscopic examination (TC0081) Skin scale and scrape for ringworm culture (TC0080 – takes several weeks)	Rare to uncommon and tends to be self-limiting.
Orf	Scab material for electron microscopy (TC0082)	Uncommon to rare. Consider mange as a differential diagnosis.

Miscellaneous and exotic farmed species

	Fixed tissue for histopathology (PC0006)	
Nutritional/metabolic	Fixed tissue for histopathology (PC0006)	Idiopathic necrolytic/neutrophilic hyperkeratosis (generalised munge) and munge have distinct histological changes. Causes unknown but can be seen with concurrent disease.
Neoplasia	Fixed tissue for histopathology (PC0006)	Papillomas, fibropapillomas, squamous cell carcinoma, melanocytoma and mast cell tumours.
Skin disorders	Fixed tissue for histopathology (PC0006)	May be useful in assessing skin disease if other tests have failed to establish a diagnosis.

Nervous disorders

Condition/causes	Sample type and recommended tests	Further information
Nervous disorders	Carcase for PME	E.g., CCN, bacterial meningitis, encephalitis, 'alpaca fever', abscess. Carcase submission enables full diagnostic investigation.
Lead poisoning	Carcase for PME	Please discuss all cases of suspected lead poisoning with a VIO. Consult VIO for sampling advice other than PME.
BVD	Serum or tissue (spleen, thymus, lymph node) for BVD PCR (TC0655)	Congenital neurological signs have been described. Unvalidated for use in camelids.

Sudden death

Always consider anthrax and tuberculosis. Clinical suspicion must be [reported](#).

Condition/causes	Recommended tests	Further information
Sudden death	Carcase for PME	PME enables full diagnostic investigation of possible causes.
Hepatic lipidosis	Carcase for PME Fixed liver for histopathology (PC0006)	Hepatic lipidosis can present as sudden death and 'outbreaks' can be seen, particularly in pregnant or lactating hembras. Consult VIO for sampling advice other than PME or histopathology.
Toxins and plant poisoning	Carcase for PME	History may be suggestive. Carcase submission – preferred.

Miscellaneous and exotic farmed species

Lead poisoning	Carcase for PME	Please discuss all cases of suspected lead poisoning with a VIO. Consult VIO for sampling advice other than PME or histopathology.
Endo-parasitism	Faeces (5-10g) for camelid worm egg/coccidial oocyst count (TC0860) Differential fluorescent staining of <i>Haemonchus</i> eggs (TC0777)	Pooled sampling is not recommended. Endoparasites, particularly <i>Haemonchus</i> , can cause sudden death or signs may be limited as camelids are often not diarrhoeic.
Clostridial enterotoxaemia	Carcase for PME (TC0020) Small intestinal contents for <i>Clostridium perfringens</i> toxin test ELISA (TC0035)	Specify toxins to be tested. Send contents from affected portion of bowel – if not obviously affected, pool contents from at least 3 ileal sites. Remove contents from intestine before sending.

Respiratory disorders

Condition/causes	Sample types and recommended tests	Further information
Bacterial respiratory pathogens	BAL samples or charcoal swab for primary bacterial culture (TC0101)	Viral respiratory infections in camelids are rare. Consider TB and BTV which are notifiable and must be reported . To take lung swabs, sear the lung surface, incise and swab with a charcoal swab or use a sterile scalpel to avoid contamination. Send samples for culture to arrive at laboratory next day. Sensitivity testing undertaken where appropriate.
Respiratory disorders	Carcase viscera including tests, excluding disposal (TC0005)	Whole tissues or organs can be submitted from on-farm PMEs for examination and/or test allocation by a VIO.

Wildlife

Unusual and mass mortality of wildlife (terrestrial vertebrate species and seals) can be investigated at PME centres under the Diseases of Wildlife Scheme (DoWS), funded by Defra.

Carcases for PME or samples for laboratory testing can be submitted by veterinary practitioners, wildlife charities and members of the public, after consultation with a PME centre. Cases will be triaged to ensure they are appropriate for the scheme; carcasses with obvious trauma e.g. road traffic accident or animals which have been in a rehabilitation facility for over 48 hours will not generally be accepted for submission. The provision of additional information including clinical history and the map reference where the animal was found, if known, is useful. Submissions accepted under the scheme will be examined free of charge. The person submitting the carcase can be provided with a written report of our PME findings and subsequent laboratory testing results. Please add your email address on the submission form to receive this.

You should [report dead wild birds online or by phone](#) if you find:

- one or more dead bird of prey or owl
- one or more dead gulls or wild waterfowl (swans, geese and ducks)
- 5 or more dead birds of any species.

Please wear appropriate personal protective equipment when handling wildlife carcasses or collecting samples. When you report dead wild birds, they may be collected and tested for [avian influenza](#) or other causes of death. [Not all dead wild birds will be collected.](#)

Investigations into new and emerging disease, zoonoses (in particular, mass mortalities of wild birds that may be caused by avian influenza virus, West Nile virus and Usutu virus) and disease threats to livestock and biodiversity are prioritised. When discussing cases with a PME centre, we may refer you to other projects that might be more suitable. These include:

- [UK Cetacean Strandings Investigation Programme](#) for cetaceans (porpoises, dolphins, whales), basking sharks, sea turtles and seals.
- [Garden Wildlife Heath](#) for hedgehogs, garden birds, amphibians and reptiles.
- [Wildlife Incident Investigation Scheme Pesticides HSE](#) for any suspect malicious or accidental poisoning or misuse of pesticides or agrochemicals affecting wildlife.
- Cases of suspected wildlife crime should be [reported to the police](#).

The testing guidance below is not exhaustive. Please discuss unusual cases or diseases not mentioned with a VIO.

Wild birds

Nervous disorders

Condition/causes	Sample type	Recommended tests	Further information
Avian influenza virus, West Nile virus, Usutu virus, paramyxovirus, avian botulism, louping ill (grouse) & poisoning	Carcase	PME	Clinical history essential. Virology may take several weeks. For animals in captivity, e.g., rehabilitation facilities, notifiable disease suspicion must be reported .

Enteric disease

Condition/causes	Sample type	Recommended tests	Further information
Oral trichomonosis, salmonellosis, duck viral enteritis (DVE)	Carcase, intestinal contents, faeces, fixed tissues	PME Microscopy (TC0580) Primary bacterial cultures (TC0101) <i>Salmonella</i> culture (TC0025) Cryptosporidia smear (TC0492) Histopathology (PC0006)	Specify if <i>Yersinia</i> and/or <i>Listeria</i> suspected for primary bacterial cultures.

Wild mammals

Nervous disorders

Condition/causes	Sample type	Recommended tests	Further information
Listeriosis, poisoning, botulism, rabies and avian influenza	Carcase	PME	For animals in captivity e.g. rehabilitation facilities, suspicion notifiable disease must be reported .

Respiratory disorders

Condition/causes	Sample type	Recommended tests	Further information
Parasites, bacterial, viral and fungal infections	Carcase, tracheal/lung swabs, lung/pluck, fixed tissues	PME Primary bacterial culture (TC0101) Histopathology (PC0006)	Specify if fungal cultures are required for primary bacterial culture.

Enteric disorders

Condition/causes	Sample type	Recommended tests	Further information
Parasites, bacteria (including salmonellosis, yersiniosis and listeriosis) and viral disease	Carcase, intestinal contents, faecal sample, gralloch, fixed tissues	PME Worm egg/coccidial oocyst count (TC0060), coccidial oocyst speciation (TC0408) Primary bacterial culture (TC0101), <i>Salmonella</i> culture (TC0025) Cryptosporidia smear (TC0492) Histopathology (PC0006)	Specify if <i>Yersinia</i> and/or <i>Listeria</i> suspected for primary bacterial cultures.

Mortality in wild bats

Condition/causes	Sample type	Recommended tests	Further information
EBLV, bacterial disease, parasites, trauma, cat predation, poisoning, white-nose syndrome	Carcase	PME	Submitted bats screened for EBLV before further testing; allow an additional 7-14 days. Do not directly handle carcasses without appropriate PPE. Submit carcasses in a "bat pack" obtained from the bat Conservation Trust .

Mortality in wild squirrels

Condition/causes	Sample type	Recommended tests
Red squirrel adenovirus, squirrel pox, squirrel leprosy, tumour e.g. histiocytosis	Carcase, skin lesions (pox virus, leprosy, histiocytosis), intestinal contents (adenovirus), fixed tissues	PME Electron microscopy (TC0082) Histopathology (PC0006)

Mortality in wild lagomorphs

Condition/causes	Sample type	Recommended tests
Myxomatosis, Rabbit haemorrhagic disease (RHD), European brown hare syndrome, leporine dysautonomia	Carcase, skin lesions, (myxomatosis), liver (RHD), fixed tissues	PME Electron microscopy (TC0082) RHDV PCR (TC0159) Histopathology (PC0006)

Appendix 1 – abbreviations

- Ab – antibody
- Ag – antigen
- AGIDT – agar gel immunodiffusion test
- AT – agglutination test
- BAL – bronchoalveolar lavage
- BVD – bovine viral diarrhoea
- CCN – cerebrocortical necrosis
- CEL – chicken embryo liver
- CIT – citrate
- CFT – complement fixation test
- CIE – counter immuno electrophoresis
- CNF – cytotoxic necrotising factor
- CTM – charcoal transport medium
- DAT – direct agglutination test
- DEL – duck embryo liver
- EDTA – ethylene diamine tetra-acetic acid
- ELISA – enzyme-linked immunosorbent assay
- EM – electron microscopy
- FAT – fluorescent antibody test
- FAVN – fluorescent antibody virus neutralisation
- FPT – four plate test
- HAT – haemagglutination test
- HAIT – haemagglutination inhibition test
- Hb – haemoglobin
- HEP – heparin
- IBR – infectious bovine rhinotracheitis
- IBV – infectious bronchitis virus
- ID – identification
- IFAT – indirect fluorescent antibody test
- IHC – immunohistochemistry
- IPMA – immunoperoxidase monolayer assay
- ISH – in situ hybridisation
- LAT – latex agglutination test
- LC – large colony variant
- MAT – microscopic agglutination test
- MIC – minimum inhibitory concentration
- MRT – milk ring test
- MZN – modified ziehl-neelsen stain
- NEFA – non-esterified fatty acids
- NPLA – neutralising peroxide linked assay
- OCD – osteochondritis dissecans
- OXF – oxalate fluoride
- PAGE – polyacrylamide gel electrophoresis
- PBS – phosphate buffered saline
- PCR – polymerase chain reaction
- PCV – packed cell volume
- PDNS – porcine dermatitis and nephropathy syndrome

- PED – porcine epidemic diarrhoea
- PGE – parasitic gastro-enteritis
- PI3 – parainfluenza 3
- PME – post-mortem examination
- PMWS – postweaning multisystemic wasting syndrome
- PNP – porcine necrotising pneumonia
- PoA – price on application
- PRCV – porcine respiratory coronavirus
- PRRS – porcine reproductive and respiratory syndrome
- RBC – red blood cells
- RBT – rose bengal test
- RIA – radio immuno assay
- RSA – rapid slide agglutination
- RSV – respiratory syncytial virus
- RT-PCR – real time polymerase chain reaction
- SAF – scrapie associated fibrils
- SAT – serum agglutination test
- SC – small colony variant
- SNT – serum neutralisation test
- SPF – specific pathogen free
- TGE – transmissible gastro-enteritis
- VMAT – vaginal mucus agglutination test
- VTEC – verotoxic escherichia coli
- VTM – virus transport medium
- VI – virus isolation
- VIC – veterinary investigation centre/s (formerly regional laboratories)
- WBC – white blood cells



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