SRUC Veterinary Services

Sampling Guide

SRUC

Introduction

This guide is intended as a 'back of the car' quick reference to help you collect the correct samples from the correct animals to investigate a problem.

The guide has been produced by SRUC vets for practitioners to offer some advice and guidance on sample collection. It is not intended to be a diagnostic guide however some useful articles (BVA and open access publications) are signposted which provide complementary information. There are many ways to approach a problem, and we have provided an opinion on how to do so.

While the cattle, sheep and game bird sections concentrate more on commercial production, the pig and poultry sections are biased toward 'backyard' animals which often become the responsibility of a farm animal practitioner.

We are always more than happy to discuss cases over the phone, just call 0131 535 3130 to talk to a duty vet.

We very much hope you find this guide a useful addition to your car boot!

Contents

Useful information

Cattle disease investigation

Sheep disease investigation

Ruminant parasitology

Pig disease investigation

On-farm postmortem examination

Backyard Poultry

Gamebirds

SRUC Contact Details

Useful Information

Where to send samples

Diagnostic Samples	**SRUC Veterinary Laboratory,** Pentlands Science Park, Bush Loan, Penicuik, Midlothian, EH26 0PZ DX address (legal post): DXED626 Tel: **0131 535 3130** Email: **VSEnquiries@sruc.ac.uk**
Cattle, Sheep and Goat Health Schemes **BVD Scheme Samples**	**SRUC Veterinary Services,** Greycrook, St Boswells, Roxburghshire, TD6 0EQ DX address (legal post): DX556985 Tel: **01835 822456** Email: **healthschemes@sruc.ac.uk**

Addresses and contact details for your local Disease Surveillance Centre or Disease Surveillance Hub can be found on page 89 of the guide.

Please see page 7 for detailed guidelines on the packaging and postage of pathological specimens.

How to package samples

Full guidance on how to package samples can be found by searching "P650 packaging instruction" in your internet browser.

Packaging should be of good quality, strong enough to withstand the shocks and loadings normally encountered during carriage and should be closed to prevent any loss of contents that might be caused under normal conditions of carriage by vibration or by changes in temperature, humidity, or pressure.

Packaging will consist of three components:

1. **Primary receptacle(s): - leakproof container(s) containing sample(s) e.g., blood tubes, faeces pots (not rectal gloves) etc, wrapped or packed to prevent contact between them.**
2. **Secondary packaging: - leakproof container/bag with sufficient absorbent material within to contain the contents of the primary receptacle(s) should they leak.**
3. **Outer packaging: - Addressed envelope bearing the UN3373 symbol (letters and numbers at least 6mm high).**

The completed package should be able to be dropped from a height of 1.2m without breaking.

Don't forget to include the submission form – place between the secondary and outer packaging.

Royal Mail requirements

Royal Mail will only carry UN3373 Diagnostic Specimens if they are packed following Packaging Instruction P650, and:

- **Are sent by first class post or Special Delivery to inland addresses only**
- **The packet is marked with the sender's name, telephone number and address**

TNT (Courier) requirements

The "Nature and Quantity of Goods" box must contain the text "Biological Substance, Category B" and "UN3373" on the Consignment Note/Air Waybill. The Dangerous Goods "YES" box must be ticked.

The name and telephone number of a "responsible person" must be written on the consignment note or on the package.

The package must carry the warning symbol bearing the text UN3373, and the words "Biological Substance, Category B"

Getting the best from your diagnostic samples

Faecal samples

Test	Amount of faeces needed
Worm Egg/ Coccidial Oocyst count	0.5g
Worm Egg/ Coccidial Oocyst count	3g (Heaped teaspoon)
Lungworm detection	10g (Heaped dessertspoon)
Worm/Cocci, Fluke egg and lungworm	14g (Heaped serving spoon)

- **Please use a leak proof container to submit faeces samples (not a glove!).**
- **When submitting faeces for an enteritis package, please state an accurate age of the animal (especially young calves) as appropriate tests will vary with age.**
- **Ask farmers not to pre-pool samples. Either pool them yourselves using accurate scales or send individually to be pooled at the lab.**
- **Lungworm detection and coproantigen ELISA have not been validated on pooled samples. Risk of false negatives when testing pooled samples.**

Blood samples

- **Our serology system is robotic. Please ensure there is at least 2mls of blood in every tube, ideally fill tubes as full as possible.**
- **If you would like BVD PCR, then please submit extra serum samples if you require any other tests.**
- **If you require multiple tests, consider submitting an extra tube.**
- **Haemolysed samples can affect biochemistry (e.g. GGT, ZST).**
- **Remember to invert your green and purple top tubes to prevent clotting.**
- **Biochemistry packages on page 11 are offered at a discounted rate.**
- **Paired serology: first sample in acute case, second sample 3 weeks later.**

Skin scrapes for sheep scab

We will examine skin scrapes from Scottish sheep suspected to have sheep scab for free. Remember to sample from the edge of the lesion. Pluck the wool rather than cutting it and take superficial skin scrapes. Submit wool and plenty of scabby/crusty material to avoid false negatives. Do not send sharps in the post please!

Aqueous/Vitreous Humour

Can be used to test Ca, Mg, BOHB and Urea if sampled within 24hrs of death.
See page 56 for details of how to collect the sample.

Swabs and transport media

Test	Samples
Bacterial Culture	Charcoal swab preferred (see page 56) Tissue filling a 60ml container Any sterile swab or fluid in sterile container
Campylobacter Culture	Contact SRUC to pre-arrange submission of samples prior to sampling.
Mycoplasma Culture	Swab or tissue ideally in Eaton's Broth*
Respiratory PCR	Plastic stemmed swab, ideally in VTM* Lung tissue, ideally in VTM*

* Transport media available from SRUC Vet Services (0131 535 3130)

Sample storage if unable to send immediately

Sample	Preferred Storage
Tissues or swabs for bacterial/fungal culture	Fridge (Freezer if >72hrs delay)
Swabs/tissues for PCR	Freezer (or Fridge)
Serum	Fridge Centrifuge & freeze serum (>1 week delay)
Plasma	Fridge Make an air-dried smear for haematology
Faeces for parasitology	Fridge (or Freeze). Limit amount of air within sample container where possible
Fixed tissues in formalin	Warm room temperature

Blood tube guide

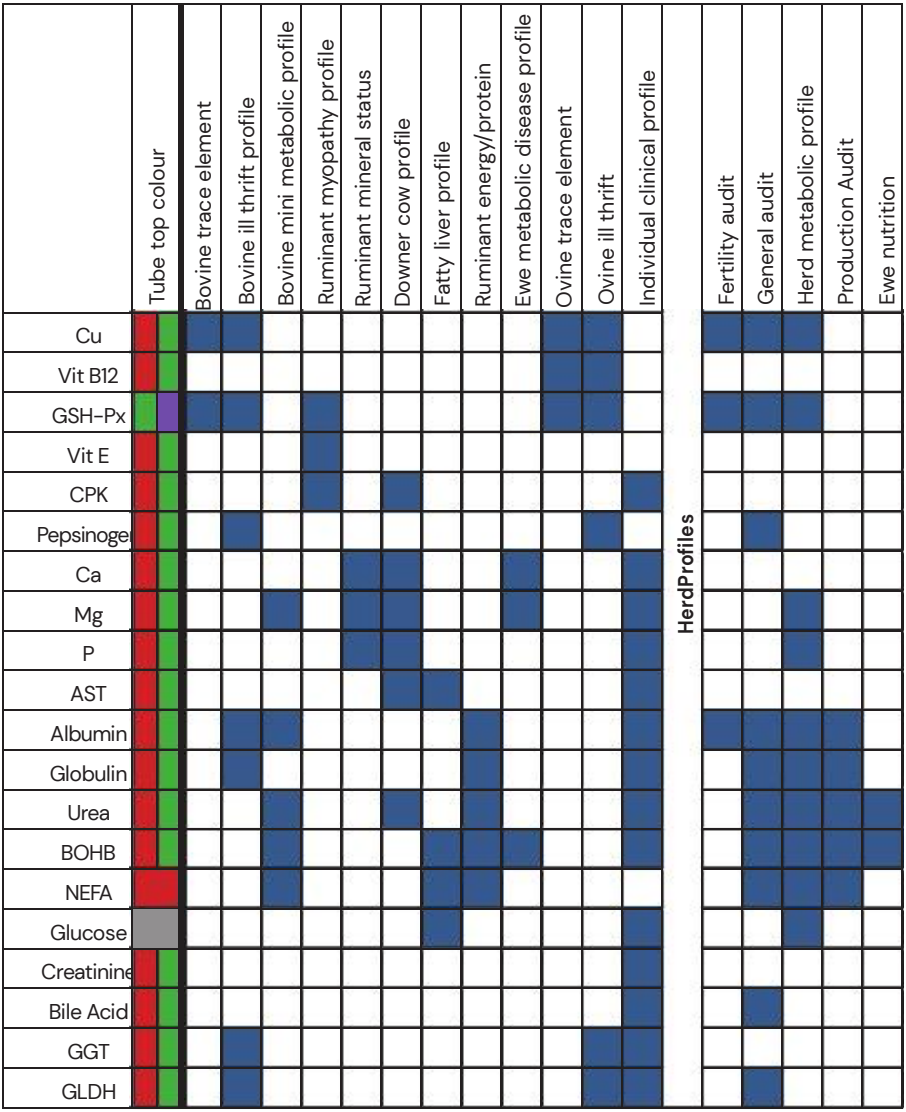
Tube Top	Sample	Common Uses
	Serum (no additive)	Biochemistry (can also use plasma sample) Serology Vitamin A or E (wrap in foil to exclude light) Fluids for bacterial culture
	Heparinised Plasma	GSH-Px, selenium, manganese and lead Inorganic iodine (can also use serum) Progesterone
	EDTA plasma	Haematology (include smear if possible) PCR testing & Scrapie Genotyping Fluids for cytology
	Fluoride Oxalate	Glucose
	Citrate	Coagulation tests (PT, APTT, fibrinogen)

Further information

Otter, A. (2013), Diagnostic blood biochemistry and haematology in cattle. In Practice, 35: 7-16

Milne, E. and Scott, P. (2006), Cost-effective biochemistry and haematology in sheep. In Practice, 28: 454-461.

Biochemistry profiles



Note: Haematology (EDTA) can be added to any profile at a reduced fee.

Notes

Cattle Disease Investigation

Barren cows

The cause of a high barren rate can be complex and multifactorial, with non-infectious causes often contributing significantly more than infectious disease. In seasonal systems, existing calving pattern and subsequent length of the bulling period have a major influence, as cows calving after the first 6 weeks have fewer opportunities to get pregnant. Herds can achieve 95% pregnant in 9 weeks of breeding, by consistently achieving a 65% pregnancy rate (proportion of *eligible* cows that get pregnant every three weeks).

History

Check farm records for patterns in cow age, BCS at calving, current BCS, assistance at calving, management group / bulling group and bulls used. Note nutritional anoestrus is common but retrospective diagnosis is not possible. Review abortions, stillbirths, post-calving nutrition and biosecurity breaches in the last 12 months. Bulls: BCS < 2.5 or >3.5 is associated with a decline in semen quality. Assess feet, leg conformation, gait, leg joints, head. Multi-bull groups can have dominance issues leading to injuries and poor fertility.

Investigation/Sampling

Bull: Unless excluded by history, fertility test bulls from affected groups.

Campylobacter: Encourage laboratory screening of all abortions for next 12 months (preferred). Consider sheath washing bulls and / or vaginal swabs from 12 cows and submit within 24hrs (please contact SRUC in advance of collecting samples, **0131 535 3130**).

Other infectious: Sample 4-6 barren cows and 4-6 pregnant cows for antibody (serum). Consider BVD, L. Hardjo, Neospora, IBR, Salmonella Dublin serology depending on vaccine / clinical history. Encourage laboratory screening of all abortions for next 12 months.

Trace Elements: 4-6 cows screened for copper, GSH-PX and pooled iodine (heparin plasma and serum). Results will reflect recent diet.

Further Information

Statham, J., Burton, K. and Spilman, M. (2019), Looking after the bull: guide to management and assessment of fertility. In Practice, 41: 69-83

Caldow, G., Lowman, B. and Riddell, I., (2005). Veterinary intervention in the reproductive management of beef cow herds. In Practice, 27(8), pp.406-411.

Abortion

Abortions are an indicator event of multiple herd-health issues and can be the first indicator of a new infectious disease in the herd. Investigation is advised whenever quality material available (full foetus, placenta, maternal blood). Infectious disease, placentitis and environmental pathogens are common causes.

NB: Notify Animal and Plant Health Agency and test for Brucella if indicated

History

Review farm records for abortions, stillbirths, endemic disease status, recent biosecurity breaches; check BCS and any ill-health in dam. Check for patterns in cows / heifer dams; sire; management groups. Observe cleanliness of pre-calving cows and their feed (spoilage / mould) and water (cleanliness).

Investigation/Sampling

Foetus/Placenta: Submit foetus and placenta to PM centre if possible. If not follow abortion sampling guidelines on pages 70-71. Approximately 18 common causes will be screened for in each submission. Negative results allow common infectious causes to be ruled out. Encourage submission of multiple (≥3) separate cases during outbreaks.

Serology: 4-6 aborted cows and 4-6 pregnant cows for antibody (serum). Consider BVD, L. Hardjo, Neospora, IBR, Salmonella Dublin depending on vaccine / clinical history. Paired serology for S. Dublin is significantly better than single serology.

Further Information

Cabell, E. (2007), Bovine abortion: aetiology and investigations. In Practice, 29: 455-463

Stillbirth/Poor calf viability

Malformations (heritable + sporadic), infectious disease, placentitis, environmental pathogens, dystocia and anoxia are all common causes of bovine stillbirth and multifactorial cases occur frequently

History

Review farm records for abortions, stillbirths, and endemic disease status; pre-and post-calving nutrition and management, and individual animal history. Check for patterns in cows / heifer dams; sire; management groups; BCS at calving. Observe cleanliness of pre-calving cows and their feed (spoilage / mould) and water (cleanliness).

Investigation/Sampling

Postmortem: Examination of calf and placenta is essential. Submit to PM centre or on-farm postmortem with reference to In Practice article below. Enourage multiple (≥3) submissions during high incidence problems.

Nutritional audit: Take serum and heparin plasma samples from 4-6 pre-calving cows as close to calving as possible for NEFA, albumin, urea, Ca, Mg, GSH-Px, Cu, pooled iodine (+/- vit A, vit E).

Colostrum: If calves are living more than 24hrs then screen 4-6 calves under 1 week of age for colostrum intake by total protein or ZST (serum).

Other infectious: Sample 4-6 affected dams and 4-6 unaffected dams for antibody (serum). Consider BVD, L. Hardjo, Neospora, IBR, and paired Salmonella Dublin serology depending on vaccine / clinical history. Not an appropriate substitute for comprehensive postmortem exam of affected calves and placenta.

Further Information

Geraghty, T et al. (2021), How to investigate a stillbirth on-farm. In Practice, 43: 373-387.

Diarrhoea in young calves

If treatment is required, then the cause should be investigated.

History

Review pen / stock cleanliness, stocking density, humidity, ventilation, age-range of calves in group, time since pens last cleaned out.

Investigation/Sampling

Colostrum: Always check colostrum uptake if appropriately aged calves are available (4-6 calves >24hr but < 7days) for total protein or ZST (serum). ZST results will be falsely elevated in sick / dehydrated calves, therefore if sampling these animals interpret results in relation to hydration status.

Infectious agent(s): Multiple (≥3) untreated calves should be screened for rotavirus, coronavirus, cryptosporidium and salmonella (neonatal enteritis package, faeces); if calves are under 4 days old screen for E. coli K99 by ELISA (faeces); if over 3 weeks old should be screened for coccidia (faeces).

Postmortem: If fresh carcase available (only method to diagnose idiopathic necrotic enteritis). Collect small and large intestinal content. Take blood for ZST if under 7d old. Place sections of duodenum, jejunum, ileum, caecum, and spiral colon, approx. 2 cm in length opened longitudinally on free border into 10% formalin, taking care not to damage mucosa. See page 60.

Further Information

Heller, M. C., & Chigerwe, M. (2018). Diagnosis and Treatment of Infectious Enteritis in Neonatal and Juvenile Ruminants. The Veterinary clinics of North America. Food animal practice, 34(1), 101–117.

Poor growth rates in calves at grass

Suckled calves can grow more than 1kg/day. Lower growth rates can be tolerated in older calves to be finished in the winter. Replacement beef heifers for bulling at 13-15 months must achieve 0.75kg/day.

History

Duration and extent of problem, current ration including supplementary feed; assess parasite burden on grass (grazing history); any specific clinical signs (particularly diarrhoea, cough, pneumonia); last treatment for coccidiosis, worms, fluke.

Investigation/Sampling

Nutrition: A complete review of the diet of the group is required. There are no reliable blood tests for inadequate nutrition in growing animals so ration / grazing analysis only. Contact SAC Consulting nutritionist for advice (your local hub can provide contact details).

Parasites: Sample 10 animals for bulk worm eggs, fluke coproantigen and lungworm as indicated by history (faeces).

Trace elements: Sample 4-10 animals for Cu, GSH-Px, (bovine Trace Element Profile, serum and heparin plasma).

Biochemistry: Albumin, globulin, GLDH, GGT, pepsinogen (serum) can aid differential diagnosis (included in the Bovine III Thrift profile along with Cu and GSH-Px, serum and heparin plasma).

Further Information

Suttle, N. (2004), Assessing the needs of cattle for trace elements. In Practice, 26: 553-561.

Poor growth rates in housed cattle

Target growth rates are determined by production system. When these are not met then investigation is justified.

History

Duration and extent of problem; current ration; feed space allocation / accessibility; frequency of feeding / push-up; any specific clinical signs (particularly diarrhoea, cough, pneumonia); last treatment for coccidiosis, worms, fluke.

Investigation/Sampling

Nutrition: A complete review of the diet of the group is required. There are no reliable blood tests for inadequate nutrition in growing animals so ration analysis is the best testing to perform. Contact SAC Consulting nutritionist for advice (your local hub can provide contact details).

Parasites: Sample 10 animals for bulk worm egg counts, fluke coproantigen and lungworm as indicated by history (faeces).

Trace elements: Sample 4-10 animals for Cu, GSH-Px, (bovine Trace Element Profile, serum and heparin plasma).

Biochemistry: Albumin, globulin, GLDH, GGT, pepsinogen (serum) can aid differential diagnosis (included in the Bovine Ill Thrift profile along with Cu and GSH-Px, serum and heparin plasma).

Further Information

Suttle, N. (2004), Assessing the needs of cattle for trace elements. In Practice, 26: 553-561.

Respiratory disease

Investigation is warranted when there is mortality, where disease is of such severity that metaphylaxis is considered, where alterations in vaccine protocol are considered or where farmer concern is driving investigation.

History

Check for known risk factors: Previous pneumonia (group + ind.), poor nutritional status; dehydration / inadequate access to clean water; concurrent / chronic disease, notably BVD; wide range of age / size in airspace; inadequate ventilation; recent stress (weaning, surgery, transport, group / diet change, handling; poor temperament); purchased stock from multiple sources and / or via market; inadequate colostrum. Check vaccine status and review vaccine handling / protocols.

Investigation/Sampling

Postmortem: Examination of acutely affected cases if available. Recent antimicrobial treatment reduces likelihood of successful bacterial culture but does not affect PCR or histopathology. Submit to postmortem centre or on-farm postmortem exam, see pages 62-63.

Samples: Sample multiple (≥3 if available) acute, untreated cases with **pyrexia and a clear nasal discharge**. Take at least one guarded nasopharyngeal swabs from each animal and place in VTM for multiplex respiratory PCR. If bacterial or mycoplasma culture is required (e.g. for antimicrobial sensitivity testing or potential autogenous vaccine) take one additional swab for each (plain swab for bacterial culture, in Eaton's broth for Mycoplasma culture). Take serum for future paired serology in case needed (repeat after 3-4 weeks) to be stored at SRUC Vet Services.

Colostrum: When affected calves are <12 weeks old always check herd colostrum uptake if appropriately aged calves are available (4-6 calves >24hr but < 7days for total protein OR ZST (serum). Do not test sick / dehydrated calves for colostrum uptake (as results are falsely elevated).

Trace element check

Routine check to monitor trace element requirement of stock either at end of grazing period (to assess pasture) or during / after housing period (to assess housed ration).

History

Ensure ration details are recorded accurately, and review access to ration in housed groups. Allow at least 3 weeks from any ration change before sampling.

Investigation/Sampling

Samples: 4-6 animals screened for copper, GSH-PX +/- pooled iodine (heparin plasma ideally but serum can be used for copper).

Suckler cow pre-calving nutritional audit

Routine test at start of calving block to assess adequacy of late-pregnancy nutritional status.

History

Ensure ration details are recorded accurately, and review access to ration in housed groups. Allow at least 3 weeks from any ration change before sampling.

Investigation/Sampling

Samples: Serum and heparin plasma from 4-6 pre-calving cows one month prior to calving for BOHB, NEFA, urea, albumin, globulin, phosphorus and magnesium (+/- Cu, GSH-Px). If possible, a further 4-6 cows that are 12-24hrs calved for calcium (serum).

Further Information

SRUC Technical note TN745. Metabolic profiling in the suckler herd. (Available online)

Acute milk drop with pyrexia in dairy cattle

Always investigate where >25% loss of yield over one or more days in individual cows AND pyrexia, with or without diarrhoea, in 5% of the herd or more in a one week period. Importantly, milk drop, at times accompanied by abortion, can be one of the first indicators of a new infectious disease entering or affecting a dairy herd.

History

Any recent ration change, concurrent disease (abortion, diarrhoea, respiratory – fevered cows have high respiratory rate).

Investigation/Sampling

Single animal: Consider Individual clinical profile and haematology (serum and EDTA)

Group problem: Collect serum and EDTA blood and faeces from multiple (≥3) acutely affected case. Consider deep, guarded, naso-pharyngeal swab if clinical signs of IBR. Samples for paired serology should be collected from the same animal three weeks after the initial sample.

Consider screening for:

- Salmonella Dublin by faecal culture + / - paired serology
- Other Salmonella (e.g., S. Mbandaka) by faecal culture
- Parasitic bronchitis (husk) by lungworm larvae screen on faeces
- Mycoplasma wenyonii by PCR on EDTA
- IBR by respiratory virus PCR testing on guarded NP swab +/- paired serology
- Leptospira Hardjo by paired serology using the MAT test
- Schmallenberg virus by PCR on EDTA blood AND paired serology

Subfertility in dairy cattle

Subfertility in dairy-cattle is typically a complex multifactorial problem.

History

Comprehensive review of nutrition, management (transition cow, oestrus detection, service method), genetic selection, lameness, and infectious disease. Laboratory screening can be an aid to some of these elements as outlined here.

Investigation/Sampling

Nutrition: Energy / protein. Mini-metabolic profile package on at least six cows 1-3 weeks calved and 6 cows in last 2 weeks of dry period (Bovine mini metabolic profile package). Consider also using milk records.

Trace Elements: 4 - 6 sub-fertile cows screened for copper, GSH-PX and pooled iodine (heparin plasma ideally but serum can be used for copper)

Infectious Disease: 4-6 sub-fertile cows and 4-6 pregnant cows for antibody (serum). Consider BVD, L. Hardjo, Neospora, IBR, Salmonella Dublin depending on vaccine / clinical history. Encourage laboratory screening of all abortions for next 12 months.

Campylobacter: Where natural service is used and a biosecurity audit indicates risk of campylobacter then encourage laboratory screening of all abortions for next 12 months. Consider sheath wash bulls and / or Vaginal swabs from 12 cows and submit within 24hrs (contact SRUC in advance, 0131 535 3130)

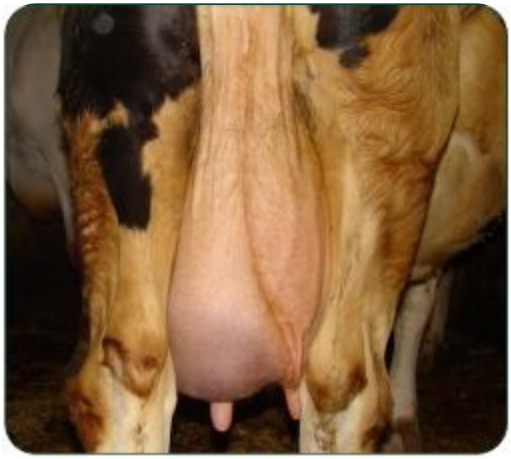
Further Information

Cook, J. (2009), Understanding conception rates in dairy herds. In Practice, 31: 262-266.

Atkinson, O., 2016. Management of transition cows in dairy practice. In Practice, 38(5), pp.229-240.

Mastitis in dairy cattle

Mastitis (clinical and sub-clinical) is typically a complex, multifactorial problem that requires comprehensive investigation. Various CPD courses are offered in the UK. Laboratory testing to identify pathogens involved is an essential component of a wider investigation.



History

Investigate all aspects of the milking machine / process, review teat health, consider risk from environmental sources and infected cows. Review management of acute / chronic cases, nutrition, genetic selection etc.

Investigation/Sampling

Clinical mastitis: Train farmer in aseptic collection of milk samples technique. Submit aseptically collected milk samples for bacterial culture from at least 5 and preferably 10 clinical cases (Mastitis bacteriology package, bacteriology only) or (Full mastitis package, includes sensitivity). Encourage freezing of aseptically collected milk samples from all future clinical cases so that several samples are ready for immediate testing should the problem recur.

Subclinical mastitis in dairy cattle

Investigation/Sampling

Train farmer in aseptic collection of milk samples technique and California mastitis test. Identify at least 10 cows with persistently elevated somatic cell counts (at least 2 and preferably 3 monthly or fortnightly counts over 300,000 cells/ml) from milk records. Exclude high counts within 2 weeks of dry-off and within 2 weeks after calving. Identify quarter infected by California mastitis test. Submit aseptically collected milk samples for bacterial culture from infected quarters from at least 10 cows.

Metabolic Profiling in Dairy Cows

Testing of late dry cows and calved cows can be used to monitor for energy and mineral status in healthy animals or to investigate transition cow issues.

History

Ration details and changes, including any forage analysis. Presentation of feed and water including feed space allowance, trough design, frequency of feeding/clearing feed and palatability. Housing design, space allowance, concurrent disease and levels of transition cow disease. Body condition scores and changes in body condition over the transition period. Any concerns with milk quality and composition. Culling patterns by days in milk. Cow-side tests such as rumen fill, faecal scoring and rumen pH may be useful depending on the specific clinical history.

Investigation/Sampling

N.B. Allow at least 3 weeks from any ration change before sampling. To get the optimum sample size of 12 cows, samples may need to be collected over more than one visit and then reviewed overall. This will depend on herd size and calving pattern.

Pre-calving: 12 dry cows between 2 and 10 days pre-calving for NEFA, urea and magnesium testing (serum).

Post-calving: 12 cows between 5 and 20 days post-calving for BOHB. (serum).

Hypocalcaemia: For subclinical hypocalcaemia sample 12 cows within 24 hours of calving (serum).

Further informatiom

Cook, N., Oetzel, G. and Nordlund, K. (2006) 'Modern techniques for monitoring high-producing dairy cows. 1. Principles of herd level diagnosis'. In Practice, **28**, 510-515

Atkinson, O (2009) 'Guide to the rumen health visit'. In Practice, **31,** 314-325

Notes

Sheep Disease Investigation

Barren ewes

High barren ewe rate is often multifactorial and can be challenging to investigate as it involves a retrospective investigation. Nutritional causes can be suspected based on history but cannot be definitively confirmed. In general trigger levels for investigation include a barren rate of greater than 2% or an increase in the barren rate compared to normal for that flock.

History

Scanning results (historical and current), including age distribution of barren animals, ram to ewe ratio of tupping groups, whether ewes were marked by tups more than once, and regular/irregular returns. BCS of ewes and tups at tupping, including weather events and forage availability at tupping and early pregnancy. Flock history of endemic disease (e.g., lameness, especially of tups), prevalence of ticks.

Investigation/Sampling

Nutrition: BCS affected ewes (although condition may have changed). If poor condition is evident go to ill thrift investigation (page 35). Consider checking GSH-Px (heparin plasma) as an indicator of longer-term selenium status; other trace elements will reflect current diet.

Infectious: Take serum from 6-10 affected animals for toxoplasma and Border disease serology.

Rams: Examine for abnormalities of testicles or penis, and for signs of lameness.

Following year

Pre-tupping check of rams. Check BCS of ewes 4-6 weeks pre-mating and post mating. Consider taking serum and heparin plasma from 6 typical ewes for copper, vitamin B12, GSH-Px (Ovine Trace Element Profile) and pooled iodine at pre-tupping check.

Abortion (Ovine)

Abortion should be investigated if rate is >2%, if several ewes abort in a short space of time or if abortions occur in added animals. Several abortifacient agents are zoonotic and are of significant concern especially in children and women of childbearing age. Dispose of aborted material and contaminated bedding. Isolate ewes that have aborted from rest of flock for at least 1 month.

History

Vaccination history, replacement policy, and age of affected sheep. Immediate history of recent handling or ill health. Review nutrition and assess access to concentrate and supplementary forage. Appearance of aborted foetuses and placentae; presence of mummified foetuses.

Investigation/Sampling

Clinical Examination: Check ewes are in good health and are in appropriate body condition score. Abortion may follow pyrexia of any cause.

Foetal Samples: Submit foetuses and placentae, ideally from multiple ewes, to postmortem centre or take samples as per guidelines on pages 72 & 73.

Maternal Samples: Take serum +/- EDTA plasma from affected ewes and store pending results from above. If necessary, test for toxoplasma, EAE +/- Border disease, Q fever. Test plasma for tick borne fever PCR if history is suggestive. Note that ewes with EAE may not have seroconverted at the time of abortion.

Further informatiom

Mearns, R. (2007), Abortion in sheep 1. Investigation and principal causes. In Practice, 29: 40-46.

Mearns, R. (2007), Abortion in sheep 2. Other common and exotic causes. In Practice, 29: 83-90.

Stillbirth in sheep

Abortion can present as, or alongside stillbirth, so investigate as for abortion, especially if rate is greater than 2%. Foetal oversize or other factors which lead to dystocia. Levels of supervision and intervention at lambing may also contribute to stillbirth.

History

Including concurrent abortion, presence of mummified foetuses, vaccination history, feeding of affected ewes, mineral supplementation, health of ewes. Clinical pregnancy toxaemia suggests energy deficient diet. Lamb birthweights, litter size, dystocia, intervention and supervision at lambing. Establish if lambs are born dead or live for a short period of time.

Investigation/Sampling

Foetal & Maternal Samples: As for abortion above. Postmortem exam of stillborn lambs looking for signs of placentitis, infection (liver lesions) and trauma (oedema, bruising, internal haemorrhage).

Trace Elements: Consider screening for trace element deficiency (iodine, copper, and GSH-Px - serum and heparin plasma) depending on history, postmortem exam findings and exclusion of other causes.

Weak neonatal lambs

Both infectious and environmental factors can contribute to weak neonatal lambs with increased mortality.

History

Establish whether lambs are born weak vs normal at birth then deteriorating, and clinical signs shown. History of abortion/stillbirth and maternal vaccinations. Review dietary history and current intake, incidence of twin lamb disease, colostrum/milk quality/supply. Conditions at lambing including evidence of dystocia, weather, routine husbandry/treatment of new-borns.

Investigation/Sampling

Colostrum: Serum sample 4-6 affected lambs under 7 days old for ZST.
Infectious disease: Consider screening for border disease if other abortion agents have been ruled out – examine placentas from affected lambs if possible.

Postmortem: Submit lambs to local postmortem centre or carry out on-farm postmortem examination (see pages 58, 59 and 64). Include placental sampling where possible to screen for (infectious) placentitis. Note that infectious disease can be secondary to hypogammaglobulinaemia – collect postmortem blood and send serum for ZST. Check thyroid for goitre. If neurological signs fix brain and spinal cord, and collect fresh liver for copper and selenium assay.

Nutritional: Assess body condition and review recent diet and colostrum/milk production of ewes. If prolonged lambing period, checking BOHB of ewes and/or forage analysis may be useful for late lambing ewes (serum). Ewe nutrition (Urea, BOHB) and trace elements (GSH-Px, copper, iodine - serum and heparin plasma) may be useful pre-lambing the following year if ewe nutritional cause suspected (see page 37).

Diarrhoea in neonatal lambs

Scour in neonatal lambs can be due to individual pathogens or a combination of dietary problems (colostrum and milk intake), and/or husbandry issues leading to pathogenic infections. Assessing management and hygiene can be a very useful part of investigation. Scour can spread rapidly therefore prompt investigation is encouraged. Some pathogens are zoonotic. Consider isolation of affected lambs if possible.

History

Ewe body condition score, vaccination history, current diet, and colostrum/milk production. Lambing shed and neonatal lamb management, historical disease problems.

Investigation/Sampling

Infectious disease: Take faecal sample from 2-3 untreated cases for E. coli K99, rotavirus, salmonella and cryptosporidiosis +/- coccidiosis if >2wo (Neonatal Enteritis Package).

Colostrum: Take serum for ZST from 4-6 affected lambs <7d old to assess colostrum intake.

Postmortem: Examine any lambs for signs of Lamb dysentery – dark, distended, small intestine sometimes with gas production within the intestinal wall and blood-stained peritoneal fluid. Take intestinal content for anaerobic culture, beta and epsilon toxin detection to support the diagnosis. Collect faeces and blood for testing as above.

Further information

Sargison, N. (2004), Differential diagnosis of diarrhoea in lambs. In Practice, 26: 20-27.

Poor growth rates in lambs

Target growth rates are 300g/day pre-weaning and 200g/day post-weaning but will vary with production system. Ill thrift in lambs can be multifactorial and the causes can be historical e.g., if growth rate is poor in the first 8 weeks of life, lambs rarely make up the deficit. Taking a thorough history is key to effective investigation.

History

Age, number affected, timing of anthelmintic treatment(s), when last wormed and with which product, evidence of scour, duration of problem, number of deaths. Assess level of nutrition post lambing and availability/quality of current pasture. Assess pasture grazing history with respect to parasite risk.

Investigation/Sampling

Nutrition: Assess forage quality, availability, and stocking rate (see AHDB reference below)

Samples: Fresh faecal samples from ten lambs for pooled worm egg counts +/- screening for liver fluke (serum) depending on time of year/risk. Blood sample (serum and heparin plasma) six from affected group for vitamin B12, copper, GSH-PX and pepsinogen +/- liver fluke serology

Postmortem: If mortality or sacrifice 2-4 typical cases (see sampling guide on page 58, 59 and 64).

Further information

AHDB (2018), Planning grazing strategies for better returns (available online)

Gascoigne, E. and Lovatt, F. (2015), Lamb growth rates and optimising production. In Practice, 37: 401-414.

Sargison, N. (2004), Differential diagnosis of diarrhoea in lambs. In Practice, 26: 20-27.

Respiratory tract conditions in sheep

History

Including number affected, duration and severity of problem, number of deaths, condition of affected animals, vaccinations used, response to treatment.

Investigation/Sampling

Lambs: Submit faecal samples from affected animals for lungworm check. Abattoir feedback for enzootic pneumonia in lambs.

Adults: Blood sample (serum) 6-10 animals for MV serology. Ultrasound scan or postmortem examination for OPA.

Postmortem: If mortality do postmortem examination, and collect fixed and fresh lung samples as per pages 58, 59 & 64.

Further information

Bell, S. (2008), Respiratory disease in sheep. In Practice, 30: 200-207 and 278-283.

Sudden deaths

Investigation/Sampling

Postmortem: Submit or carry out postmortem examination of fresh carcase(s). Take samples as per page 58 & 59 or phone the duty vet on 0131 535 3130 for sampling advice if needed

Further information

Lovatt, F., Stevenson, H. and Davies, I. (2014), Sudden death in sheep. In Practice, 36: 409-417.

Otter, A and Davies, I. (2015) Disease features and diagnostic sampling of cattle and sheep postmortem examinations. In Practice, 37:293-305

Ill thrift in adult sheep

Depending on the presentation, ill thrift can be nutritional (although trace element deficiency in adult animals is rare as a cause of ill thrift) or due to disease. Always investigate if culling due to weight loss is increasing in a flock.

History

Percentage affected, duration of problem, age range, time of year problem is occurring, date of weaning, dates of anthelmintic/flukicide treatment and products used, diet fed/available and trace element supplementation, clinical signs e.g., diarrhoea, lameness, respiratory signs.

Investigation/Sampling

Clinical Examination: Body condition score affected ewes and proportion of rest of flock. Check for broken mouths, causes of lameness, mastitis, or other concurrent disease.

Parasitism: Submit faecal samples from ten individuals to assess worm and fluke burdens. Note that high worm burdens may be secondary to underlying disease.

Infectious disease: Submit serum blood samples from 6-10 affected animals for Johne's disease, MV +/- CLA serology. Ultrasound examination for OPA (although histopathology is required for definitive diagnosis).

Postmortem: Submit or perform an on-farm postmortem examination (see sampling guide on page 58, 59 & 64) of 2-4 typically affected ewes with no explanation for poor condition found on clinical exam. This can be a very cost-effective screen.

Further information

Busin, V. (2020), Recognising and dealing with ill thrift in ewes. In Practice, 42: 498-509.

Skin conditions in sheep

History

Number affected, duration of problem, whether bought-in, details of quarantine procedure, whether pruritic, response to treatment, signs seen.

Investigation/Sampling

Clinical Exam: Examine wool for lice and scab mites (latter just visible to naked eye but need skin scrape to rule out).

Parasites: Submit skin scrapes and scabs from edge of affected area from affected animals. Include as much crust material as possible. To be checked for ectoparasites (free of charge for practices in Scotland).

Infectious disease: If appropriate submit swabs for bacterial culture for *Dermatophilus, Staphylococus aureus* or CLA (+/- serology for the latter). Consider fungal culture for ringworm. Submit small, clean, dry scabs for Orf PCR (do not use VTM). Consider fixed skin biopsies for histopathology.

Further information

External parasites of sheep, search SCOPS (www.scops.org.uk/external-parasites/)

Gascoigne, E., Ogden, N., Lovatt, F. and Davies, P. (2020), Update on caseous lymphadenitis in sheep. In Practice, 42: 105-114.

Trace element check

Routine check to monitor trace element requirement of stock either at end of grazing period (to assess pasture) or during / after housing period (to assess housed ration).

History

Ensure ration details are recorded accurately and review access to ration in housed groups. Allow at least 3 weeks from any ration change before sampling.

Investigation/Sampling

Samples: 4-6 animals screened for copper, vitamin B12, GSH-PX and pooled iodine (heparin plasma ideally but serum can be used for copper)

Metabolic profile in ewes pre-lambing

History

Assess quality of forage and concentrate available. Check the timing and amount of concentrate fed alongside available trough space for both concentrate and forage. Check water source is clean and accessible. Any evidence of widespread decrease in body condition score or presence of twin lamb disease suggests a significant nutritional issue.

Investigation/Sampling

Samples: Take serum from 5-10 animals from each group (twins/triplet bearing ewes if scanned) 3-4 weeks prior to lambing. Test BOHB and Urea +/- albumin +/- Mg. Avoid sampling straight after concentrate feeding.

Further information

Phillips, K., et al. (2014), Sheep health, welfare and production planning 2. Assessing nutrition of the ewe in late pregnancy. In Practice, 36: 133-143

Notes

Ruminant Parasitology

Investigation of anthelmintic resistance

Faecal egg count reduction test (FECRT) protocol (search FECRT combar, www.combar-ca.eu/media)

Animals should not have had anthelmintic in the previous 6 weeks (longer if a persistent product has been used)

Carry out individual faecal egg count on 10 individually identified animals

Ensure product is used as per manufacturer's instructions, drenching guns are calibrated, animals are weighed and dosed appropriately for weight.

Take post-treatment samples at a suitable time point depending on the anthelmintic used:

- levamisole: 7 to 10 days
- benzimidazoles: 10 to 14 days
- ivermectin and other macrocyclic lactones: 14 to 17 days
- moxidectin: 17 to 21 days
- monepantel: 14 days
  when testing in parallel two or more drugs in same flock: 14 days

Ensure containers are as full as possible and samples are kept cool prior to worm egg count.

Where possible, if lack of efficacy is identified, identification of L3 larvae (or molecular techniques) can be useful to identify resistant species.

Investigation of triclabendazole resistance

Coproantigen assay can be used to assess triclabendazole efficacy at times of year when the liver fluke burden is likely to consist of late immature/adult flukes. If treatment has been successful, the mean percentage positivity should ideally fall by at least 90%. For other flukicides the test can be used when liver fluke burdens are expected to consist of adult flukes. Any reduction in positivity should be interpreted alongside the expected efficacy of the product against adult liver fluke, as noted in the data sheet.

Collect 10 individually identified faecal samples for individual coproantigen assay.
Treat according to data sheet, check dosing gun is calibrated, and animals treated for weight.

After 14 days, collect individually identified faecal samples from the same 10 animals for coproantigen.

Fluke diagnosis/ monitoring

Test	Applications	Limitations
Fluke Egg Detection (Individual or pooled sample)	Requires presence of adult liver fluke (10-12wks post infection) producing eggs	Egg numbers fluctuate daily and not evenly distributed in faeces Small numbers of eggs may still be detected for around 3 weeks after successful treatment Can miss low levels of infection in pooled samples
Coproantigen ELISA (Individual or pooled samples)	Can detect infection with late immature and adult liver fluke 2-3wks before fluke eggs detected. Useful for checking flukicide efficacy	Levels can fluctuate daily and not evenly distributed in faeces Can miss low levels of infection in pooled samples
Serology	GLDH – increase from 2-3 weeks after infection GGT – Increase from 6-8 weeks after infection Albumin – Decreases in chronic disease	Antibody varies over time and sheep remain positive for months after treatment. Maternally derived colostral antibody lasts around 12 weeks
Biochemistry	GLDH – increase from 2-3 weeks after infection GGT – Increase from 6-8 weeks after infection Albumin – Decreases in chronic disease	Non-specific changes therefore interpretation can be challenging
Postmortem	Definitive diagnosis if immature fluke present in liver parenchyma or adults found in bile ducts of liver. Gently squeezing liver can extrude migrating fluke	One sheep with no evidence of fluke infection does not rule out fluke at group level. Can get scarring of liver with Taenia migration

Notes

Pig Disease Investigation

Infertility/Barren pigs

This is more typically chronic reproductive failure, usually exhibited by low farrowing rates, low live births, and/or a high number of animals failing to conceive.

History

Initial questions:
- Are sows or boars off feed or running high fevers?
- Are there abortions, high incidence of mummies and/or stillbirths?
- Increased number of returns to heat?
- Weak and premature piglets born?

If answer to the above is NO, then infertility is unlikely to be infectious and boar, sow/gilt, environment, management, and feed should be considered.

Investigation/Sampling

Serology: Maternal serum samples for serology for PRRSV, Porcine parvovirus (PPV), Erysipelothrix rhusiopathiae , Swine influenza, Leptospira Bratislava (or all 19 Leptospira serovars). Serum samples also for PRRSV PCR

Boar: Clinically examine. Consider age and level of usage

Sow/Gilt Nutrition: Consider parity and body condition

Management: Assess quality of management including level of stockperson training

Environment: Assess housing conditions. Consider time of the year e.g., effect of heat stress.

Feed: Review feed composition and amounts. Consider trace element screening and testing feed for mycotoxins (see price list for test options).

Further information

Reuff, L. (2000) Diagnostic approaches to reproductive failure in pigs. Swine health and production, 8(6):285-287

Abortion/stillbirth/weak piglets

Abortion target = 1%, (intervention if >/= 2.5%). Mummified foetuses / litter target = 0.5%, (intervention if >/= 1%). Stillborn per litter target = 5%, (intervention if >/= 7.5%). Infections and non-infectious causes need to be considered.

History

Note sow/gilt age and parity, condition score, service date and expected farrowing date, recent treatments, concurrent illness, management changes, vaccination details, and whether deaths are pre-, intra- or post-partum.

Investigation/Sampling

Nutrition: Review diet. Spoiled feed? Consider trace element screening and testing feed for mycotoxins.

Serology: Maternal serum samples for PRRSV, PPV, Erysipelas, Swine influenza, Leptospira Bratislava (or all 19 Leptospira serovars) serology. Serum samples also for PRRSV PCR. Nasal swabs for swine influenza.

Postmortem: See pig abortion sampling section on pages 74 & 75.

Further information

Barlow, A.M. (1998). A guide to the investigation of porcine abortion/stillbirth. In Practice 20(10): 559-564.

Gresham, A. (2003), Infectious reproductive disease in pigs. In Practice, 25: 466-473.

Diarrhoea in piglets

Infections are a common cause and there are a range of viral, bacterial, protozoal and parasitic causes to consider. Susceptibility varies with age, therefore testing can be more focused (please see price list for testing recommendations according to age categories). Also consider nutritional factors.

History

Historical disease or scour problems. Query colostrum management and environmental hygiene. Review vaccination history and level and timing of antibiotic use. Timing of any neonatal treatments.

Investigation/Sampling

Live animals: Fresh faeces from at least three recently infected, untreated pigs. Test based on age category– see SRUC vet services pricelist.

Postmortem: Batch of up to three, untreated pigs ideally. Submit alive (if welfare allows and is pre-agreed with vet at postmortem centre) or within a few hours of death. See page 58, 59 and 68 for on-farm sampling, but carcases should be very fresh/euthanased.

Further information

The pig site (2018) Diarrhoea or scours. Available at: https://www.thepigsite.com/disease-guide/diarrhoea-scours

Respiratory disease

The cause is usually infectious. There are a range of viral, bacterial and parasitic causes to consider.

History

Consider acute versus chronic disease Note environmental conditions, vaccination history and response to treatment.

Investigation/Sampling

Live animal sampling: Paired serum samples (2-3 weeks apart) may be useful for swine influenza, PRRS and Mycoplasma hyopneumoniae. Take samples from acutely affected animals and repeat three weeks later. PCR on nasal swabs for swine influenza.

Postmortem: Ideally a batch of up to three pigs/plucks from untreated pigs early in the course of disease are ideal. If treatment is failing, it may be appropriate to submit treated pigs. Submit to local postmortem centre of if performing on-farm investigation, see sampling guide on pages 58, 59 and 68.

Further information

Done, S. and White, M. (2003), Porcine respiratory disease and complexes: the story to date. In Practice, 25: 410-417

Carr, J., & Howells, M. (2017). Porcine respiratory disease: investigation and prevention. Livestock, 22(Sup6), 4-12.

Nervous disease

Infectious causes (e.g., bacterial meningitis) are common. Be aware that some notifiable diseases can present with neurological disease, e.g. Aujeszky's disease (pseudorabies) and classical swine fever (can present as congenital tremors in piglets).

History

Full history required. Confirm neurological origin and if central or peripheral CNS. Establish if individual or multiple animals/whole group affected. History of water deprivation, heat stress or recent injection.

Investigation/Sampling

Postmortem: Submit fresh carcase to post mortem centre if possible. If doing on-farm postmortem examination then see pages 58, 59 and 69 for sampling advice.

Further information

Done, S. (1995). Diagnosis of central nervous system disorders in the pig. In Practice, 17(7), 318–327.

Skin disease

Causes can be infectious (viral, bacterial, fungal, parasitic), nutritional or congenital/hereditary.

History

Age of affected pigs. Establish if individual or multiple animals/whole group affected

Investigation/Sampling

- Charcoal swabs for bacterial culture
- Hair plucks for ringworm culture
- Skin biopsies for histopathology and electron microscopy.
- Skin and ear wax scrapings for ectoparasite examination.
- Serum for biochemistry – to rule out parakeratosis (Zn deficiency)

Further information

White, M. (1999), Skin lesions in pigs. In Practice, 21: 20–29

Lameness and locomotor disturbance

Disease of skeletal system, joints, muscles, feet or neurological system can cause lameness or locomotor disturbance. Lameness due to vesicles and blisters on the feet can be associated with notifiable diseases.

Causes include inflammatory conditions (synovitis/osteomyelitis secondary to bacterial septicaemia, including mycoplasma); nutritional osteodystrophy or myopathy; and degenerative conditions such as osteochondrosis, osteomalacia and epiphysiolysis.

History

Detailed history is essential as there are large numbers of potential causes. Determine if an individual or group problem, if multiple groups affected and the age of affected animals. Recent history of injection into neck muscles (can lead to iatrogentic spinal cord trauma). Review diet/nutrition with respect to calcium/phosphorus/vitamin E/ vitamin D.

Investigation/Sampling

Clinical examination: Examine feet for laminitis, ulceration, foot abscesses and cracks.

Live animal: Examine feet for pain or visible lesions. Collect synovial fluid samples for bacterial culture. Serum for Mycoplasma serology.

Postmortem: Complete PM with full sample set required to rule out other differentials (see pages 58, 59 and 69).

Further information

Canning, P *et al.*, (2019). Retrospective study of lameness cases in growing pigs associated with joint and leg submissions to a veterinary diagnostic laboratory. Journal of Swine Health and Production 27(3): 118-124

Sudden death

Wide range of possible causes. Acute bacterial septicaemia is most common. Also consider nutritional causes (mulberry heart disease, iron deficiency anaemia, hypocalcaemia) toxicity (bracken, coal tar), intestinal torsion, electrocution, trauma (crushing in neonates). Consider notifiable conditions, particularly if large numbers of pigs are found dead or are showing signs of acute disease.

History

Detailed history will help eliminate certain possibilities and narrow the differential list.

Investigation/Sampling

Postmortem: Submit fresh carcase(s) to postmortem centre if possible. If doing on-farm postmortem, a full range of samples is strongly recommended (see page 58 & 59).

Useful reading for the unexpected pig visit

Further information

Potter, R. (1998), Clinical conditions of pigs in outdoor breeding herds. In Practice, 20: 3-14.

Robbins, R. C., *et al.* (2014), Swine Diseases and Disorders. Encyclopaedia of Agriculture and Food Systems, 261–276.

Carr, J. and Wilbers, A. (2008), Pet pig medicine. 1. The normal pig. In Practice, 30: 160-166.

Carr, J. and Wilbers, A. (2008), Pet pig medicine. 2. The sick pig. In Practice, 30: 214-221.

Postmortem Exam and Sampling

Field Postmortem – Equipment

Equipment list

Useful tools and equipment

- PPE – waterproofs, gauntlet/vinyl/cut-proof/chain mail gloves
- Disinfectant (remember zoonotic implications for you and your farmer)
- Postmortem knives – large and small and/or PM40 blades.
- Plastic chopping board
- Scissors and rat tooth forceps
- Saw +/- loppers
- Hammer and chisel
- Measuring tape
- pH paper
- Camera

Sample collection

- Charcoal swabs
- Plain blood tubes
- Full set of blood tubes if live animal is euthanased
- Syringe and needle or vacutainer
- 30ml and 60ml pots for fresh tissue (pre-labelled with standard samples)
- Large pot for brain (do not squash the brain, and add 5-10 times the volume of formalin)
- 10% formal saline (formalin fixative)

Preparing for on-farm postmortem examination

- Find a well-lit, easily disinfected area, away from other stock
- Set up a makeshift work area – loader bucket, straw bales, tarpaulin
- Set up two clinical waste bags doubled up suspended inside an empty bucket or drum - to dispose of viscera. Secure with cable ties once full.

Practical tips for field postmortem examination

Useful guides and information on postmortem technique

Excellent references for further guidance on postmortem examinations:

- Getting the most out of on-farm postmortems by AHDB. Available online at: https://ahdb.org.uk/knowledge-library/getting-the-most-out-of-on-farm-postmortems
- Disease features and diagnostic sampling of cattle and sheep postmortem examinations by Arthur Otter and Ian Davies. In Practice 2015; 37:293-305
- Postmortem examination of cattle and sheep by Ian Griffiths. In Practice 2005; 27: 458-465
- Postmortem examination of horses by Katherine Whitwell, In Practice 2009, 31: 104-113.

Before you start

- Always take a full clinical history
- Take blood samples (red, green, and purple top) before euthanasing an animal for postmortem examination.
- Rule out anthrax (if required) prior to starting the examination

Postmortem examination: Technique in brief

- Assess carcase externally – Faecal staining, scavenging, body condition, injuries.
- Stabilise the carcase by cutting through axillae and hip joints and reflect the limbs.
- Remove the skin – look for oedema, haemorrhage, enlarged lymph nodes. (Picture 1)
- General internal exam – look for effusions (collect a sample), haemorrhage, pallor, congestion, icterus, oedema, lymph node enlargement
- Respiratory – remove the pluck (Picture 2). Examine the larynx, trachea, bronchi, lung parenchyma. Look at the distribution and nature of lesions (Picture 3, cranioventral depressed consolidation)
- Cardiovascular – Look for pericardial effusion, size and shape of heart, valve lesions
- Abdominal solid organs (Picture 4, normal viscera. Empty gall bladder)
  - spleen: size.
  - liver: colour, consistency, rounding of edges, parasitism
  - kidney: size, consistency, and colour
- Gastrointestinal tract (Picture 5) – Consider the type of content, rumen pH, and rumen fill, abomasal mucosa, intestinal fill, and nature of content. Colour of serosa and mucosa, intestinal thickening.
- Reproductive system – Gestation, infection.
- Urinary system – Check ureters, bladder; urinary obstruction, urine appearance
- Musculoskeletal – Look for muscle discolouration, necrosis. Check joint fluid – appearance, amount, turbidity.
- Brain (Picture 6, normal brain) – Malformation, fluorescence

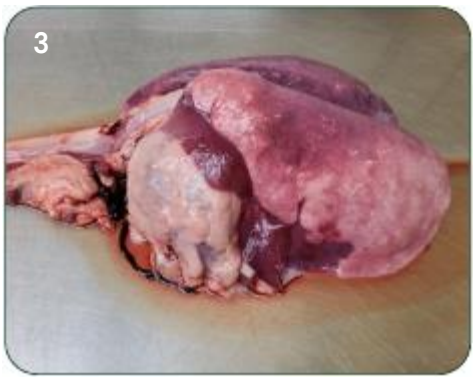
If in doubt – take photos and standard samples then phone 0131 535 3130 to discuss with a SRUC vet.

Take pictures if there are lesions of which you are unsure.

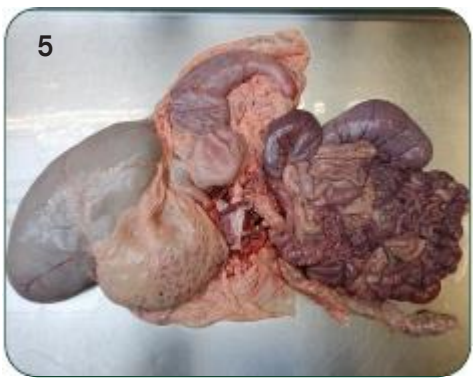
- Is it pathology or just postmortem change?
- Use Email or WhatsApp to send them to your local SRUC duty vet


1


2


3


4


5

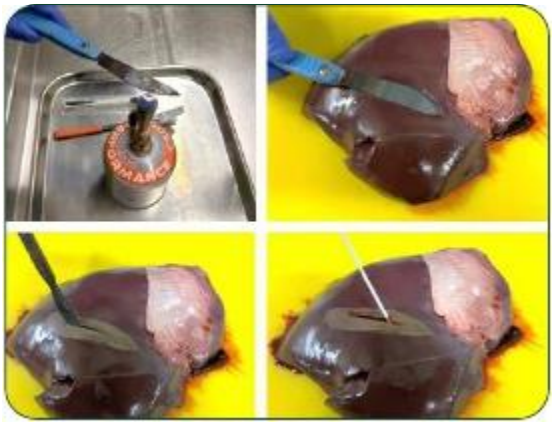

6

Tips for sampling at Postmortem

Tissues for bacterial culture:

Take a swab by searing the surface of the tissue with a hot blade. Incise with a sterile scalpel within the seared tissue before taking sterile swab.
OR
Fill a 60ml pot with clean tissue and submit for bacterial culture as soon as possible.

Specific mycoplasma transport medium is available from your local postmortem centre or the SRUC Vet Services, Edinburgh lab (0131 535 3130).

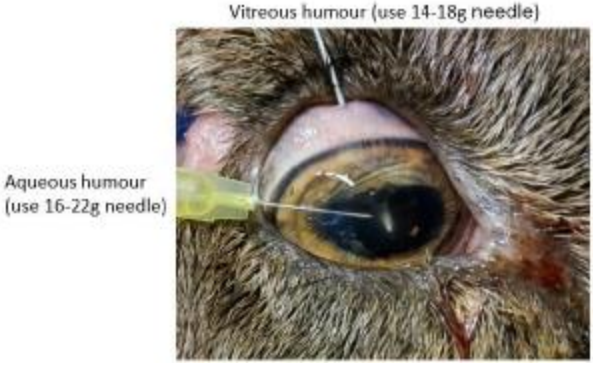


Sterile swabbing of post mortem tissue

Aqueous and Vitreous Humour:

Useful for biochemistry, especially Ca, Mg, Urea and BOHB. Vitreous humour is generally more stable and the sample of choice for PM testing.
Use a large bore needle inserted through the cornea into the posterior chamber and angle caudally then aspirate 1-2ml. A vacutainer also works well. You may need to rotate or reposition the needle to collect a sample.

Contaminants will affect Ca and Mg levels in fluid therefore centrifuge before sending clean sample to lab.

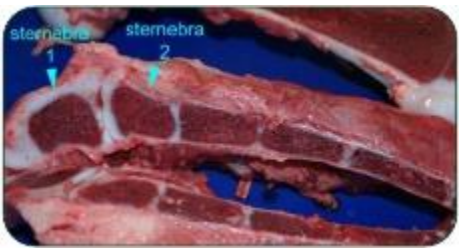


Histopathology samples:

- If it looks weird – put some into fixative!
- 1 x 1 x 2 cm pieces of tissue are ideal.
- They can all be in the same pot together, just tell us which tissues are present.
- Fix these in ten times as much 10% formal saline / formalin as soon as possible. If the tissues went into a dry pot gently swirl to loosen from the bottom.
- Complete your paperwork with your initial testing requests and mark it 'tissues for histopathology available/to follow'
- Once tissues are fixed, usually after 48–72 hours at room temperature you can remove them from the formalin and send them in one pot with a maximum of 50ml of formalin.

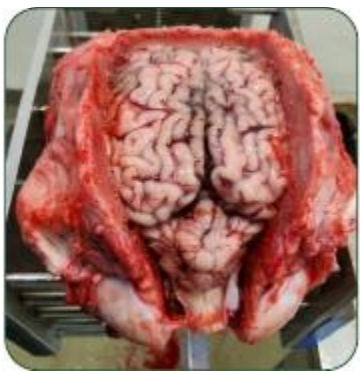
Splitting a sternum for bone marrow histopathology:

- Remove the tissues surrounding the sternum.
- Make a longitudinal cut down the midline of the sternum
- Put one half of sternebrae 1 and 2 into fixative
- Allow to fix for at least 4 days prior to submission



Neuropathology:

- For neurological conditions histological examination of the brain may be your best chance of getting a diagnosis.
- Remove the brain and let it cool before placing into formalin
- Fix it in ten times as much formal saline / formalin
- For calf and sheep brains, fix for at least seven days at room temperature.
- Fixed brains can then be submitted in a small rigid pot, with padding around the brain for protection (see pages 6 & 7). Do not send large volumes of formalin in the post.



Standard sample set for Postmortem examination

We recommend taking this sample set for every postmortem examination, as it will provide a good chance of reaching a diagnosis in most cases (unless the carcase is significantly autolysed).

We recognise it is not always possible or easy to collect all these samples on farm. For this reason, over the following pages a reduced sampling list for investigation of specific problems or diseases has been provided, however *this may lead to a lower chance of reaching a diagnosis*.

Sample	Fresh	Fixed*	Common Test(s)	Sample requirements
Vitreous humour	√		Ca, Mg, BOHB, Urea	Plain vacutainer
Serum	√		ZST (if not too haemolysed), BVD Ab/Ag Other serology NOT Biochem	Plain vacutainer (collect blood from axilla / groin / heart)
Trachea	√	√	BHV1 PCR	Tissue/swab in VTM
Lung	√	√	Bacterial culture Viral / Bacterial PCR	Swab/60ml pot of tissue for culture 1 cm cube in VTM from edge of lesion 4-6 sections into fixative
Heart, tongue, intercostal muscle, diaphragm		√	Histopathology (White muscle disease)	1 x 1 x 2 cm of each in formalin

Sample	Fresh	Fixed*	Common Test(s)	Sample requirements
Liver	√	√	Bacterial culture Copper, Lead, Selenium, Cobalt, Vits A & E	Swab/60ml pot of tissue for culture Separate lidded pot for trace element analysis
Spleen	√	√	BVD, BDV, TBF PCR	1 cm cube in VTM
Kidney	√	√	Copper, Lead Toxicity	Submit in lidded pot
Rumen content	√		pH	Test pH on farm
Rumen, abomasum, and intestine		√	Ruminal acidosis Parasitism, enteric disease	Rumen, abomasum, 2cm intestinal sections: jejunum, ileum, caecum, and colon
Terminal ileal content	√		Clostridial toxins	Submit in lidded pot
Caecal/ colonic content	√		Parasitology. Rotavirus, Coronavirus, E. coli K99	Submit in lidded pot
Brain	√	√	Fresh: BVD/ BDV/ SBV PCR Fixed: Neuropathology	1 cm cube in lidded pot in VTM Whole brain in formalin

*Fixed tissues can be put in a single tightly lidded pot. There should be 10 times the volume of 10% formalin as there is tissue.

Cattle Postmortem sampling: Problem oriented approach

Presentation	Sample	Test
Diarrhoea in youngstock (fresh carcase required)	[a]Blood for ZST if <7days old [b]Intestinal content +/or Faeces [c]Fix several sections of small and large intestine	[a]ZST if <7doa [b]Bacterial culture incl. Salmonella [b]E. coli K99 (<5doa) [b]Rota and coronavirus (<21doa) [b]Cryptosporidia (6-21 doa) [b]Parasitology (>14 doa) [c]Histopathology
Sudden death in youngstock	See standard sample set on pages 58 & 59	Bacteriology Histopathology Other testing as indicated by gross exam.
Pneumonia	See respiratory sampling guide, pages 62 & 63	
Adult scour	[a]Faeces [b]Intestine: fresh ileum [c]Fix selection of small and large intestine	[a] Johne's PCR, Salmonella culture, [a]Fluke egg count [a,b]ZN smear [c]Histopathology
Sudden Death (NB - rule out anthrax)	[a]Vitreous for Mg if >6mo, 7 rib if <6mo [b]Rumen pH, check for toxic leaves, fix rumen Muscles: Dry, dark lesions: [c] fresh and dfixed [e]Small intestinal content, [f]Kidney [g]Liver [h]Fixed brain [i]Collect the standard sample set if no gross diagnosis	[a]Mg [c]Tissue FAT and Histopathology [e]Clostridial Epsilon toxin [f, g]Lead [g]Selenium & Vit E [h]Neuropathology [i]Histopathology

*Superscript letters indicate the tissues which are required for the individual tests

Cattle postmortem sampling: Disease oriented approach

Condition	Sample	Test
Bacterial disease	Fresh tissue in 60ml pot, charcoal swab (p50&51)	Bacterial culture
Black disease	Liver: Fresh lesion Liver lesion: Fixed	Bacterial culture, FAT Histopathology
Blackleg	Liver/Spleen Affected muscles: Fresh and fixed	Bacterial culture Clostridial FAT Histopathology
Bovine neonatal pancytopenia	Split and fix cranial sternum (p57)	Histopathology
Cl. perfringens enterotoxaemia	Small intestinal content. Fixed brain	Clostridial epsilon toxin Neuropathology
Copper poisoning	Fresh liver and kidney	Tissue copper
Hypocalcaemia, hypomagnesaemia	Vitreous humour (p44), centrifuged	Biochemistry (Ca, Mg)
Hypomagnesaemia (calf)	2 cm section of clean 7th rib bone	Bone ash analysis
Lead poisoning	Fresh kidney	Tissue lead
Listeriosis	Small wedge of brain stem (fresh) Fixed brain	Bacterial culture Neuropathology
Lungworm	Worms grossly; faeces; Fixed lung	Baermann Histopathology
MCF	EDTA blood, spleen	MCF PCR
PGE	Faeces Fix multiple abomasal & small intestine sections Gut / abomasal wash (pages 66 & 67)	Worm egg +/- cocci Histopathology Total worm count
Trace elements	Liver	Tissue chemistry
White muscle disease	Fixed tongue, heart, intercostal muscle, and diaphragm. Fresh liver	Histopathology Vit E & Selenium

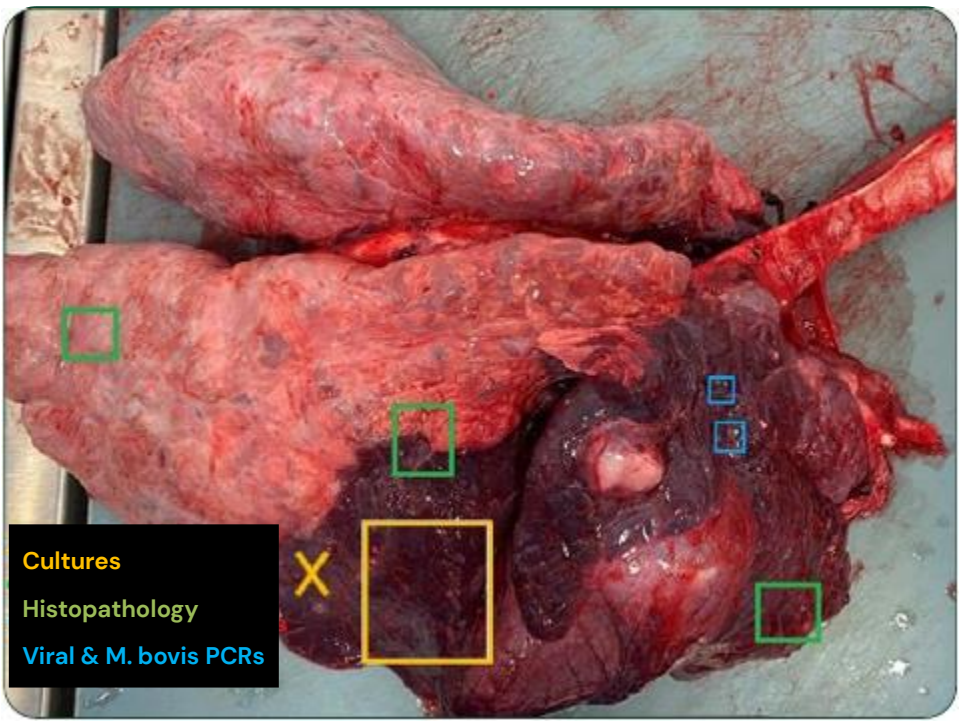
Bovine respiratory disease sampling

A combination of bacterial culture, PCR testing and histopathology can help build a picture of the pathogenesis of pneumonia in that animal. Testing in acute cases is most helpful for detecting the primary pathogens.

Bacterial cultures are useful for antibiotic sensitivity (not possible for mycoplasma) and growing isolates for autogenous vaccine. Sampling of fresh tissues, good aseptic technique and keeping samples cool are essential for best results.

Transport media (Eaton's broth for Mycoplasma and virus transport medium VTM) are available from your local postmortem centre or from the SRUC Vet Services, Edinburgh on request (0131 535 3130). Lack of transport media does not prevent testing; however results may be negatively affected.

Suggested sampling sites in bovine respiratory disease:



Test	Sample	Sample Requirements
The Essentials:		
Histopathology 	Lung x 6 (both lungs) Papillary muscle of heart Trachea Larynx Any other lesions	1 x 1 x 2 cm pieces of tissue Place in 5-10 times the volume of 10% formalin
Bacterial cultures 	60ml leak proof pot full of affected lung Or Swabs from lung (see page 44) +/-swabs from abscess	Charcoal swab Avoid very necrotic or autolytic tissue
Extended Respiratory PCR (IBR, PI3, RSV, P. mult, M. haem., H. somni, M. bovis) 	Lung	1 cm cube of tissue from top of the right middle lung lobe in VTM
The Optional Extras (if suspected on history/examination):		
Histophilus somni septicaemia PCR 	Lesions: Heart, Larynx, Brain, Joint	Tissue 1cm cube in VTM
Histophilus somni septicaemia cultures 	Lesions: Heart, Larynx, Brain, Joint	Charcoal swab
M. bovis culture 	Lung	Plain swab in Eaton's broth. (do not put into charcoal)
M. bovis PCR 	Lung	Tissue 1 cm cube in Eaton's broth

Sheep post-mortem sampling: Problem oriented approach

Presentation	Sample	Test
Neonatal Lamb	[a]Serum [b]Aqueous/Vitreous Humour [c]Intestinal content [d]Lung and Liver Swabs/Tissue [e]Fixed sections of intestine & brain	[a]ZST [a,b]Urea [c]Crypto, rotavirus, [c]Clostridial toxin. [c,d]Bacterial culture [e]Histopathology
Grazing Lamb	Standard sample set (pages 58 & 59) Consider gut wash (pages 66 & 67)	Routine testing Total worm count
Lamb with respiratory disease	[a]Fresh lung or charcoal swab [b]1 cm cube fresh lung (in Eaton's broth) [c]Fixed lung (4-6 sections)	[a]Bacterial culture [b]Mycoplasma DGGE/PCR [c]Histopathology
Autumn Lamb with Ill Thrift	[a]Pre-mortem bloods [b]Liver [c]Faeces [d]Fresh lung and fixed lung if lesions [e]Fix: rumen, abomasum, and several small and large intestinal sections Check for chronic illness, abomasum	[a,b]Trace elements [c]Worm egg count [d]Bacterial culture [d,e]Histopathology
Adult Ill Thrift	[a]Pre-mortem bloods or PM serum Check teeth (dental dis.), Abomasum: Haemonchus [b]Swab wall of purulent lesions [c]Faeces [d]Fix: lung, liver, kidney, abomasum, rumen, intestinal sections especially ileum	[a]Johne's, MV, CLA serology [b]Bacterial culture [c]FWEC, (Johne's PCR) [d]Histopathology
Adult Periparturient losses	[a]Aqueous/Vitreous humour [b]Fix: Liver, lung, intestine and abnormal tissues [c]Serum sample cohort	[a,c]Urea, BOHB, Ca & Mg [b]Histopathology

*Superscript letters indicate the tissues which are required for the individual tests

Sheep post-mortem sampling: Disease oriented approach

Condition	Sample	Test
Bacterial disease	Fresh tissue, charcoal swab	Bacterial culture
CCN	Fresh brain Fixed brain	Look for fluorescence Neuropathology
Clostridial enterotoxaemia (pulpy kidney)	Intestinal (ileal) content +/- pericardial effusion Fixed brain	Clostridial enterotoxins Neuropathology
Johne's disease	Faeces Intestine (fresh and fixed) Ileocaecal lymph node (fixed)	Johne's PCR, ZN smear, Histopathology
Listeriosis	Small wedge of tissue from ventral brain stem (fresh) Fixed Brain	Bacterial culture Neuropathology
Metabolic disorders	Vitreous humour, centrifuged	Biochemistry (Ca, Mg, BOHB)
MV	Blood (serum) Fixed lung	MV ELISA Histopathology
Mycoplasma (enzootic) pneumonia	Lung in Eaton's broth Fixed lung	Mycoplasma DGGE/PCR Histopathology
Nephrosis	Vitreous humour Fixed kidney	Urea Histopathology
OPA	Fixed lung	Histopathology
PGE	Gut wash (pages 66 & 67) Faeces Fixed abomasum and intestine	Total worm count Worm egg count Histopathology
Trace element deficiency	Liver	Tissue chemistry (Cu, Se, Co)
White muscle disease	Fixed heart, intercostal muscle, and diaphragm; liver (fresh)	Histopathology, tissue chemistry (vitamin E / Selenium)

Diagnosing acute Nematodirosis in lambs

Nematodirosis should always be considered as a differential diagnosis in sudden deaths amongst growing lambs in the spring/early summer, particularly if some of the cohort have diarrhoea. Diagnosis can be reached readily by examining the small intestinal content for the characteristic clumps of worms. Worm recovery and identification can be challenging in autolysed carcases.

Equipment

Buckets

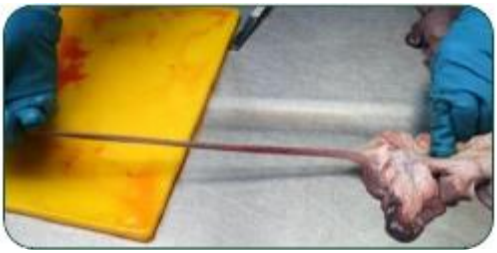
Scissors

Water (tap or slow running hose)

355 µm sieve (From suppliers such as SLS: product SIE1044)

Procedure

Gently tear the intestine away from the mesenteric attachment until the whole small intestine is free. Don't worry if it breaks in a few places. Place into a bucket.



Fill the intestine with cold water at low pressure until at least 20cm of the intestine is distended with water.

Run the gut through your fingers, and using gravity to help, wash the water and gut contents through the length of the gut. Ensure all of the content is caught in the bucket. It may be necessary, split the intestine into sections, to prevent blockages. Repeat for each section of gut you have. Discard the gut.

Pour the contents of the bucket, a bit at a time, over a 355 µm sieve – this process catches the fine worms in the sieve. Gently rinse the debris in the sieve under the cold tap until no more material will pass through the sieve and the water runs clear. A tea strainer or fine flour sieve can be used but will catch fewer worms. The contents will often have more fibrous content than those shown in the photograph and it may take some time for the material to go through the seive.

It is often possible to visualise Nematodirus as small clumps of very fine white worms amongst the fibrous debris on the surface of the sieve, often described as appearing like fine wet "cotton wool" (pictures below. The presence of tapeworm segments on the right below is incidental).

Microscopic examination can be carried out to identify the worms if desired but is usually unnecessary.

To submit a total worm count this process can be followed for the contents of the abomasum or small intestine. For the abomasum, collect the abomasal contents into a bucket, then wash the mucosal surface until clean, collecting all of the water in the bucket. Wash the content through the sieve as above (N.B. teladorsagia and trichuris are not easy to see with the naked eye). When the water runs clear, re-suspend the sediment collected in the sieve in 2 litres of tap water. Agitate the sample and collect 2 x 200ml alliquots into sealed leak proof containers and submit to the lab.

Pig post-mortem sampling: Problem oriented approach

Presentation	Sample	Test
Diarrhoea	Fresh small and large intestinal content Fix several sections of intestines and lymph nodes	Varies by age. Bacterial culture: • Aerobic • Anaerobic • Yersinia • Brachyspira Clostridial toxins E. coli virulence PCR Brachyspira PCR Lawsonia PCR Rotavirus-PAGE/ELISA Porcine coronavirus Faecal smear - cryptosporidium Histopathology
Pneumonia	Swab or 60ml pot fresh lung +/- liver 1 cm cube fresh lung Fixed lung (4-6 sections both sides)	Bacterial culture PCR (Mycoplasma hyopneumoniae, Swine influenza, PRRS, APP) Histopathology
Reproductive disease with abortion/ stillbirths/ weak piglets	Fresh - heart, thymus, spleen, lung. Foetal stomach content Fixed heart, lung, liver, kidney, placenta, (plus serum and nasal swabs from dam)	PCR (Swine influenza PRRS, Porcine Parvovirus) Bacterial culture Histopathology Maternal serology (pg 63)

Pig post-mortem sampling: Problem oriented approach

Presentation	Sample	Test
Lameness/ locomotor problem	Joint fluid or swab (collect aseptically) Synovial membrane – fresh (in Eatons broth) Liver – fresh 6 cm of 7th rib +/- femur Full range of fixed tissues incl. synovial membrane and growth plate (split bone longitudianlly)	Bacterial culture Mycoplasma DGGE/PCR Liver vitamin E & selenium Bone ash analysis Histopathology
Neurological disease	Meningeal swab 1 cm cube fresh brain Whole brain fixed	Bacterial culture PCR testing if necessary Histopathology

Pig post-mortem sampling: Disease oriented approach

Presentation	Sample	Test
PCV-2 associated disease e.g. PMWS, PDNS	Carcase lymph nodes (fix and fresh from at least 3 acutely affected pigs) Full sample set of fresh and fixed tissues	PCR for PCV-2 Histopathology +/- IHC
Progressive atrophic rhinitis	Fresh tonsil (Nasal/tonsil swabs from at least 20 live pigs) Transverse section through nose at level of premolar 1-2	Toxigenic P. multocida PCR Histopathology

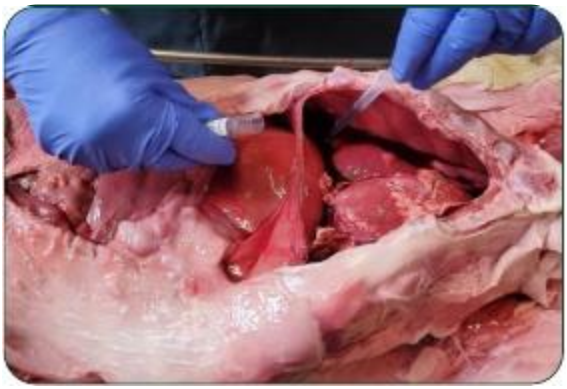
Bovine abortion sampling

Placenta – Bacterial culture and histopathology.

- 60ml pot of placenta (as clean as possible) with both cotyledon and membrane
- Fix a section of cotyledon and membrane (abnormal tissue if there is some)

Foetal fluid or blood (for BVD antibody, BVD antigen, N. Caninum and L. Hardjo antibody. Schmallenberg antibody on request).

- Fill two red top tubes and label as foetal fluid.
- Fluid from the thorax / pericardium/abdomen or unclotted blood is suitable



Collection of foetal fluid

Foetal stomach contents (FSC) for bacterial/fungal culture including Salmonella, Brucella and Campylobacter.

- Using a vacutainer needle and red top tube aspirate fluid from the stomach
- Sample should be collected in a sterile manner

If no FSC available:

- Lung for bacterial culture – place in a labelled universal container.

Collection of foetal stomach contents

Histopathology

1 x 1 x 2 cm representative tissue sections of:

- Liver - can be useful in identifying IBR
- Lung - histological changes are often evident in cases of bacterial abortion
- Heart - useful in the diagnosis of Neospora infection
- Brain - whole- useful in the diagnosis of Neospora infection
- Thyroid - hyperplasia can indicate iodine deficiency
- Placenta - placentitis can be indicative of an infectious cause of abortion

Tissues should be stored in 10 times the volume of formalin after collection.

Removal of thyroid gland in stillbirths.

Further Testing

PCR: A 1 cm cube of tissue (in virus transport medium if possible):

- IBR: liver
- BVD: spleen
- Schmallenberg virus (brain)

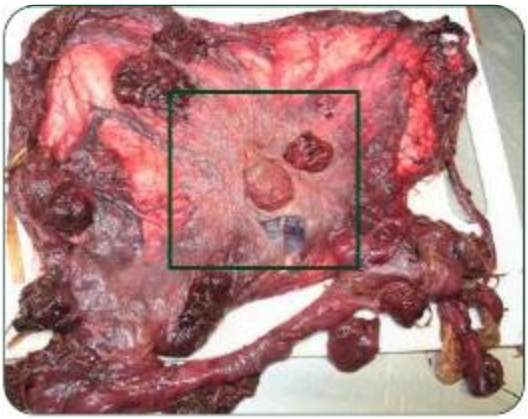
Trace elements:

- Iodine: Thyroid (stillborn calves)
- Selenium: Liver

Ovine abortion sampling

Placenta – Bacterial culture, MZN stain for EAE and histopathology.

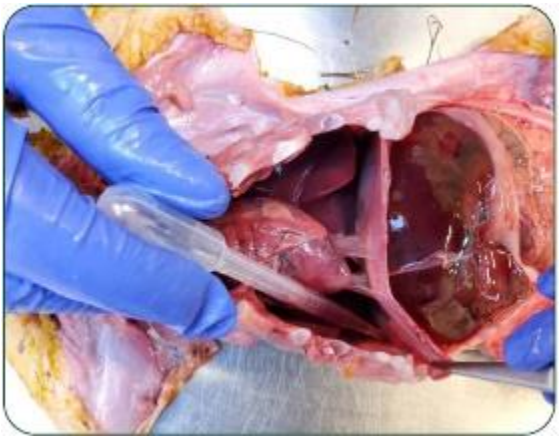
- 60ml pot of placenta (as clean as possible) with both cotyledon and membrane
- Fix a section of cotyledon and membrane (abnormal tissue if there is some)



Examine the whole placenta and select areas for sampling with pathology present.

Foetal fluid or blood (toxoplasma FAT)

- Fluid from the thorax/ pericardium/abdomen or unclotted blood is suitable
- Fill a red top tube labelled as foetal fluid



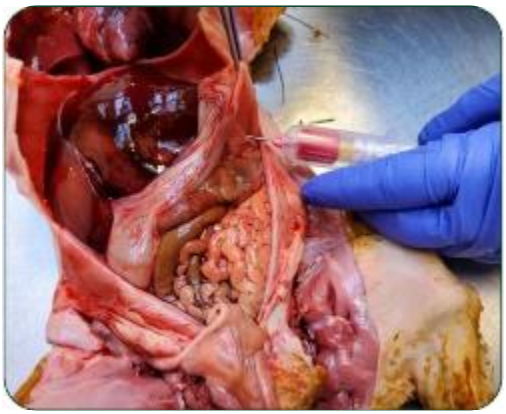
Foetal fluid is usually best found in the caudo-dorsal thorax. Abdominal fluid or blood are also suitable for testing.

Foetal stomach contents (FSC) for bacterial culture including Salmonella, Brucella and Campylobacter

- Using a vacutainer needle and red top tube aspirate fluid from the stomach.
- Sample should be collected in a sterile manner

If no FSC available:

- Lung for bacterial culture – place in a labelled universal container.



Collection of foetal stomach contents.

Histopathology

1 x 1 x 2 cm representative tissue sections of:

- Liver – histological changes often evident in bacterial abortion
- Lung - histological changes often evident in bacterial abortion
- Heart
- Brain – whole fixed brain is useful in the diagnosis of Border disease, Schmallenberg and bluetongue virus infection.
- Thyroid - hyperplasia can indicate iodine deficiency
- Placenta - placentitis can be indicative of an infectious cause of abortion. Typical lesions present in EAE and toxoplasmosis.

Tissues should be stored in 10 times the volume of formalin after collection.

Further Testing

PCR: A 1 cm cube of tissue (in virus transport medium if possible):

- Border disease virus: spleen
- Schmallenberg virus: brain
- Toxoplasmosis: placenta

Suspect Tick-borne Fever

- Maternal EDTA blood

Trace elements

- Iodine: Thyroid
- Selenium: Liver

Porcine abortion sampling

Postmortem examination

Note the following for each foetus:

- Weight
- Crown-rump lengths
- Any malformations
- Lungs inflated?
- Meconium in stomach?

Do foetuses appear to have died at the same time, or at different times (sequential deaths)?

Porcine abortion.

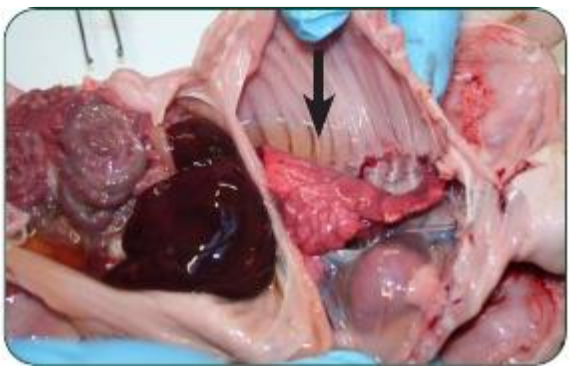
Sampling for laboratory investigations

Placenta/vaginal swabs – Bacterial culture for Brucella suis and histopathology

- 60ml pot of placenta (as clean as possible) with both cotyledon and membrane
- Fix sections of at least three cotyledons and membrane (include abnormal tissue if there is some)

Foetal fluid or blood (for porcine parvovirus HAIT and ELISA, and swine influenza HAIT)

- Fill two red top tubes labelled as foetal fluid with fluid from the thorax/pericardium/abdomen



Collection of foetal fluid from thorax (black arrow). Abdominal fluid can also be used.

Foetal stomach contents (FSC) (or liver if not available) for bacterial/fungal culture including Brucella suis and other bacteria.

- Using a vacutainer needle and remaining red top tube aspirate fluid from the stomach in a sterile manner.

Histopathology

1 x 1 x 2 cm representative tissue sections of:

- Liver
- Lung
- Heart
- Kidney
- Brain
- Placenta

Tissues should be stored in 10 times the volume of formalin after collection.

Fresh tissues

Sample 1 cm cube of each of the following into separate pots.

- Lung – Swine influenza PCR
- Liver – Porcine parvovirus PCR
- Thymus. spleen or lung – PRRS PCR
- Heart – for possible PCV-2 and EMCV testing

Further Testing

Sow serology: 'Acute phase' blood samples from affected and unaffected sows/gilts permit subsequent paired serology with 'convalescent' blood samples taken 2 to 3 weeks later. However, abortion is often a sequel to infection thus seroconversion may already have occurred. Potential testing for PRRSV, PPV, Erysipelas, swine influenza and Leptospira Bratislava

Notes

Poultry and Gamebirds

Domestic/backyard poultry disease investigation

History: For all poultry diseases, a thorough history is of particular importance since diagnostic sampling is often limited and owners may only present one bird for examination. The history should include:

- Number and type of birds (hybrid layer, pure breed, fancy breeds, ex-commercial, mixture)
- Housing/environment
- Management including diet, feeding method and equipment, supplements or treats, amounts and timing
- Source(s) of birds, and when most recent birds were added
- Vaccination and treatment history (e.g. worming, coccidiostat) before and after purchase.
- Birds affected – source(s), vaccination history, breed, and age – compared to those unaffected.
- Duration and clinical signs seen, numbers of birds affected,
- Contact with wild birds and waterfowl, wildlife or vermin.
- Any previous problems identified.

Blood sampling live birds

Diagnostic serum biochemistry and haematology testing in individual sick birds can be challenging to interpret (reference ranges are usually not available) and a conclusive diagnosis is rarely reached.

If serum samples (plain blood tube) are collected, note that chicken blood is prone to serum clots which can render the sample unsuitable for analysis. To minimise this avoid agitating samples, do not expose them to extremes of heat or cold e.g., in the car, and send to the lab on the day they are collected.

If you wish to carry out diagnostics in a small flock please don't hesitate to contact your local SRUC Vet (0131 535 3130) as a pre-sampling discussion is likely to be helpful.

Further information

Kelly, L.M. and Alworth, L.C., 2013. Techniques for collecting blood from the domestic chicken. *Lab animal*, 42(10), pp.359-361.

Problem oriented approach to poultry disease

Presentation	Sample	Test
Diarrhoea*	Faeces (fresh, avoid bedding)	Worm egg counts, Coccidial oocyst counts (young birds), +/- bacterial culture and/or Brachyspira
Respiratory Disease*	Faeces Swab from nares/conjunctiva Blood / serum	Gapeworm Mycoplasma PCR Bacterial Culture (may overgrow with contaminants) Note prior vaccination/exposure
Weight loss (individual)	Postmortem examination	History - rule out bullying Usually individual disease process (diagnostically challenging in the live animal).
Weight loss (group)	Faeces	History, esp. nutrition (see page 78). Check housing for red mite Worm egg counts, Coccidial oocyst counts (young birds)
Ascites	Peritoneal Tap	Turbid, malodorous effusion: Likely egg peritonitis Clear effusion: May be due to heart disease, hepatic disease or neoplasia among other diagnoses.
Neurological signs**	Postmortem examination	Fix brain (cut head in half into fix) and sample peripheral nerves.
Sudden Deaths**	Postmortem examination	Take standard sample set (page 82)

*Postmortem examination if mortality occurs
**Neurological signs/increased mortality can occur in notifiable diseases and APHA should be contacted if there is suspicion of Avian Influenza or Newcastle Disease.

Domestic poultry – Postmortem examination

Postmortem examination can be most valuable for investigation of flock level problems. Carcases can be delivered to SRUC postmortem centre's (see page 89) via courier with a chill pack in a polystyrene box (see packaging guidelines on page 7). Ensure notifiable disease has been excluded prior to submission.

Equipment:

- Sharp scissors
- Scalpel and a larger sharp knife
- Rat tooth forceps
- Bucket of disinfectant
- Kitchen scale

Top tips:

- Always perform an external examination. Check nares, eyes, oral cavity including the larynx, vent for abnormalities. Check skin for mites/lice (red mite not always present on carcase). Palpate bones for fractures or deformities
- Weighing can evaluate any variability within a group of the same age and type.
- Before opening, hold the carcase by the head and dip the body into a bucket of disinfectant, ensuring the head and beak are NOT submerged. Dipping reduces feathers sticking to hands/tissues.

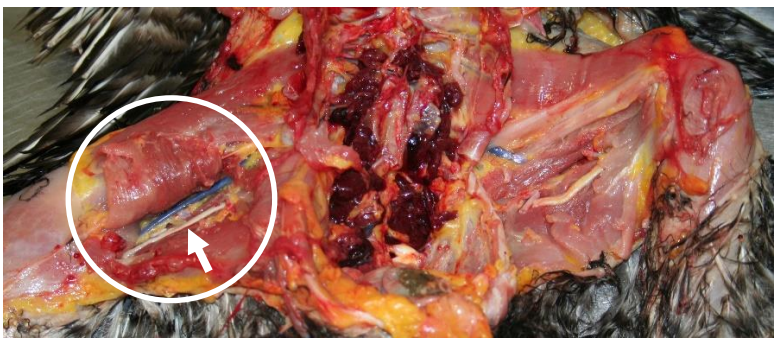
NB: If a bird is covered in lice or mites ensure wrists of gloves and clothing are sealed. These do not live on humans but will move onto humans in an emergency!

Further information

SRUC online CPD Academy, Free chicken pathology webinar

Technique in brief

- Place carcase on its back and press legs backwards to disarticulate the hips (stabilises the carcase).
- Cut along the midline from the ventral beak down almost to the vent with scissors and bluntly dissect/peel skin off.
- Cut through ribs (avoiding keel) with large sharp scissors and through the tough furcula (wish bone) cranially.
- Peel off the keel and attached abdominal wall.
- Grasp the oesophagus just underneath the heart, where it enters the proventriculus, and pull outwards. Cut the oesophagus and pull the proventriculus, gizzard, liver, spleen and intestinal tract out, cutting the large intestine close to the entry into the vent. Check abdominal air sacs for abnormalities as you remove the viscera.
- Examine the full digestive tract (including contents and mucosa) alongside liver and spleen.
- Examine reproductive tract, especially if the bird is a layer. Remove salpinx and ovary/developing follicles and yolks.
- Examine kidneys, particularly ureters (check for urates).
- Remove heart, examining for any visceral gout or abnormality. Note: euthanasia by cranial abdominal injection can cause crystals / gritty consistency which can be mistaken for visceral gout.
- Examine lungs and thoracic air sacs (including the membranes on the underside of the discarded keel bone).
- Examine inside of trachea, open from larynx to bifurcation.
- Check the crop for over-distention, sour odour or abnormal mucosa.
- Dissect between wing and thorax to examine brachial plexus. Dissect between muscle masses on caudomedial thigh to examine sciatic nerves (see below).
- Cut head longitudinally with large sharp knife. Examine sinuses.



Standard sample set for poultry postmortem

Sample	Test	Comment
Fresh liver	Bacterial culture	
Fresh liver, air sac	ZN impression smear	If avian TB suspected
Fresh air sac (if plaques present)	Bacterial and fungal culture	
Intestinal content	Worm egg count, Coccidial oocyst count Bacterial culture	Especially if presenting with diarrhoea
Fresh sinus tissue/ sinus swabs or swabs of ocular discharge. Fresh lung	Mycoplasma PCR Bacterial culture	
Fresh spleen, trachea, liver and lung. Tracheal swabs	Virology	e.g., Infectious bronchitis (IBV), Infectious laryngotracheitis (ILT)
Fixed tissues: Trachea, lung, heart, liver, spleen, kidney, intestine from various sites (duodenum, jejunum, ileum, caeca) opened out flat, sinus/half head with brain.	Histopathology (Can be very useful)	Additionally: any lesions seen e.g., neoplastic lesion, air sac plaque. Add sciatic nerve and brachial plexus if Marek's disease is suspected. (see pictures on page 81)

Game bird postmortem

Game bird postmortem and interpretation of findings can be challenging. If possible, consider submitting carcases to a SRUC postmortem centre. If you are doing postmortem examinations in practice, we recommend taking photos and discussing your findings with a SRUC Vet (0131 535 3130).

Further Information: Common diseases of game birds for further guidance on specific diseases of game birds, available at: http://apha.defra.gov.uk/documents/surveillance/diseases/gamebirds-common-diseases.pdf

Always consider notifiable disease (Newcastle disease and Avian Influenza) – contact APHA (03000 200301) for further advice in any cases where notifiable disease is suspected.

Equipment and Top Tips: As for Domestic Poultry (see page 80-82)

Selecting which birds to sample:

- If presented with a large selection of dead birds select the 'average' birds – the outliers may not be representative of the group problem.
- Chicks: Dead or obviously affected live birds can be examined (often only dead ones are seen). Very squashed or autolytic chicks can be examined (and may indicate of crowding under heat lamps). Fresh chicks are preferrable where possible.
- Poults: It is important to examine a targeted selection of sick birds with representative clinical signs. Submissions should include some live birds alongside dead ones, (especially if signs of abnormal faeces or stunting/wasting are seen).
- Submission of a random sample of live healthy birds, "just to see what's in the batch" without any accompanying clinical signs is rarely of use.

Standard samples for game bird postmortem examination depends on the species and age of affected birds

Pheasant/partridge chick

First two weeks of life, in housing.

Sample	Test	Sample Requirement
Yolk sac	Bacterial culture (E. coli, Salmonella, Staphylococcus etc)	Pick yolk sac out into sterile container. Concentrate on birds with enlarged/ discoloured yolk sac
Liver	Bacterial culture	Place whole liver into sterile container. Concentrate on chicks that appear "mushy" or congested.
Intestinal content	Rotavirus ELISA	Strip what little intestinal content there is into a small container (plain blood tube). Multiple samples can go in one container. Concentrate on chicks with yellow fluid or frothy caecal content.
	Histopathology	Not usually useful in chicks

Other things to look for: -

- Livers are pale for the first few days of life. If pallor is still present at day 4-5 then this suggests the chick is not feeding. Gall bladder may also be enlarged.
- Check gizzard for sawdust or lack of feed. This can indicate starveout – which can be a complex combination of causes.
- Check ureters for urates (dehydration).
- If no diagnosis is reached, submission of further chicks will be more useful than proceeding to histopathology at this age.

Pheasant/partridge poults (and older chicks)

The chick down is now replaced by light brown/tan juvenile plumage in both males and females, usually in release pens

Sample	Test	Sample Requirement
Intestinal wet preps (Examine immediately. Cannot be submitted to lab)	Motile Protozoa, Coccidial oocysts	Intestinal scrape from duodenum, jejunum and caecum in freshly dead (still warm) bird. Score each location by number of protozoa/oocysts seen (e.g. +, ++, +++, ++++) Location can be important. SRUC can provide training.
Faeces/intestinal and caecal content	Coccidiosis Worm Burden	Can be submitted to the lab
Liver, lung or synovial fluid depending on organ lesions or swollen joints	Bacterial culture	Swabs or whole tissues can be submitted to lab – Amies transport medium for swabs can help.
Tissues in Formalin: Heart, lung, liver, spleen, kidney, opened intestinal sections and whole head, cut midline/longitudinally (including brain and sinuses)	Histopathology	If nothing obvious was found on gross PM, submission of further birds may be more suitable than proceeding to histopathology in this age of pheasant/partridge

Adult pheasant/partridge

Those at an age where the plumage is obviously changing to adult plumage (usually living free).

Sample	Test	Sample Requirement
Lung or liver, whole organ	Bacterial culture	Swabs or whole organs (or most of the organ) for bacterial culture
Spleen or small piece fresh liver	May be used for viral testing	This will be frozen at the lab until needed
Intestinal and caecal content	Endoparasites	If you can see adult Syngamus trachea in the airways, confirmatory faecal sampling is not needed
Intestinal and caecal content	Bacterial culture, incl. anaerobic	Clostridium colinum and Heterakis/histomoniasis can be hard to differentiate on gross PM lesions in partridges – histopathology and bacterial culture can help.
Sinus tissue/ swabs of sinuses, ocular swabs or purulent discharge from eyes or sinuses	Mycoplasma PCR	Can store first to see if histopathology indicates Mycoplasmosis. Send in mycoplasma transport medium if possible
Tissues in Formalin: Heart, lung, liver, spleen, kidney, clean intestinal sections and whole head, cut longitudinally through the midline (including brain and sinuses)	Histopathology	Histopathology may be more worthwhile in older juveniles and adults than in younger poults and chicks

Red grouse chicks

Sample	Test	Sample Requirement
Liver	Bacterial culture	Place whole liver into sterile container
Brain	Louping ill PCR	Whole brain, not fixed, can be submitted in two pieces in the same tube (eases removal)

Red grouse adults

Sample	Test	Sample Requirement
Liver, spleen	Bacterial culture	Whole organ or half the organ (see histo)
Brain	Louping ill PCR	Fresh brain (from half head not put into fix) It is easier to get the brain (rather than blood) from a dead grouse
Whole caecum (NOT caecal or intestinal content)	Worm burden	One caecum is sufficient, see page 88
Tissues in formalin: Heart, lung, liver, spleen, kidney, clean intestinal sections and half head, cut longitudinally through the midline (including brain and sinuses)	Histopathology	Histopathology is often of more use in older juveniles and adults than in younger poults and chicks
Blood	Louping ill serology	Live birds, usually, although fresh dead birds may be bled successfully

Collecting grouse caeca for total worm counts

Sample 10 animals from each hill/moor to monitor worm burdens.

Technique: Remove the intestinal tract from the bird. Identify the tips of the caeca (blue arrows) and gently peel off one of the caeca until it thins and joins the ileum. Remove one caecum and place in a clearly labelled pot. Samples can be frozen prior to submission, please make this clear on the submission form if this has been done.

Diagnostic Submissions (Farm and Companion Animal) and Analytical Services (soil, seed, forage etc.)

SRUC Veterinary and Analytical Laboratory
Pentlands Science Park, Bush Loan, Penicuik, Midlothian, EH26 0PZ
Tel: 0131 535 3130 / Email: VSEnquiries@sruc.ac.uk

Farm Animal Postmortem Service

Disease Surveillance Centres

Aberdeen Disease Surveillance Centre
Mill of Craibstone, Bucksburn, Aberdeen, AB21 9TB
Tel: 0131 535 3130 / Email: VetServices.North@sruc.ac.uk

Dumfries Disease Surveillance Centre
St Mary's Industrial Estate, Dumfries, DG1 1DX
Tel: 0131 535 3130 / Email: VetServices.SouthWest@sruc.ac.uk

St Boswells Disease Surveillance Centre
Greycrook, St Boswells, Roxburghshire, TD6 0EQ
Tel: 0131 535 3130 / Email: VetServices.Central@sruc.ac.uk

Thurso Disease Surveillance Centre
Janetstown, Thurso, KW14 7XF
Tel: 0131 5353130 / Email: vcthurso@sruc.ac.uk

SVM-SRUC Farm Animal Post Mortem Service

School of Veterinary Medicine, 464 Bearsden road, Glasgow, G61 1BD.
Tel: 0131 535130 / Email: VetServices.SouthWest@sruc.ac.uk

Farm Animal Veterinary Surveillance Hubs

Perth Veterinary Surveillance Hub
5 Bertha Park View, Perth PH1 3FZ
Tel: 0131 535 3130 / Email: VetServices.Central@sruc.ac.uk

Ayr Veterinary Surveillance Hub
J F Niven Building, Auchincruive Estate, Auchincruive, Ayr, KA6 5HW
Tel: 0131 535 3130 / Email: VetServices.SouthWest@sruc.ac.uk

Inverness Veterinary Surveillance Hub
An Lòchran, 10 Inverness Campus, Inverness, IV2 5NA
Tel: 0131 535 3130 / Email: VetServices.North@sruc.ac.uk

Health Schemes

Premium Cattle Health Scheme (PCHS)
Greycrook, St Boswells, Roxburghshire, TD6 0EQ
Tel: 01835 822456 / Email: healthschemes@sruc.ac.uk / Web: www.cattlehealth.co.uk

Premium Sheep and Goat Health Schemes (PSGHS)
Greycrook, St Boswells, Roxburghshire, TD6 0EQ
Tel: 01835 822456
Email: psghs@sruc.ac.uk / Web: www.sheepandgoathealth.co.uk

Index

Index

Return to Contents

This guide was produced by SRUC with support from the Universities Innovation Fund.

Any comments, feedback, or ideas for topics to include in any future versions welcomed by fiona.crowden@sruc.ac.uk