

Unlocking the keys to ewe survival

Post-mortem examination protocol

This post-mortem protocol has been provided to assist veterinarians conduct thorough periparturient ewe post-mortem examinations. It will outline a process to achieve a gross post-mortem diagnosis. Additional tests may be needed to reach a conclusive diagnosis (e.g. aqueous humour biochemistry, tissue histology and culture).

This protocol has been adapted from the method used in the *Unlocking the keys to ewe survival* MLA funded project (L.LSM.0019). It was developed for the ewe survival research team vets to ensure consistency in approach, and for detailed follow up of post-mortem cases if required during data analysis. It may be more detailed in some areas than required for periparturient ewe post-mortem, however this enables vets following the protocol to adapt it for their own needs. The research team have agreed to make available the project methodology as a useful resource for wider use by animal health professionals.





There is a risk of exposure to zoonotic disease when conducting post mortems, especially on pregnant ewes. Appropriate PPE and good hygiene are essential.



General information

Date <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Property name
PIC	Paddock name/Mob ID
Manager name	Manager contact phone
Attending vet name	Vet contact phone



Animal/ewe ID

Ewe ID VID (if present on tag) _____

Ewe ID NLIS tag colour _____

Pink
 Black
 White
 Orange
 Light green
 Purple
 Yellow
 Red
 Sky blue
 Other – please state colour of tag

Ewe litter size	Stage of pregnancy	Lactation/post-partum duration
<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 2+ (if triplets not differentiated through scanning) <input type="checkbox"/> 3 <input type="checkbox"/> Unknown	<input type="text"/> <input type="text"/> <input type="text"/> Days	<input type="text"/> <input type="text"/> <input type="text"/> Days



External examination

1 Condition of carcass <input type="checkbox"/> Fresh <input type="checkbox"/> Moderate autolysis <input type="checkbox"/> Advanced autolysis	2 Estimated date/time of death (if known) <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> : <input type="text"/> <input type="text"/>
---	---



Environment – brief

1 Death circumstances

Ewe was found dead
 Ewe was euthanised – describe method of euthanasia and reason for euthanasia (e.g. down for 3 days)

2 Ewe moved from position found

Yes
 No

3 Brief description of where ewe was found (e.g. middle of paddock, under tree, stuck in fence, in a ditch)

4 Pasture type in paddock where found (e.g. phalaris + clover, perennial rye grass (PRG), native, fodder crop-detail)

CONTINUED NEXT PAGE

Environment – brief (continued)

5 Describe any important paddock observations (e.g. potentially toxic plant species, weeds, blue green algae etc.)

6 Estimate of feed on offer (kg DM/ha) in paddock where ewe was found

7 Is supplementary feed on offer

Yes – describe supplementary feed ration (kg/hd/week and feed type e.g. 3.5kg/ewe/wk barley) No

8 Additional observations (e.g. any relevant management practices including shearing, vaccination, drenching etc.)

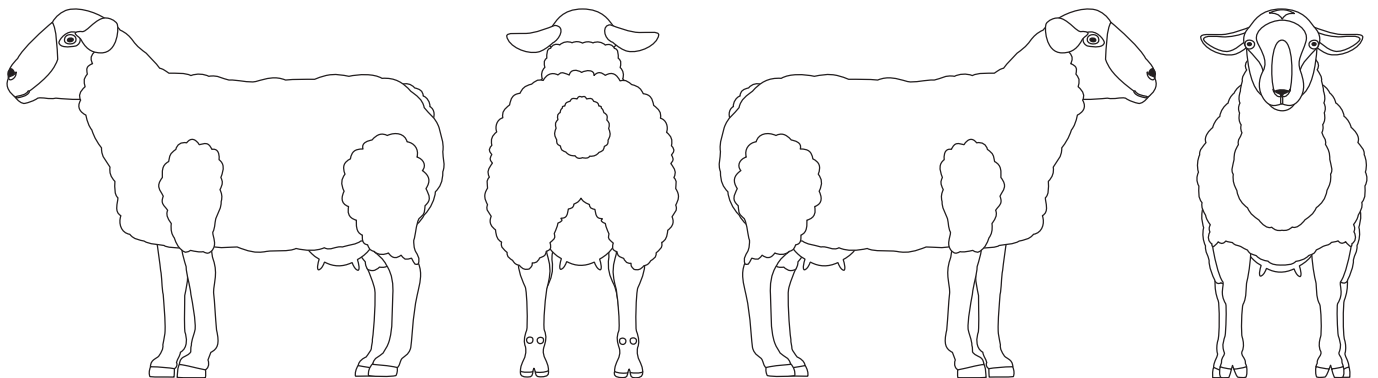
External pathology exam – general

 Supply photograph of external carcass with visible ewe ID for reference

1 Ewe body condition score

1 1.25 1.5 1.75 2 2.25 2.5 2.75 3 3.25 3.5 3.75 4 4.25 4.5 4.75 5

2 Describe any external predation including predator species, before or after death (Indicate on carcass, location of external predation)



CONTINUED NEXT PAGE

External pathology exam – general (continued)

3 Describe any signs of struggle or prolonged recumbancy (e.g. paddle marks on ground where found, unilateral periorbital swelling on down side)

4 Discolored mucosa

Yes – describe (e.g. jaundice, pallor, injected, etc.) No

5 Dentition

No adult teeth 2 tooth 4 tooth 6 tooth Full mouth Broken mouth

6 Lesion on skin/subcutis

Yes – describe (e.g. petechial haemorrhage, echymotic haemorrhage, trauma) No

7 Joints

Normal Unable to access

Abnormal – describe (e.g. joint abnormality, including joints affected)

8 Feet

Normal

Abnormal – what is the most likely foot abnormality (check all applicable)

Toe abscess Heal abscess Foot rot Other – describe

9 Any other general external observations including pelvic or spinal trauma

Yes – describe (e.g. spinal trauma or pelvic trauma. If either of these are present, describe location and extent of issue) No

10 Any other comments



External pathology exam – repro

1 Signs of mastitis

Yes – describe No

2 Obvious dystocia (e.g. part of lamb protruding)

Yes – describe (e.g. head swollen, tail, 2x feet) No

3 Perineal trauma, including vulva and vestibule

Yes – describe extent and location of trauma No

4 Discharge from vulva (NB – lochia (dark odourless, persists up to 3 weeks post-partum))

Yes – describe nature of discharge (e.g. bloody, mucopurulent, odourless or, malodorous, serous etc.) No

5 Prolapse (NB – rectal or vaginal prolapse may occur post-mortem with normal gas distension of abdominal viscera)

Yes – describe (e.g. vaginal, uterine, rectal, etc.) No

6 Other external reproductive observations



Notifiable diseases



Before opening carcase – could anthrax be a potential differential?

Consider clinical presentation, property location, history of anthrax on the property, recent livestock movements, etc.

If anthrax is suspected, STOP and contact your district veterinary officer, the Emergency Animal Disease Watch Hotline and your state government's biosecurity body where available. If suspicious, err on the side of caution.

Emergency Animal Disease Watch Hotline – 1800 675 888

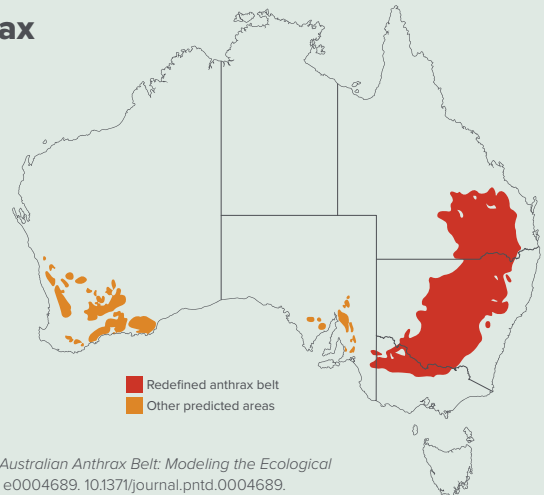
QLD: Biosecurity Queensland – 13 25 23

NSW: DPI Biosecurity – 1800 680 244

TAS: Emergency Animal Disease – 03 6165 3777

NT: Biosecurity Hotline – 1800 084 881

All other states/territories: 1800 675 888



Barro, Alassane & Moloney, Barbara & Porter, Kelly & Muller, Janine & Blackburn, Jason. (2016). Redefining the Australian Anthrax Belt: Modeling the Ecological Niche and Predicting the Geographic Distribution of *Bacillus anthracis*. PLOS Neglected Tropical Diseases. 10. e0004689. 10.1371/journal.pntd.0004689.

1 Eligibility for TSE exclusion (Australia-wide)

Criteria: 18 month to 5 years old with at least 2 signs consistent with scrapie (e.g. neural signs such as altered mental state, sensation and postural movements before death)

Yes – collect brain in formalin + fresh/frozen 2–3cm of spinal cord and dorsal 1/3rd of cerebellum No

For more information, download the [National TSE Surveillance Project \(NTSESP\) Field Guidelines 2021-22](#) or visit [Animal Health Australia](#)



Proceed to post-mortem – no suspicion of anthrax (or anthrax test negative)



Place carcass in left lateral recumbancy and open carcass to display stage and take photograph

1 Connective tissue/fascia

Discoloured – describe (e.g. jaundice, pallor, etc.) Normal, consistent with rest of observations



Thoracic cavity



Photograph thoracic cavity

1 Pleural fluid

Abnormal – describe fluid including quantity estimate, consistency and colour (e.g. 100ml thin, clear fluid) Normal

2 Pericardial fluid

Abnormal – describe fluid quantity, consistency and colour, +/- presence of fibrin Normal

3 Pericardial fat deposits

None Minimal Moderate (standard amount on a healthy ewe)

4 Lung texture

Normal – sponge-like Abnormal – rubbery (oedema or some viral pneumonias) Abnormal – liver like (consolidation)
 Other, describe any other lung texture change Unable to assess

CONTINUED NEXT PAGE

Thoracic cavity (continued)

5 Lung colour (NB – some congestion in the absence of textural change doesn't necessarily mean pneumonia. If unilateral discolouration on dependent side, likely liver mortis. Bilateral congestion can occur as a result of post-mortem change. If bilateral congestion this can occur when blood forced into lungs during rigor or due to post-mortem bloating. A normal lung is still be spongy compared to a pneumonic lung)

Normal – some livor mortis of down side or congestion in absence of textural changes is normal post mortem

Abnormal – describe colour and distribution

6 Lung pleural surface (NB – pleural fibrosis: areas of pale connective tissue may appear on dorsal surface of normal lung. Pulmonary emphysema may be present due to agonal gasps and is generally of no significance unless there is a history of respiratory distress)

Normal – some livor mortis of down side or congestion in absence of textural changes is normal post mortem

Abnormal – describe (e.g. fibrinosuppurative pleurisy, fibrin, other lung surface observations including colour, size and distribution of any lesions (e.g. 3 x 50c coin sized abscesses cranioventral lobes, lung worm nodules dorsal, etc.))

7 Pulmonary consolidation

Yes – lung sinks in water, describe distribution of consolidation (e.g. cranioventral lung fields) No Unable to access

8 Heart – epicardial abnormality (NB – epicardial and endocardial petechiae and ecchymosis are common and a normal finding especially in euthanased ruminants. If concerned about septicaemia or a clotting disorder there will also be haemorrhage elsewhere in the body)

Yes – describe lesions on epicardium No Unable to accurately assess due to autolysis

9 Heart – endocardial abnormalities (NB small foci of fat are normal)

Yes – describe endocardial abnormality No Unable to accurately assess due to autolysis

10 Any other remarkable observations in thoracic cavity including tracheal contents, tracheal trauma, cut lung surface lesions, heart valve lesions and abnormalities of the bronchial tree (including foam, blood, worms, digesta, pus)

Yes – describe No



Peritoneal cavity



Photograph peritoneal cavity

1 Organ displacement

Yes – describe No

2 Peritoneal fluid (NB action of stomach acid after death may result in abomasal wall breakdown and subsequent rupture. Antemortem rupture of abomasal ulcer will be associated with acute peritonitis signs, e.g. fibrin, pus, fluid)

Abnormal – describe (peritoneal fluid quantity, colour and consistency) Normal Unable to accurately assess due to autolysis

3 Omentum (NB grey to black discolouration or pseudomelanosis of anything in contact with intestine can occur normally with advanced autolysis when bacterial breakdown of Hb releases hydrogen sulphide. Common on liver, spleen, kidney and intestine)

Abnormal – describe Normal

4 Other peritoneal cavity observations including vena cava abscessation or thrombi



Hepatic system



Photograph hepatic system

1 Liver surface

1 Is there liver congestion? (this may be normal post-mortem due to rigor forcing blood central into viscera – lungs should be similar)

2 Are there large fibrous plaques? (extending no deeper than the capsule, indicating resolved adhesions from past local peritonitis)

3 Is there telangiectasis or 'plum pudding' liver? (dark red, irregular but circumscribed area (pin point to 1–3 centimeter diameter) throughout liver. Dilated, blood filled hepatic sinusoids with no functional significance)

Generalised abnormality – describe size, consistency, colour and margins of liver (e.g. pale fatty and friable, rounded edges)

Localised abnormality – describe lesion and location (includes abscesses, fibrin, scarring including fluke exhaust)

Normal Unable to accurately assess due to autolysis

CONTINUED NEXT PAGE

Hepatic system (continued)

2 Cut surface of liver

Abnormal – describe Normal Unable to accurately assess due to autolysis

3 Distended or thickened gall bladder (NB gall bladder distension may occur following anorexia. Bile becomes more watery with time off feed)

Yes – describe No

4 Spleen (NB: splenic enlargement may occur with barbiturate euthanasia and can occur with anthrax (along with other changes))

Abnormal – describe Normal

5 Other observations of hepatic system



Gastrointestinal



Photograph gastro-intestinal system

1 Rumen – serosal surface

Abnormal – describe (e.g. haemorrhages, fibrin, adhesions, etc.) Normal

2 Rumen – mucosal surface (NB check ventral mucosa – more likely location for lesions. Rumen mucosa sloughs normally within an hour of death. Exposed submucosa may be pale if animal exsanguinated, otherwise intensely red. Not evidence of rumenitis unless also oedema, exudate or haemorrhage (mucosa less likely to slough))

Abnormal – describe (e.g. inflammation, fibrin, scarring, short papillae, sloughing mucosa) Normal
 Unable to accurately assess due to autolysis

Gastrointestinal (continued)

3 Rumen contents (NB rapid distension of rumen resulting in tympany is common post-mortem. Only diagnostic of frothy bloat if rumen is full of frothy foam)

Briefly describe fill and nature of contents, include pH if carcass fresh enough.

4 Reticulum – serosal

Abnormal – describe (e.g. haemorrhages, fibrin, adhesions, etc.) Normal

5 Reticulum – mucosal

Abnormal – describe (e.g. haemorrhages, fibrin, inflammation, fibrin, scarring, sloughing mucosa (this can be a normal after death change) etc.)

Normal Unable to accurately assess due to autolysis

6 Omasum – serosal surface

Abnormal – describe (e.g. haemorrhages, fibrin, adhesions, etc.) Normal

7 Omasum – mucosal surface

Abnormal – describe (e.g. haemorrhages, fibrin, inflammation, scarring, sloughing mucosa (this can be a normal after death change) etc.)

Normal Unable to accurately assess due to autolysis

8 Abomasum – serosal surface (NB: action of stomach acid PM may result in abomasal wall breakdown and subsequent rupture. Antemortem rupture of abomasal ulcer will be associated with acute peritonitis signs (e.g. fibrin, pus, and inflammation))

Abnormal – describe (e.g. haemorrhages, fibrin, adhesions, etc.) Normal

9 Abomasal – mucosal surface (NB: mucosal reddening seen in sheep that have recently eaten. Gastritis always accompanied by oedema, ulceration, fibrin or haemorrhage)

Abnormal – describe (e.g. haemorrhages, fibrin, inflammation, scarring, sloughing mucosa (this can be a normal after death change, evidence of parasitism (inhibited larvae) etc.)

Normal Unable to accurately assess due to autolysis

CONTINUED NEXT PAGE

Gastrointestinal (continued)

10 Small intestine – serosal surface

- Post-mortem bile leakage into duodenum can cause duodenum and proximal jejunum to dilate, become thin-walled and dark green. Bile also stains surfaces of organs in close contact (bile imbibition).
- Large oval or linear, white raised plaques on ileum and jejunum are normal (Peyer's patches). They may extend around circumference of intestine.
- Small intestine intussusception may occur post-mortem. May see congestion associated with post-mortem intussusception. If it occurred antemortem, see oedema, haemorrhage and fibrin.

Normal

Abnormal – select abnormal SI serosal surface observations and select location

Haemorrhages Fibrin Adhesions Other _____

Duodenum Jejunum Ileum Small intestine – mucosal surface examined at several points

11 Small intestine – mucosal surface (NB segmental intestinal congestion and diapedesis should not be confused with haemorrhagic enteritis. Variable settling of blood as peristalsis subsides results in areas of blue-black congestion giving a segmental appearance. Congested segments may fill with bloody fluid as vessels break down (diapedesis). Haemorrhagic enteritis will have discolouration plus oedema, ulceration, fibrin (and necrosis) and oedematous mesenteric lymph nodes).

Normal Abnormal – describe lesion and location (use abbreviation; Jejunum 'J', duodenum 'D' and ileum 'I')

Unable to accurately assess due to autolysis

12 Ileocaecal thickening

Yes No Unable to accurately assess due to autolysis

13 Large intestine – serosal surface

Normal Abnormal – describe lesion and location (use abbreviation; Jejunum 'J', duodenum 'D' and ileum 'I')

Unable to accurately assess due to autolysis

14 Large intestine – mucosal surface examined if suspicious of abnormality

(NB linear reddening or tiger striping on colonic and rectal mucosa due to clotting of trapped blood in contracted organ. This is not necessarily diagnostically significant)

Normal Abnormal Unable to accurately assess due to autolysis



Take faecal sample

CONTINUED NEXT PAGE

Gastrointestinal (continued)

15 Faecal consistency (see below images, wormboss.com.au/sheep-goats/tests-tools/tests/assessing-faecal-consistency-score.php or scan the QR code for information on assessing the faecal consistency score)



1 1.5 2 2.5 3 Unable to accurately assess due to autolysis



16 Other GI observations including oesophageal observations (e.g. capsule trauma)



Urinary system



Photograph urinary system (if abnormalities present)

1 Kidney capsular surface

Normal Abnormal – describe lesion and whether bi- or unilateral Unable to accurately assess due to autolysis

2 Kidney cut surface

Normal Abnormal – describe lesion and whether bi- or unilateral Unable to accurately assess due to autolysis

3 Perineal fat deposits

None Minimal Moderate Large

4 Adrenal glands (NB: haemorrhage and congestion of adrenals can be normal agonal change. Can also occur in septicemia-pair with other lesions. Haemorrhage and congestion of adrenals can be normal agonal change or may be associated with disease. Pair with other PM findings)

Enlarged Normal Unable to accurately assess due to autolysis Other – describe

5 Ureters

Normal Abnormal – describe lesion and whether bi- or unilateral Unable to accurately assess due to autolysis

6 Bladder wall (NB: linear reddening or tiger striping on bladder mucosa may occur due to clotting of trapped blood in contracted organ. Not diagnostically significant)

Normal Abnormal

7 Urine dipstick results (record level – number of +)

Protein Blood Glucose Ketones Unable to accurately assess due to autolysis

8 Other other urinary tract observations



Reproductive tract



There is a risk of exposure to zoonotic disease when conducting post mortems, especially on pregnant ewes. Appropriate PPE and good hygiene are essential.



Photograph reproductive system

1 External surface of uterus

Normal Abnormal

2 Is ewe currently pregnant?

See below

Yes – complete this section if ewe was pregnant at time of death

1 Foetus/es in utero

1 2 3 4

2 Lamb weights (in kgs)

1 _____ kg 2 _____ kg 3 _____ kg 4 _____ kg

3 Lamb crown rump lengths for pre-term foetus/es (in cms)

1 _____ cm 2 _____ cm 3 _____ cm 4 _____ cm

4 Is a foetus in birth canal?

Yes – the presentation is normal (forelimbs and head first?)
 No – describe abnormal presentation

5 Are lambs all the same state of preservation and developmental age?

Yes No – describe any differences between lambs in developmental stage or preservation state

6 Estimate age or developmental stage of foetus

(e.g. describe wool distribution etc.)

7 Photograph foetus/es

8 Congenital foetal abnormalities

Yes – describe abnormality No

9 Foetus starting to decompose

Yes No

10 Amniotic fluid

Normal – clear Abnormal – describe (e.g. meconium, etc.)
 Unable to assess due to autolysis

11 Placenta

Normal Abnormal – describe (comment on placentomes and intercotyledonary membrane)

12 Cervix

Normal Abnormal – describe (e.g. ring womb (failure to dilate), trauma/tear)

13 Is an abortogenic agent suspected?

Note: foetal lesions consistent with an abortogenic agent vary with stage of gestation and the agent but include congenital malformation, mummification, a distended abdomen, increased serosanguinous pleural and peritoneal fluid, subcutaneous oedema, hepatomegaly and liver lesions. Placental lesions consistent with this diagnosis include necrotic cotyledons and placentitis.

No Yes. What is the suspected abortogenic agent?
(Ensure good PPE and submit foetus and placenta through state vet department for testing)

14 Any other comments on reproductive tract of pregnant ewe

No – Complete this section if ewe was not pregnant at time of death (i.e. already given birth, lost a pregnancy, never pregnant)

1 If not currently pregnant, is there evidence that the ewe has given birth?

No – uterus shows no signs of pregnancy
 Yes (e.g. perineal trauma, lochia, incomplete uterine involution, well developed udder, lamb found dead near by, etc.)

2 Fluid within the uterus

Mucopurulent Frank blood Lochia
 Other – describe Unable to accurately assess due to autolysis

3 Endometrium

Normal Abnormal – describe
 Unable to accurately assess due to autolysis

4 Cervix of non-pregnant ewes

Normal Abnormal – describe (e.g. trauma/tear, etc.)

5 Any other observations of reproductive tract of non-pregnant ewes?



Musculoskeletal system



Photograph femur

1 Femur – bone marrow

Normal Gelatinous Other – describe

2 Femur – cortical bone

Appears thin Normal thickness

3 Femur – trabecular bone

Deficient Appears sufficient

4 Other observations of femur

5 Other skeletal abnormalities

No Yes – describe

6 Any visible muscular abnormalities

No Yes – describe



Neurological system

1 Only open skull, spine and/or sample peripheral nerves if:

- 1 Suspicion of neuro disease (e.g. phalaris staggers)
- 2 Evidence of neuro disease antemortem (e.g. neuro signs observed)
- 3 TSE exclusion
- 4 SDI

2 Neurological post-mortem required?

No
 Yes – check box for samples required

Brain Cervical spinal cord Other spinal cord segments Peripheral nerves CSF fluid Other – describe

3 Any other neurological observations?

Record the most likely diagnosis and any alternative diagnoses, based on the gross PM findings.

This can be adjusted later following further consideration of case, discussion with colleagues and the additional information obtained from results of samples submitted for diagnostic testing.

1 Primary diagnosis including any contributing disorder linked to the primary diagnosis

- | | | |
|---|--|--|
| <input type="checkbox"/> Dystocia – describe (e.g. malpresentation, foetal/ewe size, uterine inertia, incomplete cervical dilation, or unknown) | <input type="checkbox"/> Metabolic disease – mixed | <input type="checkbox"/> Gastrointestinal parasitism |
| <input type="checkbox"/> Septicaemia – describe likely origin (e.g. metritis, peritonitis, pneumonia, etc.) | <input type="checkbox"/> Metabolic disease – hypomagnesaemia | <input type="checkbox"/> Other GI disorders – describe (e.g. <i>Yersinia</i> , <i>Salmonella</i>) |
| <input type="checkbox"/> Trauma – describe (e.g. ruptured bladder (antemortem), ruptured uterus (antemortem), ruptured uterine artery, etc.) | <input type="checkbox"/> Mastitis | <input type="checkbox"/> Accident – describe |
| <input type="checkbox"/> Metabolic disease – hypocalcaemia | <input type="checkbox"/> Vaginal prolapse | <input type="checkbox"/> Toxicity – describe |
| <input type="checkbox"/> Metabolic disease – pregnancy toxemia | <input type="checkbox"/> Uterine prolapse | <input type="checkbox"/> Foot disease – describe (e.g. resulting in recumbency) |
| | <input type="checkbox"/> Dorsal-vaginal wall rupture | <input type="checkbox"/> Other – describe |
| | <input type="checkbox"/> Flystrike | |

2 Alternative diagnosis

- | | | |
|---|--|--|
| <input type="checkbox"/> Dystocia – describe (e.g. malpresentation, foetal/ewe size, uterine inertia, incomplete cervical dilation, or unknown) | <input type="checkbox"/> Metabolic disease – mixed | <input type="checkbox"/> Gastrointestinal parasitism |
| <input type="checkbox"/> Septicaemia – describe likely origin (e.g. metritis, peritonitis, pneumonia, etc.) | <input type="checkbox"/> Metabolic disease – hypomagnesaemia | <input type="checkbox"/> Other GI disorders – describe (e.g. <i>Yersinia</i> , <i>Salmonella</i>) |
| <input type="checkbox"/> Trauma – describe (e.g. ruptured bladder (antemortem), ruptured uterus (antemortem), ruptured uterine artery, etc.) | <input type="checkbox"/> Mastitis | <input type="checkbox"/> Accident – describe |
| <input type="checkbox"/> Metabolic disease – hypocalcaemia | <input type="checkbox"/> Vaginal prolapse | <input type="checkbox"/> Toxicity – describe |
| <input type="checkbox"/> Metabolic disease – pregnancy toxemia | <input type="checkbox"/> Uterine prolapse | <input type="checkbox"/> Foot disease – describe (e.g. resulting in recumbency) |
| | <input type="checkbox"/> Dorsal-vaginal wall rupture | <input type="checkbox"/> Other – describe |
| | <input type="checkbox"/> Flystrike | |



Samples taken

1 Record which samples have been taken (and labelled)

- Aqueous humour
 Faecal sample
 Fixed tissue - describe which
 Smears/swabs
 Fresh tissue
 Other fluid (e.g. peritoneal, pleural, urine etc.)
 Samples unable to be taken (e.g. due to predation, insufficient faecal matter etc.)

2 Other samples taken for any other investigations?

- SDI
 TSE
 Private testing
 Other – describe investigation types requested

References: Jubb T Disease Investigation 2014; Jubb & Perkins 209 Veterinary Handbook, MLA and Australian Livestock Export Corporation Ltd, www.veterinaryhandbook.com.au

Care is taken to ensure the accuracy of the information contained in this publication. However, MLA cannot accept responsibility for the accuracy or completeness of the information or opinions contained in the publication. You should make your own enquiries before making decisions concerning your interests. MLA accepts no liability for any losses incurred if you rely solely on this publication and excludes all liability as a result of reliance by any person on such information or advice. Please read MLA's disclaimer at www.mla.com.au/disclaimer. © Meat & Livestock Australia 2022 ABN 39 081 678 364. Published in March 2022. MLA acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.



Meat & Livestock Australia
 Level 1, 40 Mount Street
 North Sydney NSW 2060
 Ph: 02 9463 9333
mla.com.au