



ONTARIO
VETERINARY COLLEGE
DEPARTMENT OF PATHOBIOLOGY

Introduction to lung ultrasound in cattle

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DAIRY HEALTH MANAGEMENT
CONTINUING EDUCATION PROGRAM

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Uses of thoracic ultrasound

Differentiate upper and lower respiratory disease

Identify clinical & subclinical pneumonia

Determine response to treatments

Evaluate prognostic factors:

- Caudal lobe consolidation
- Abscessation

Advantages:

- Instant results
- Quick
- Non-invasive

Equipment & setup

Linear probes (transrectal probes) preferred to access cranial thorax

70% isopropyl alcohol used as contact. Can also use coupling gel or vegetable oil.

Shaving not necessary

Minimal restraint required for dairy calves



Technique

Use enough alcohol to obtain adequate contact (approx. 100-300 mL)

Start at dorsal 10th intracostal space (ICS) and move probe downwards, staying between ribs

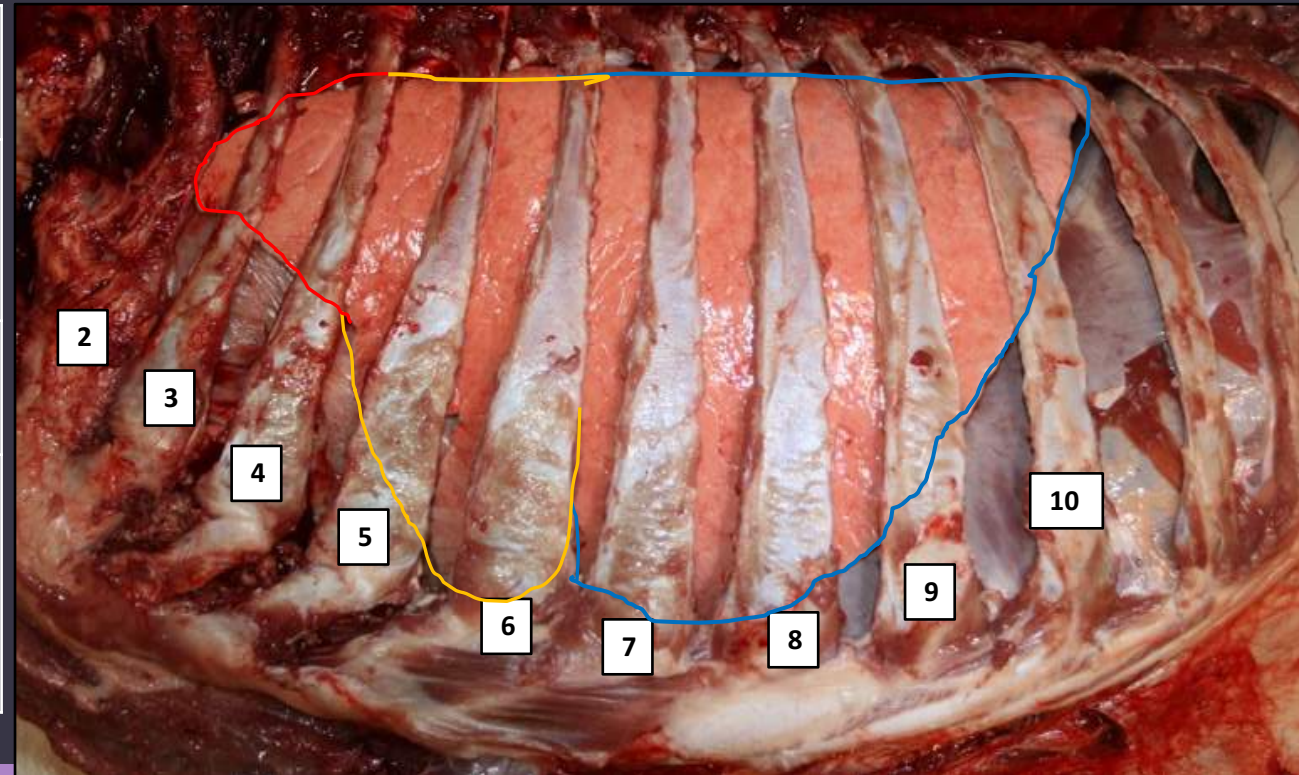
Continue to advance cranially, examining each ICS

To examine cranial lung → place probe in axillary region under limb

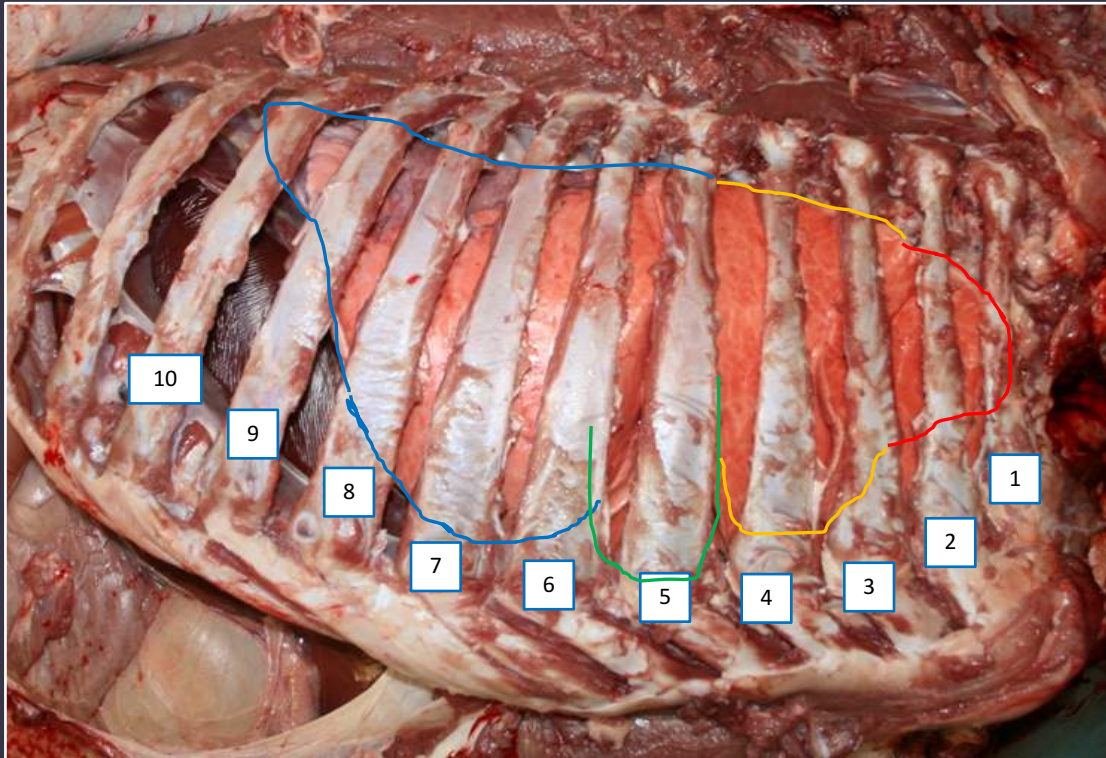


Left lung ultrasound landmarks

	Left Lung Lobe		
	Caudal	Caudal Aspect of Cranial Lobe	Cranial Aspect of Cranial Lobe
ICS	6–10	4–5	2–3
Ventral landmark(s)	Diaphragm	CCJ & pleural deviation	Heart



Right lung ultrasound landmarks



	Lung Lobe			
	Caudal	Middle	Caudal Aspect of Cranial Lobe	Cranial Aspect of Cranial Lobe
ICS	6–10	5	3–4	1–2
Ventral landmark	Diaphragm	CCJ & pleural deviation	Heart	Internal thoracic artery & vein

Anatomic landmarks for lung ultrasound (Olivett et al 2011)

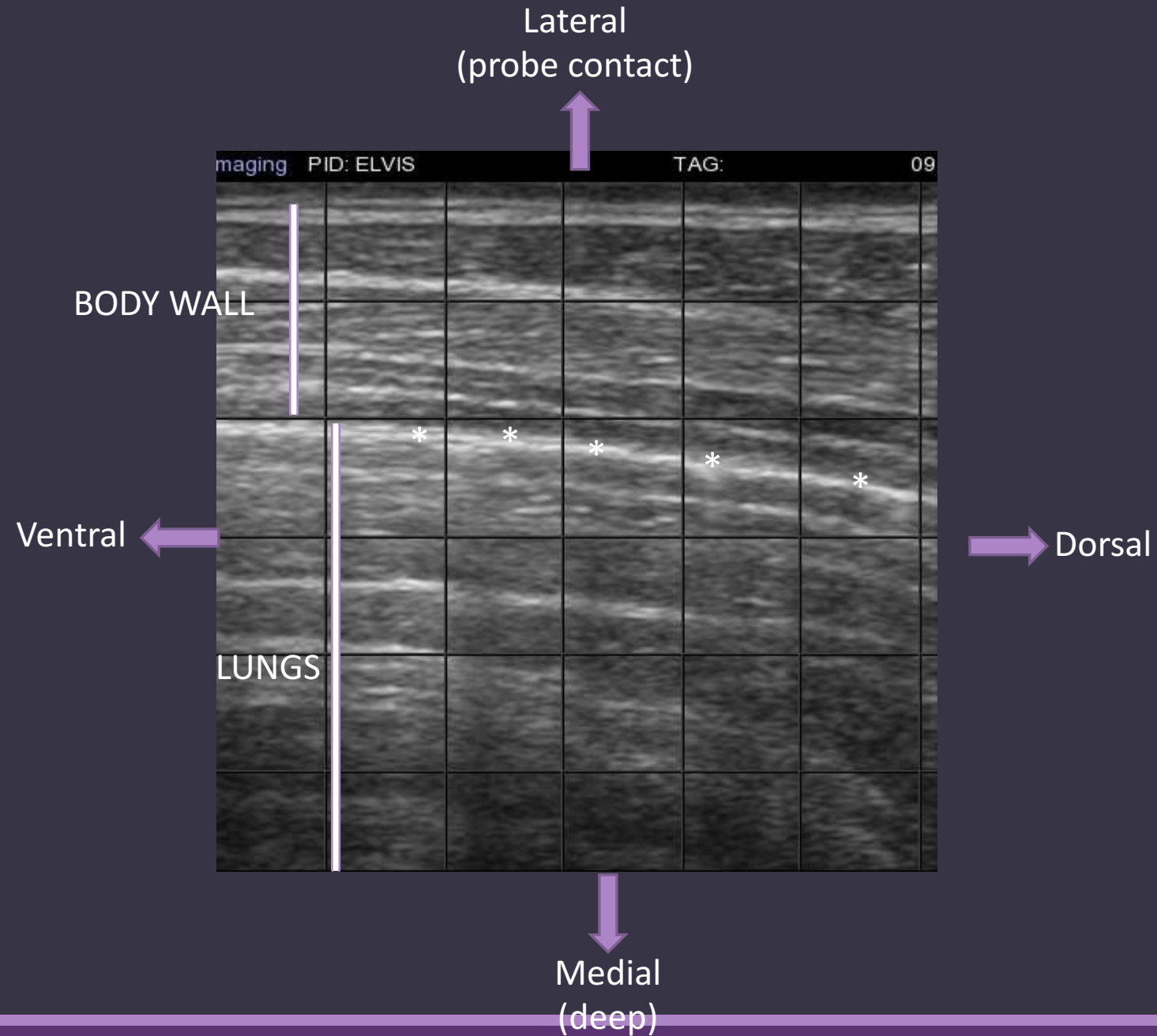
Normal lungs

Gridlines = 1 cm

Reverberation artifact (A-lines) are present in normal aerated lung

Pleural surface **

- Landmark for identifying normal lung
- Should slide rhythmically with breathing
- Useful to guide probe movement



L6.2
B ←
FV50

G 16dB
N 17dB
F 35dB
FRZ



USER1
CF



Body wall

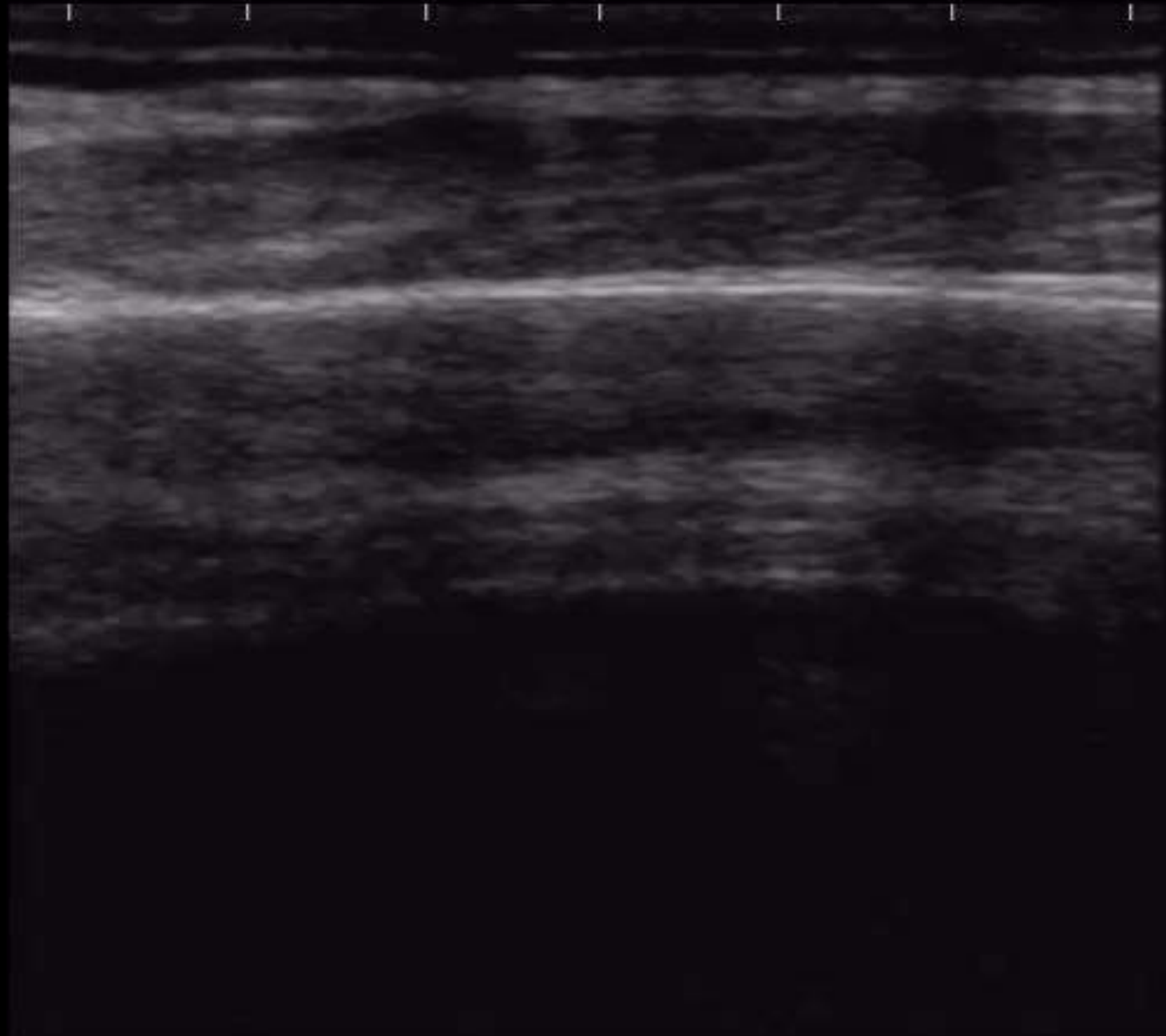
Pleural surface

Lungs

58

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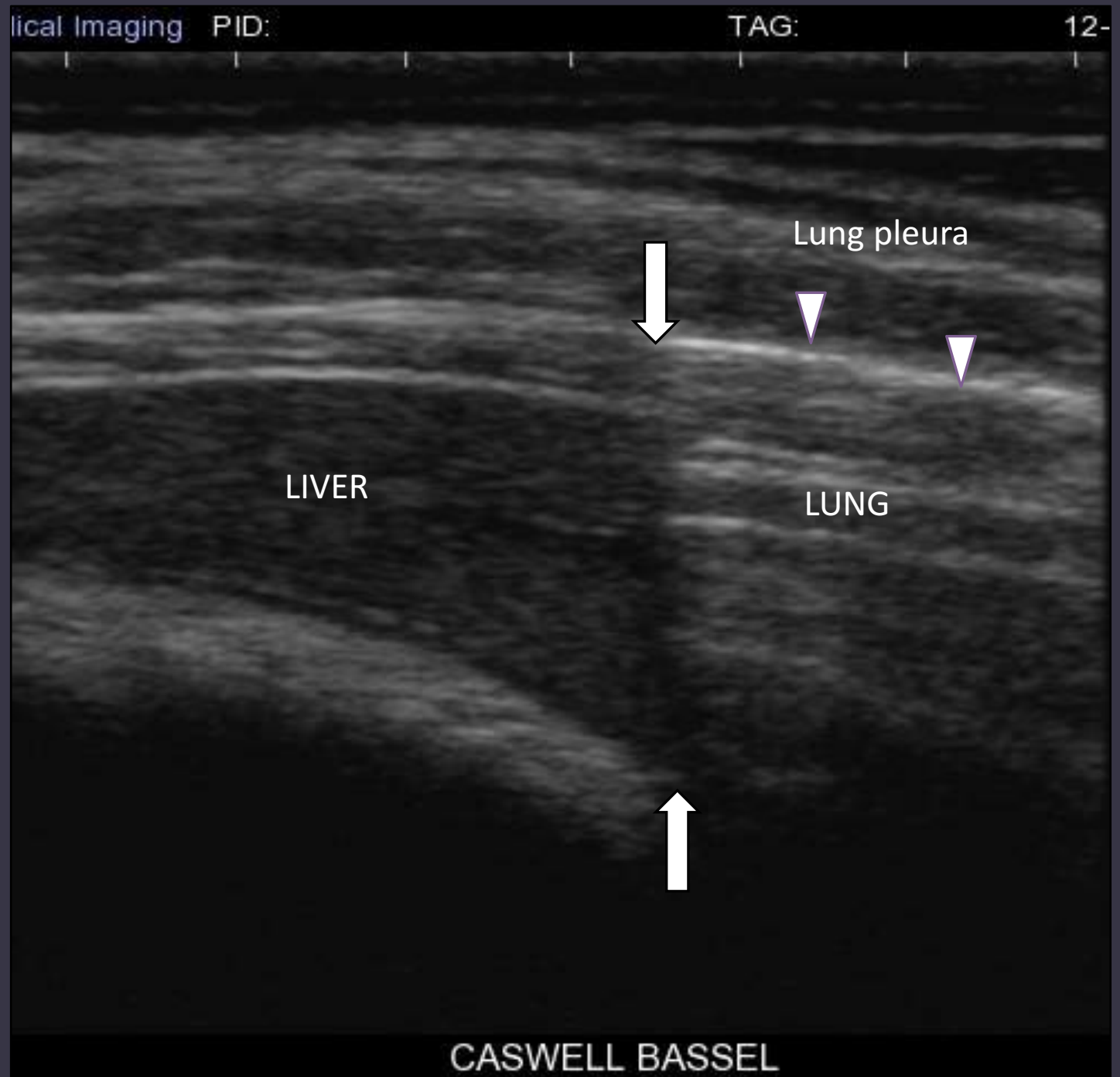
Normal lung video



Diaphragm

Ventral landmark in caudal lungs

Arrows: diaphragm (separates the liver from the lung)



Diaphragm

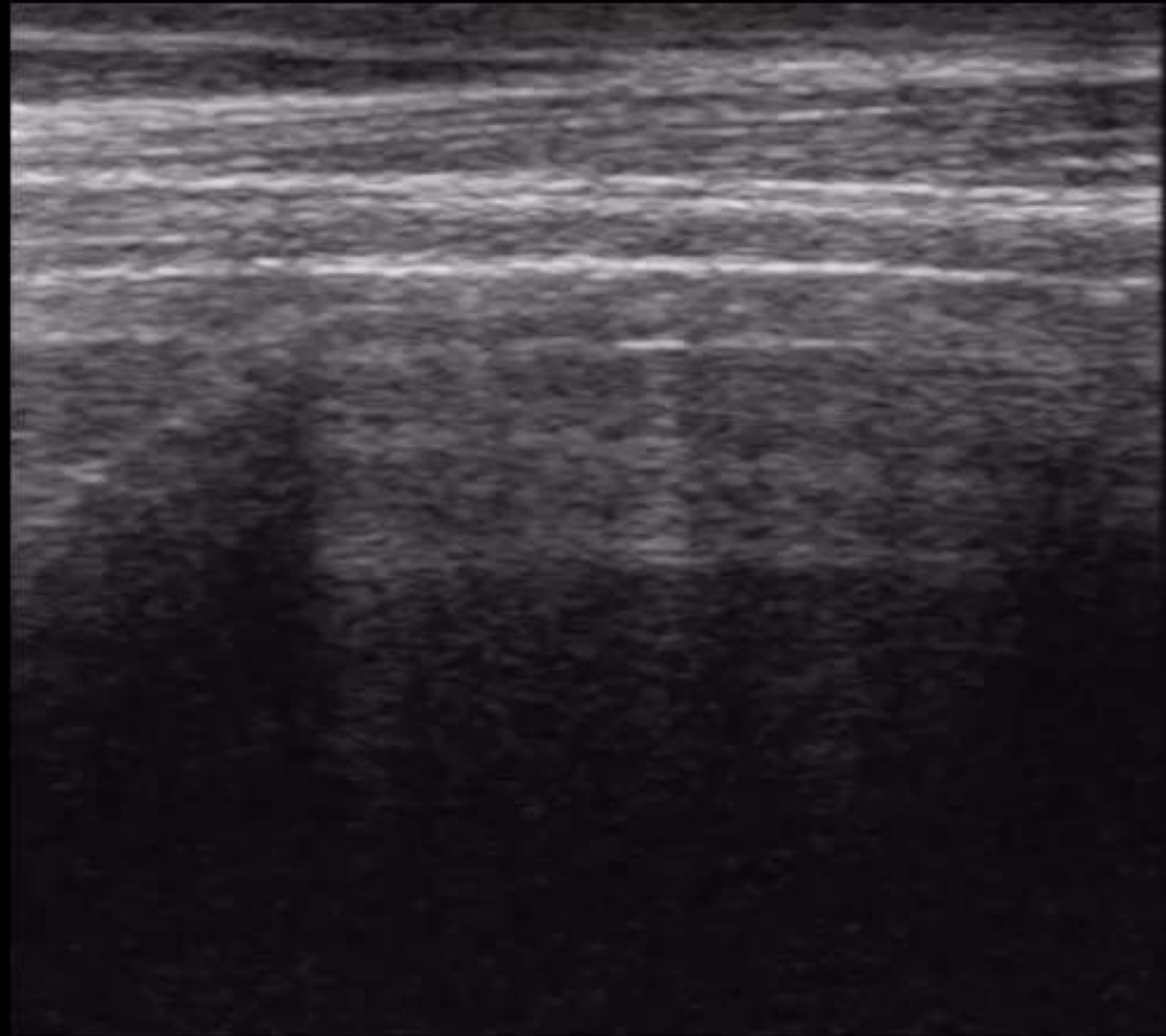


Heart

E.I. Medical Imaging PID: 10034

TAG: 10034

01-24-2017 14:46



L6.2
B ←
FV50

G 18dB
N 31dB
F 35dB
FRZ



BASS
CF 



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Comet tails

Thin vertical lines
extending from **pleural
surface**

Significance?

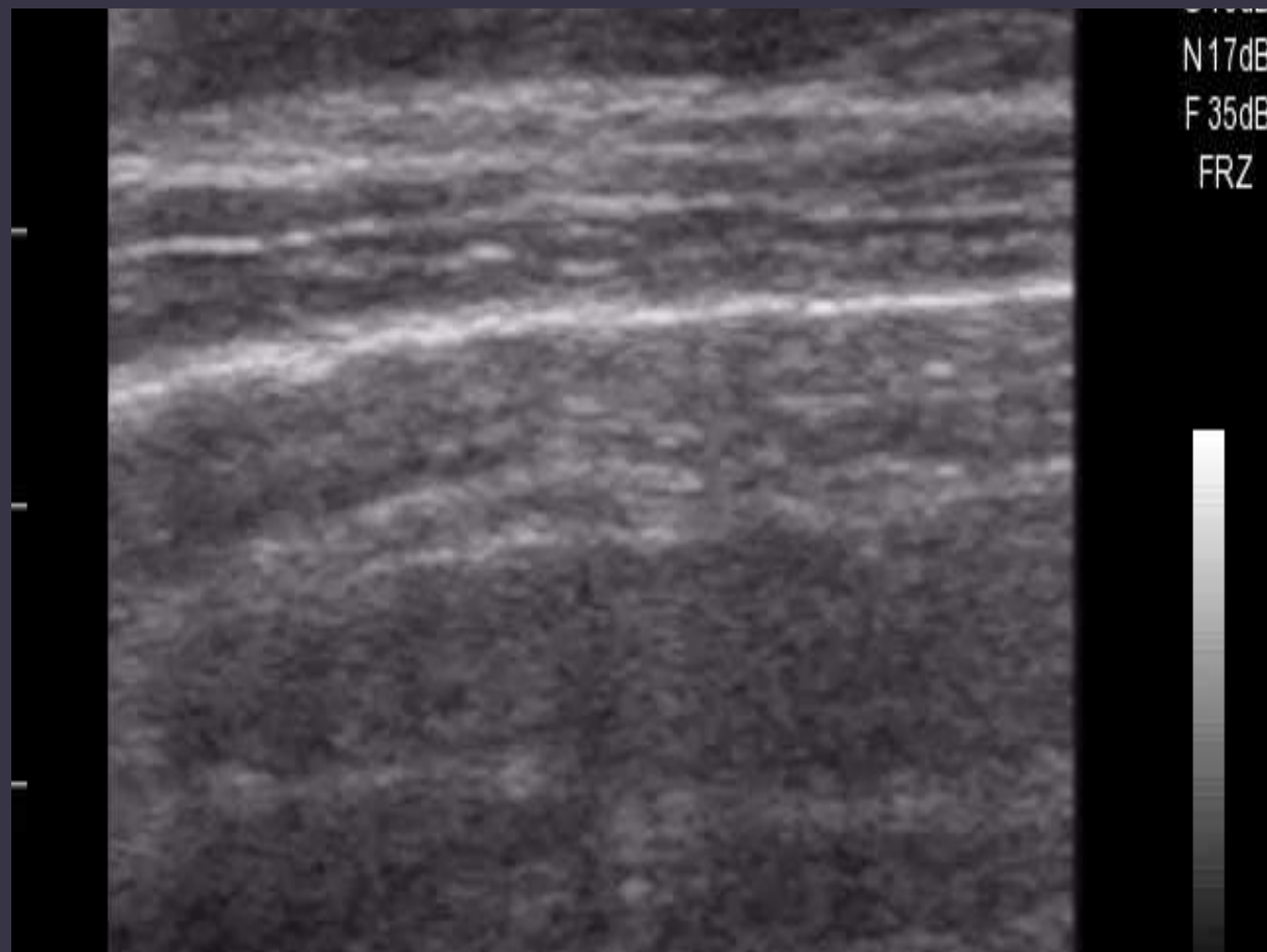


COMET TAILS VIDEO



Small areas of consolidation

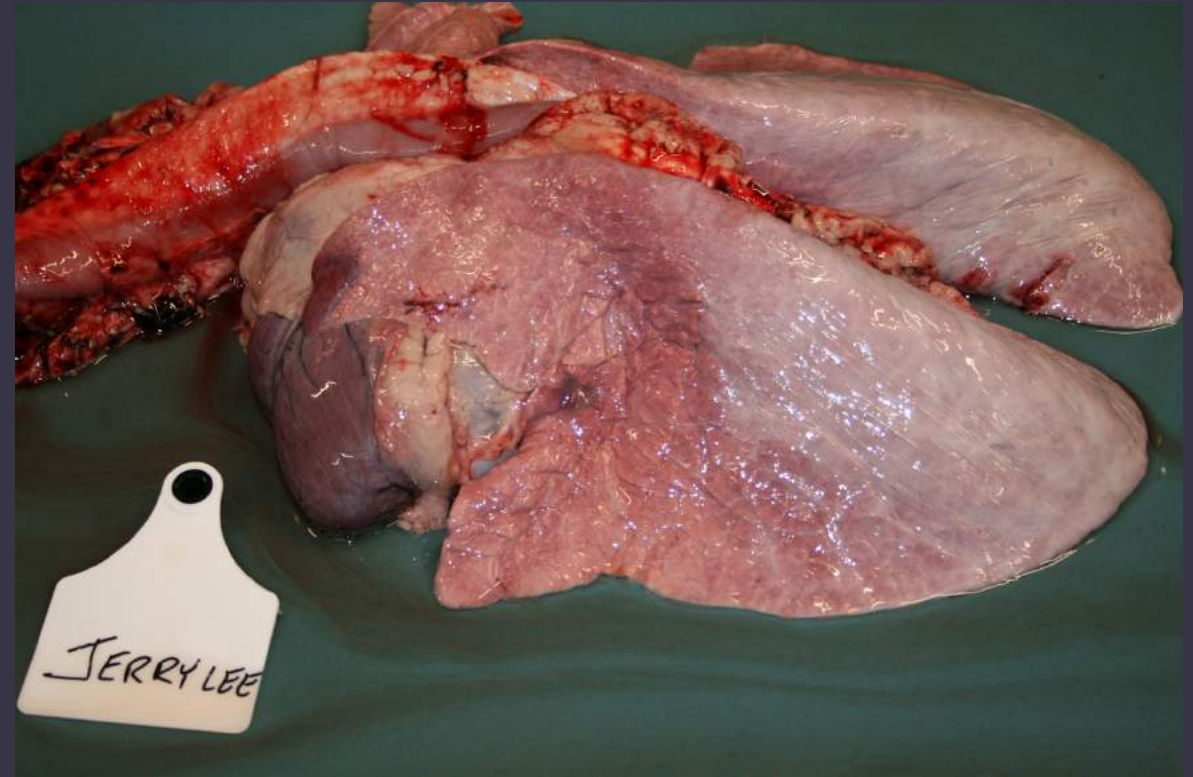
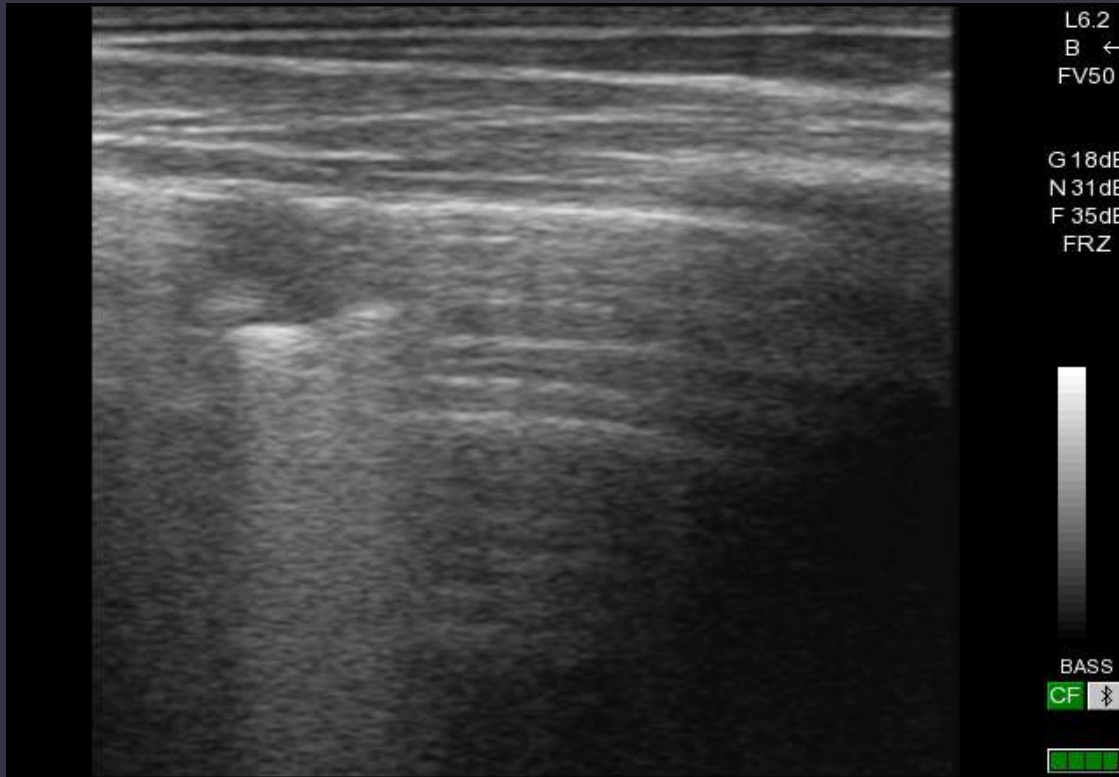




Small lesions

The lesions are not initially visible on the video, but when it starts you can see small areas at the pleural surface where there is a loss of horizontal reverberation artefact and decreased echogenicity

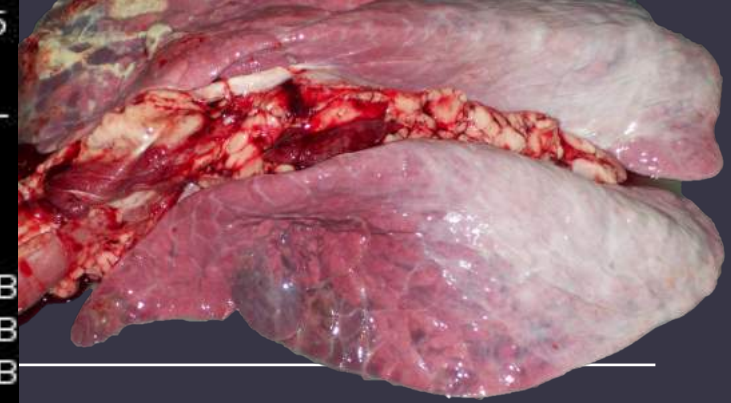
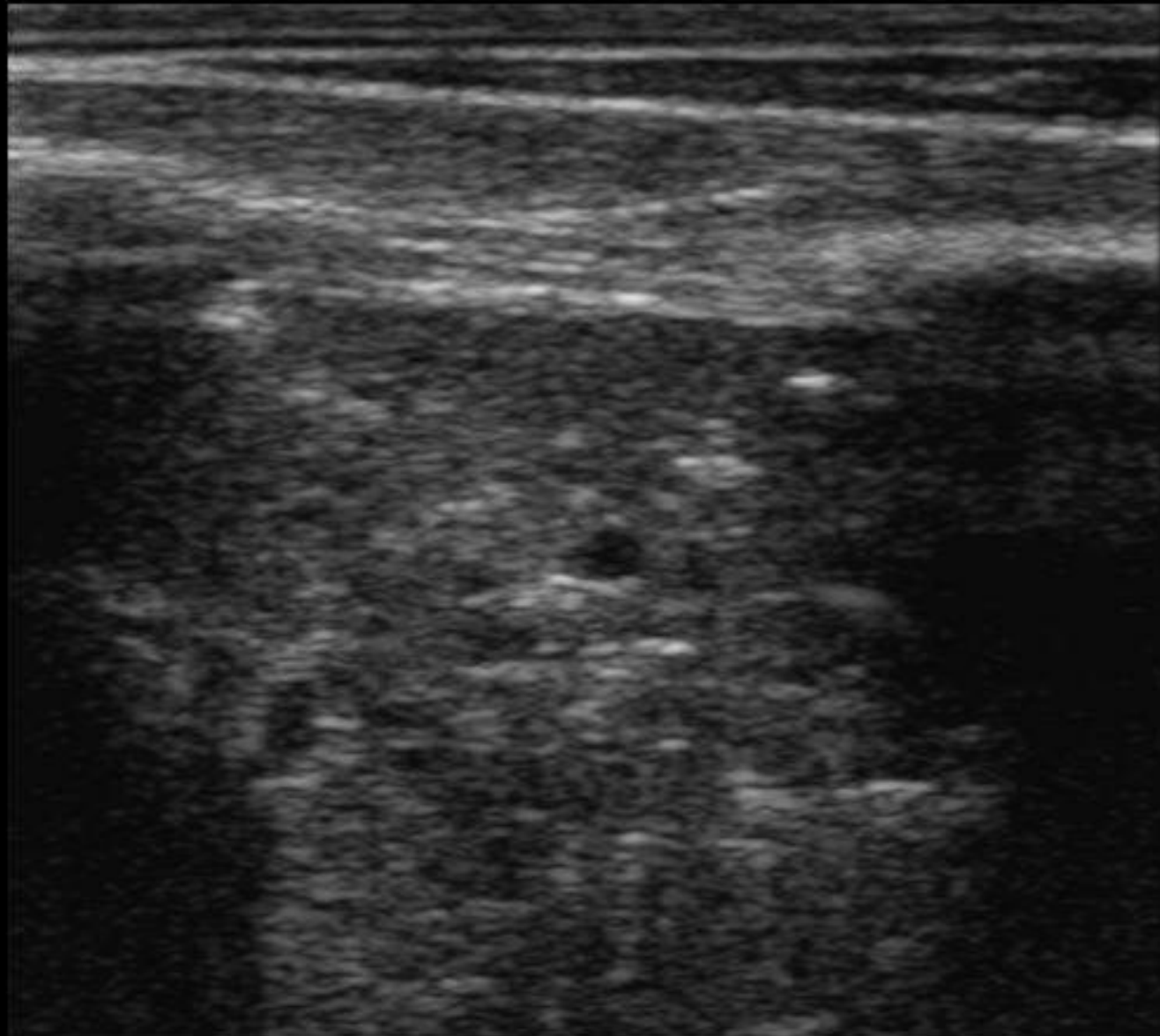
Lobular consolidation



COMET TAILS

CONSOLIDATION





L6.2
B ←
FV50

G 18dB
N 31dB
F 35dB
FRZ



Experimental *M. haemolytica*
challenge
48 hours post-
inoculation

BASS



CASWELL BASSEL

L6.2

B ←

FV50

G 16dB

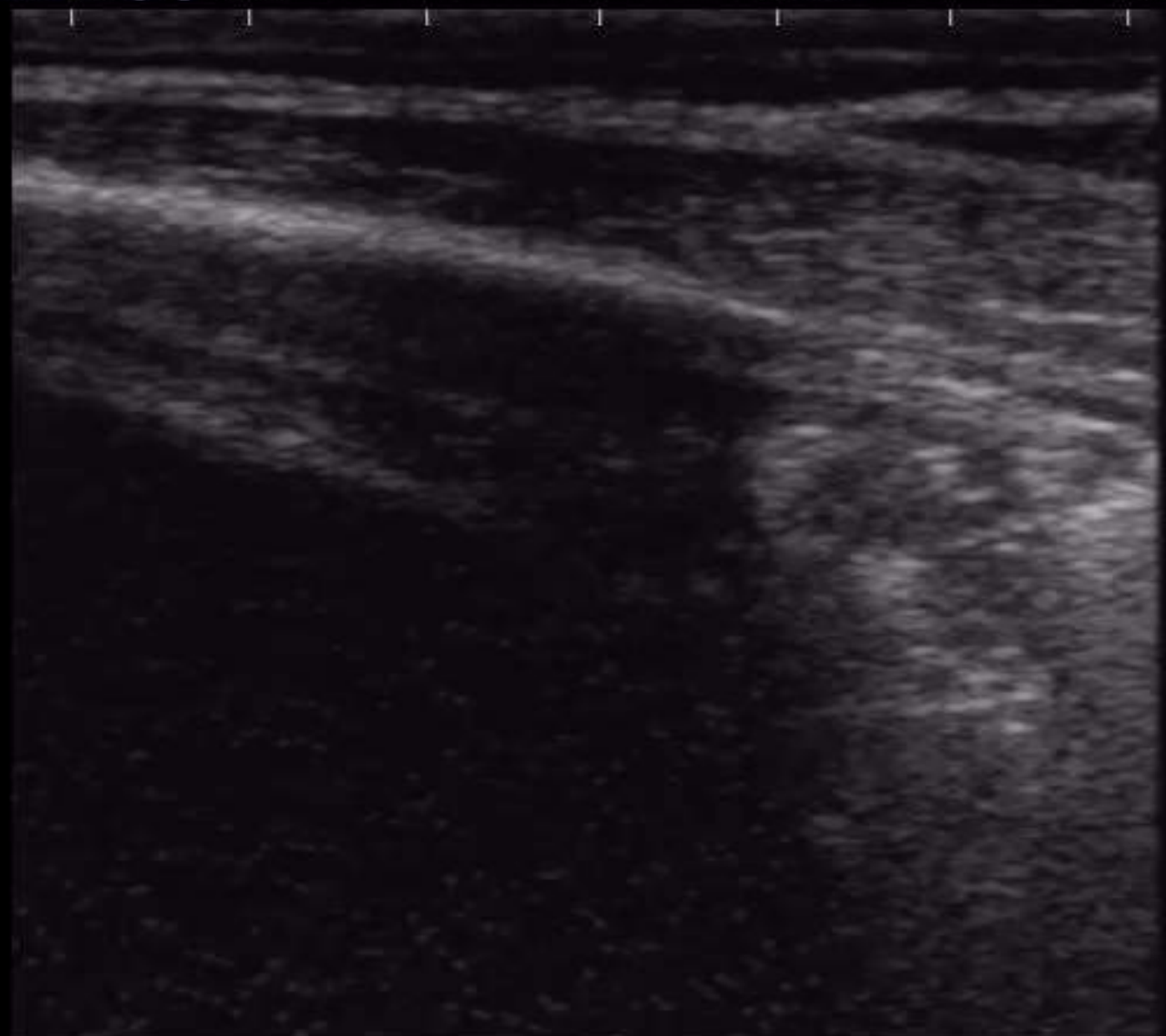
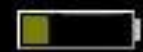
N 17dB

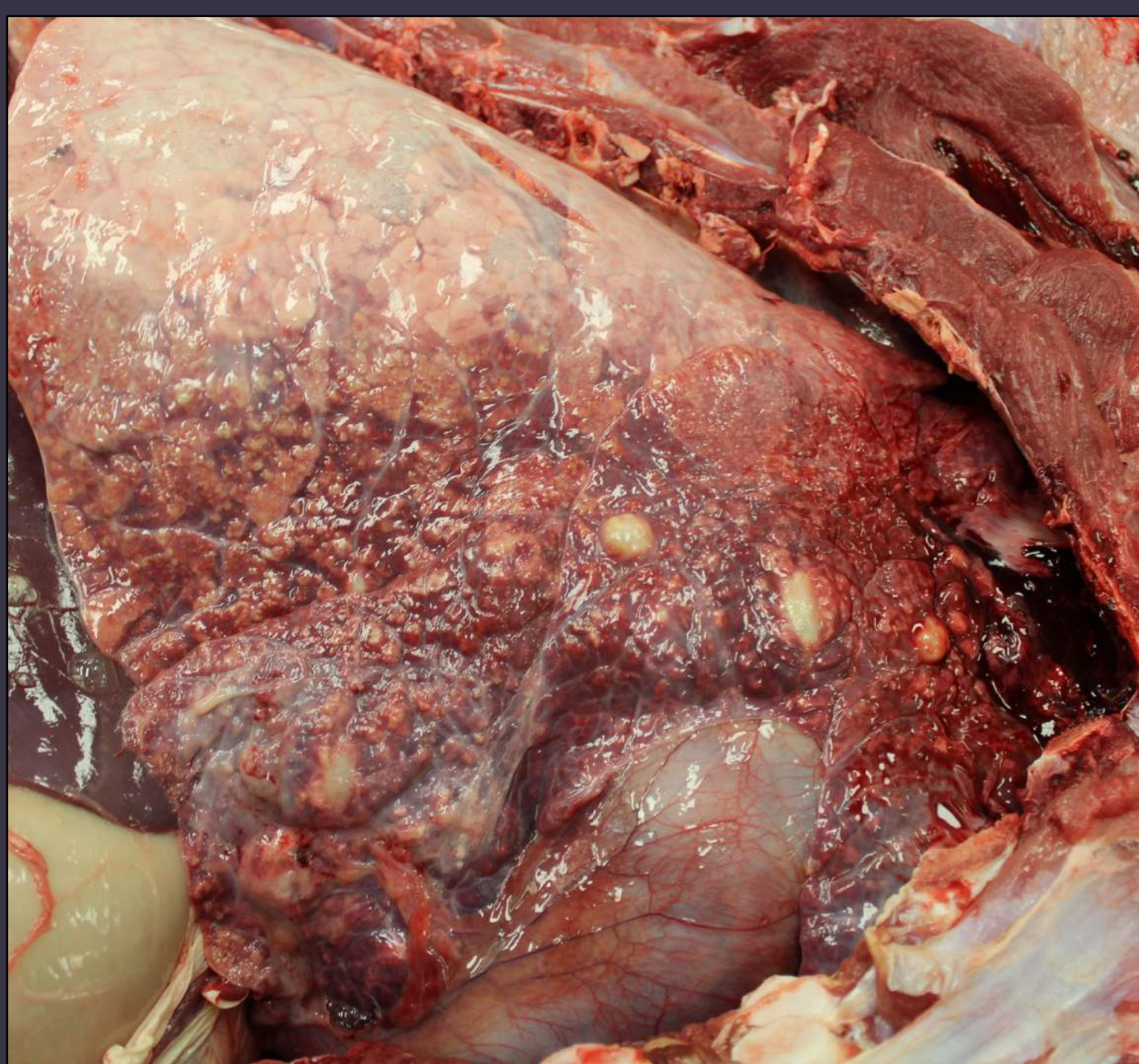
F 35dB

FRZ

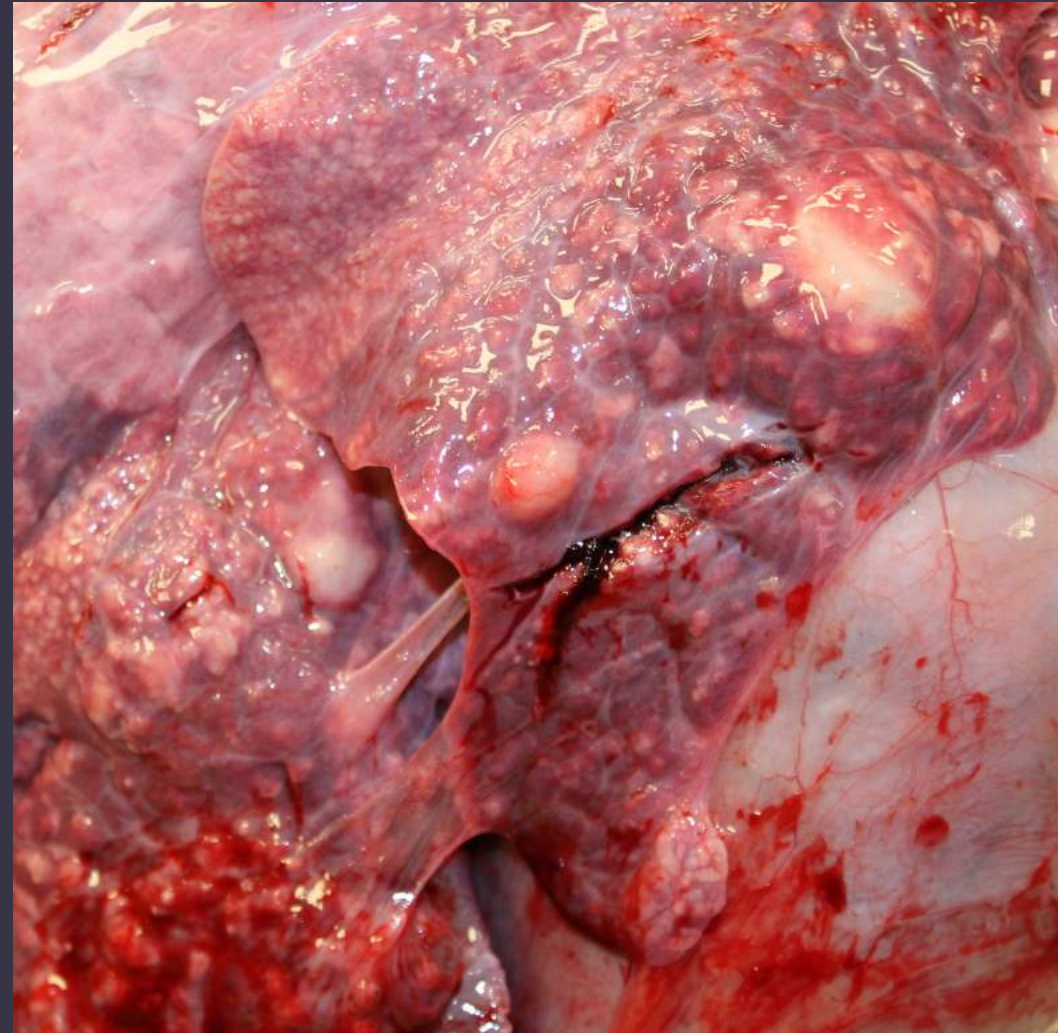


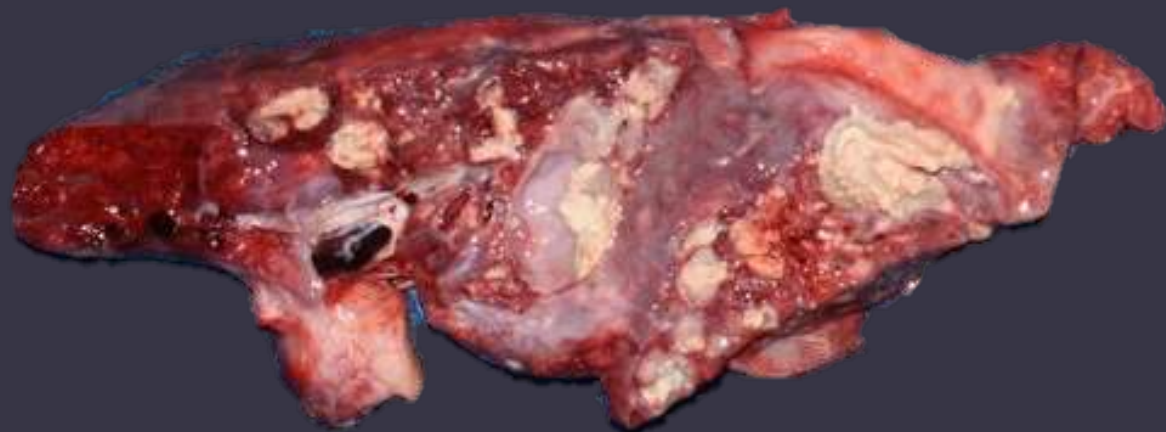
USER1



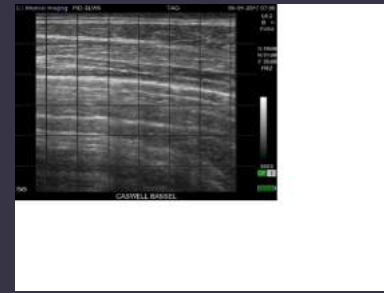


Severe lesions: 10025 LEFT





Pleural fluid (black areas between body wall and pleural surface of lung)



Normal



E.I. Medical Imaging

PID:

TAG:

11-24-2016 10:01

L6.2
B ←
FV75

G 18dB
N 13dB
F 36dB
FRZ

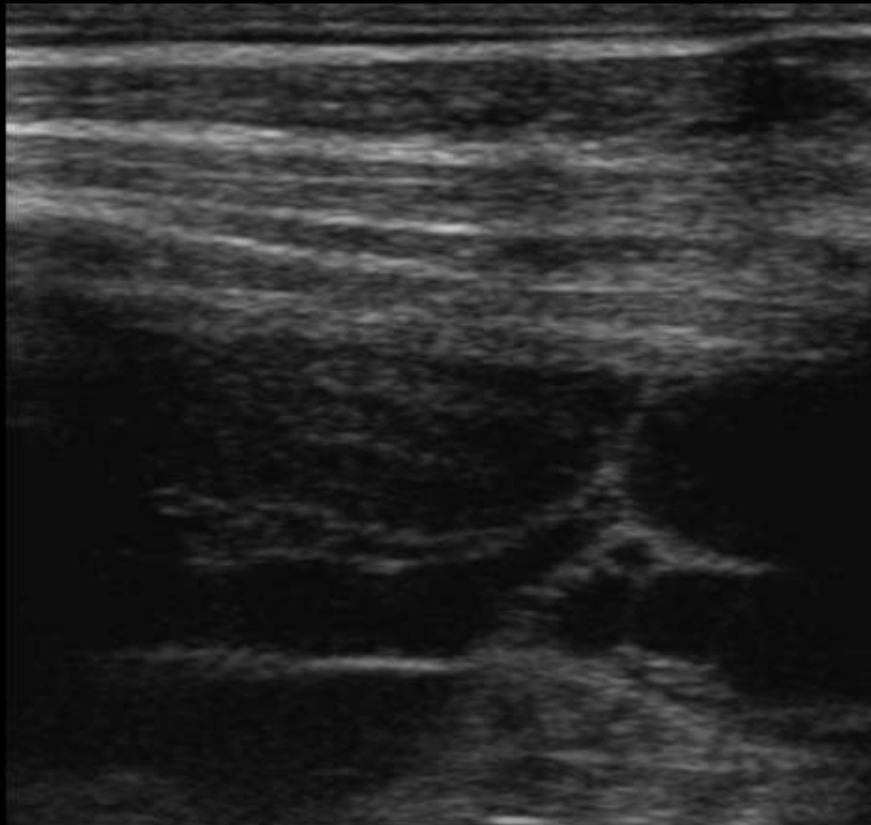


USER1
CF 

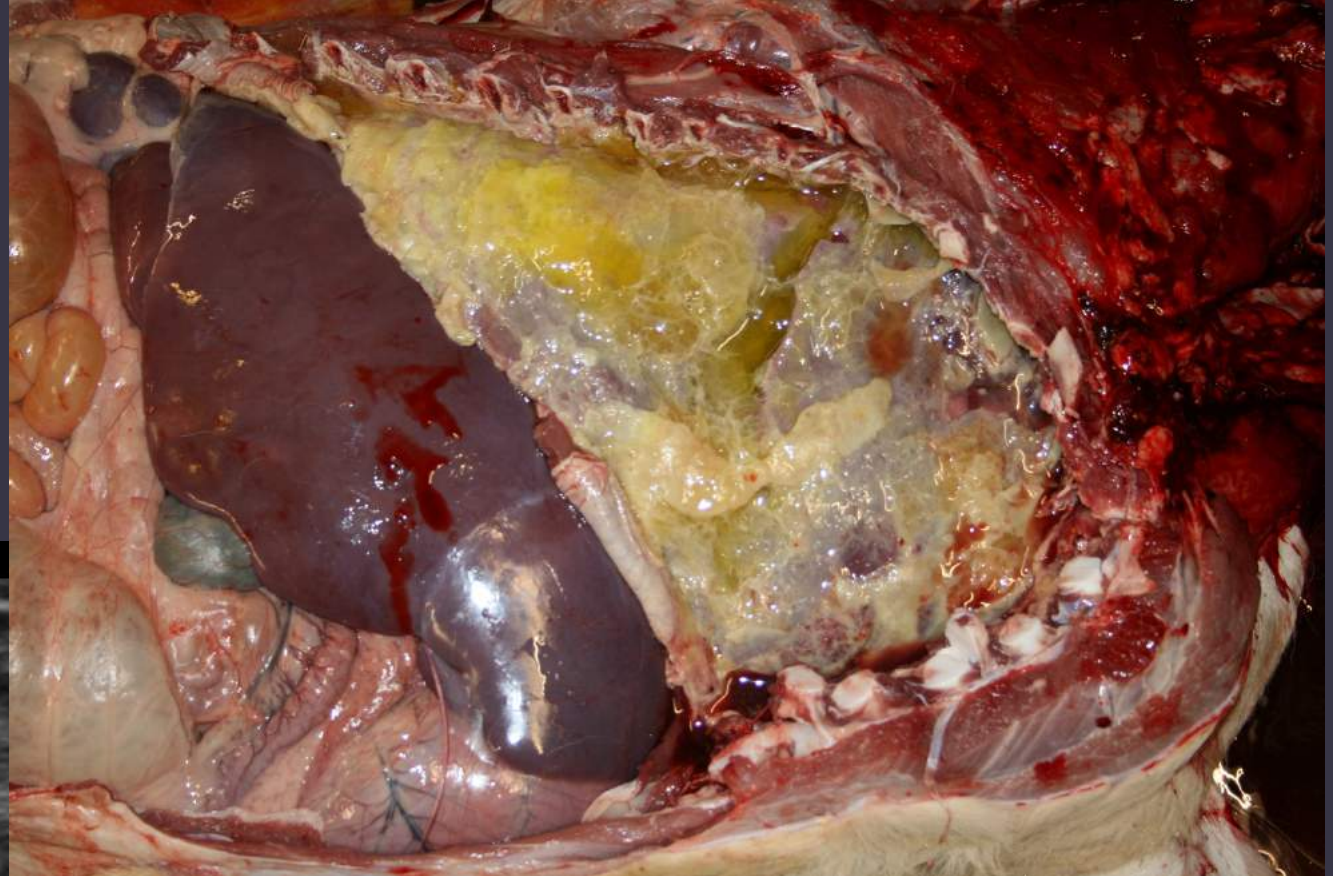


E.I. Medical Imaging PID: CASH

TAG:



CASWELL BASSEL



The black area is fluid with grey fibrin strands
In the pleural space. The gross pictures above
were taken at post mortem immediately following
ultrasound

BASS

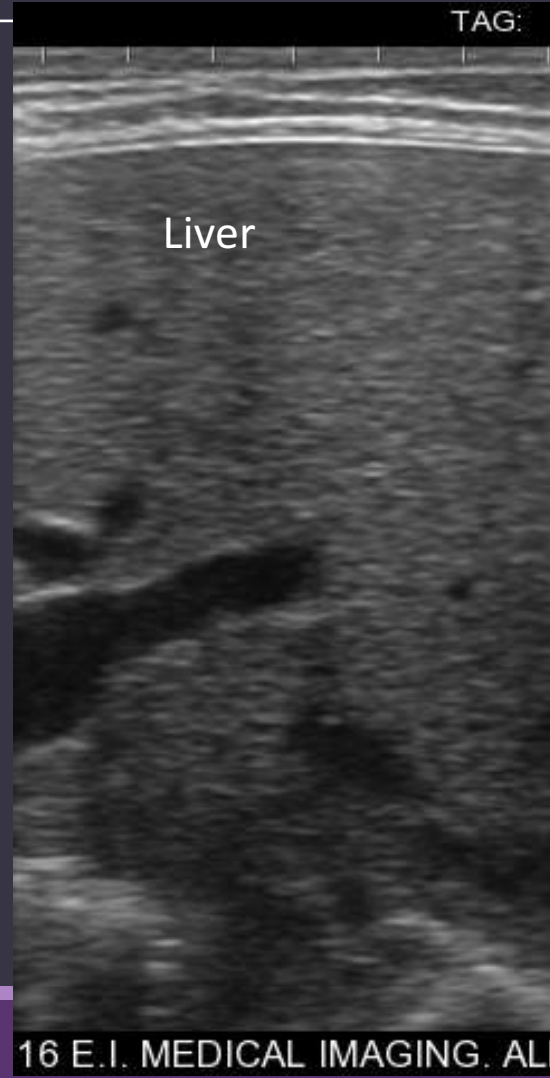
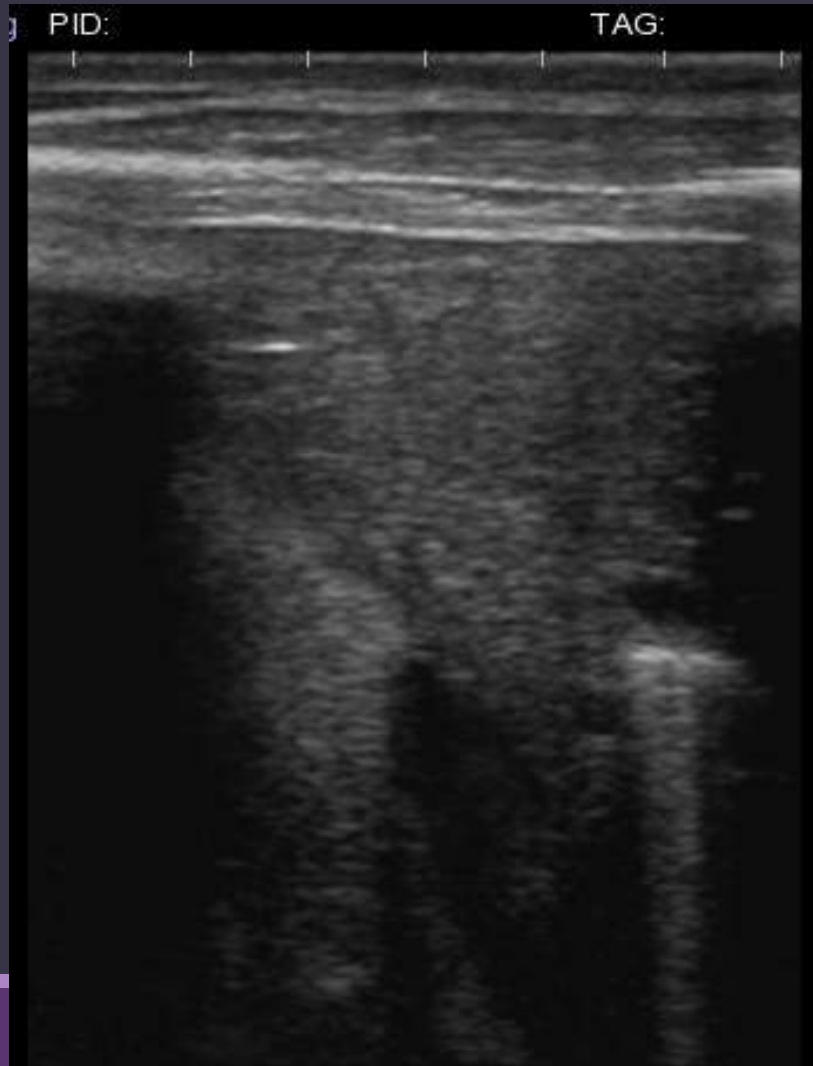
CF



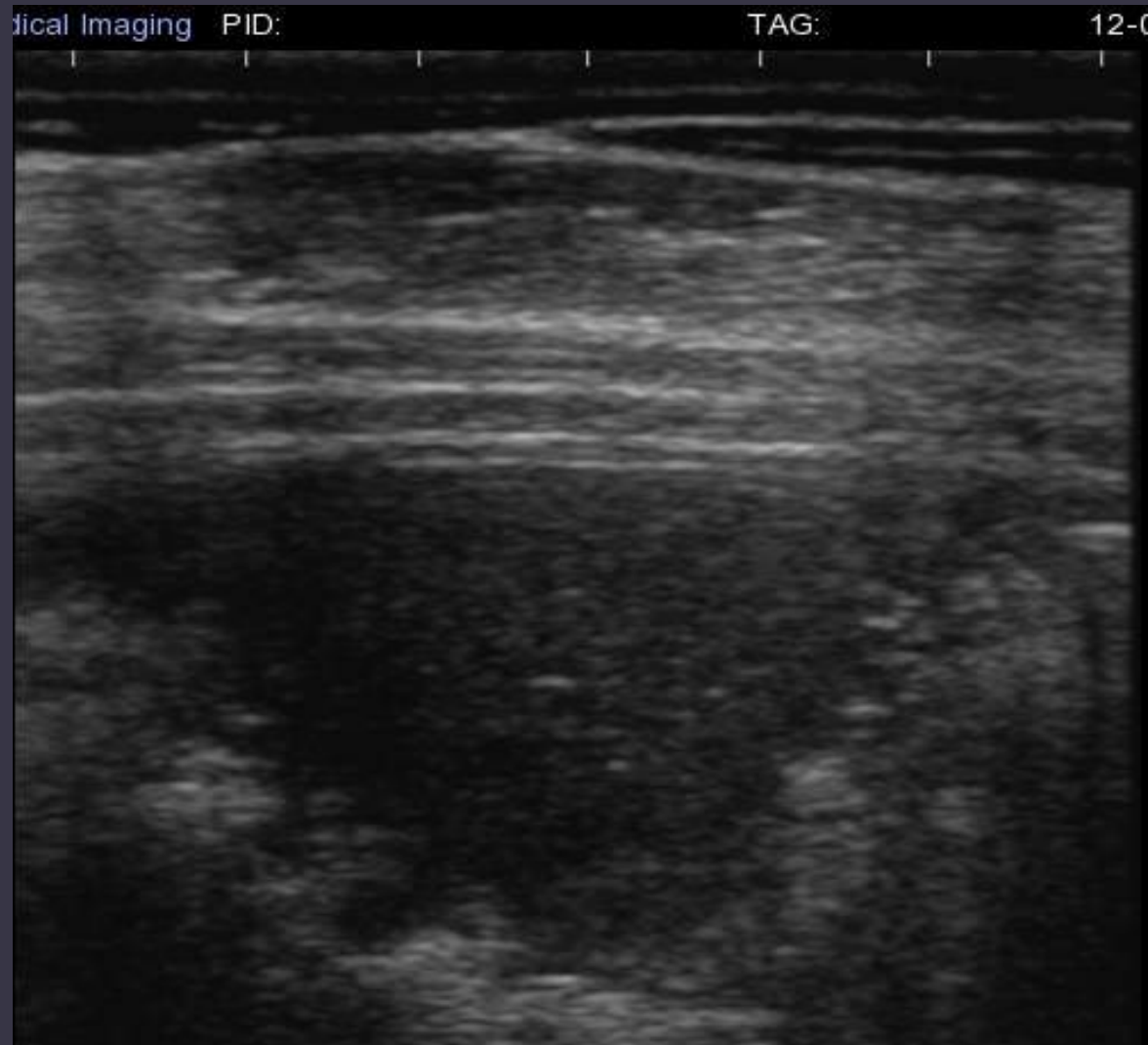
Hepaticization – which image is liver?



Normal

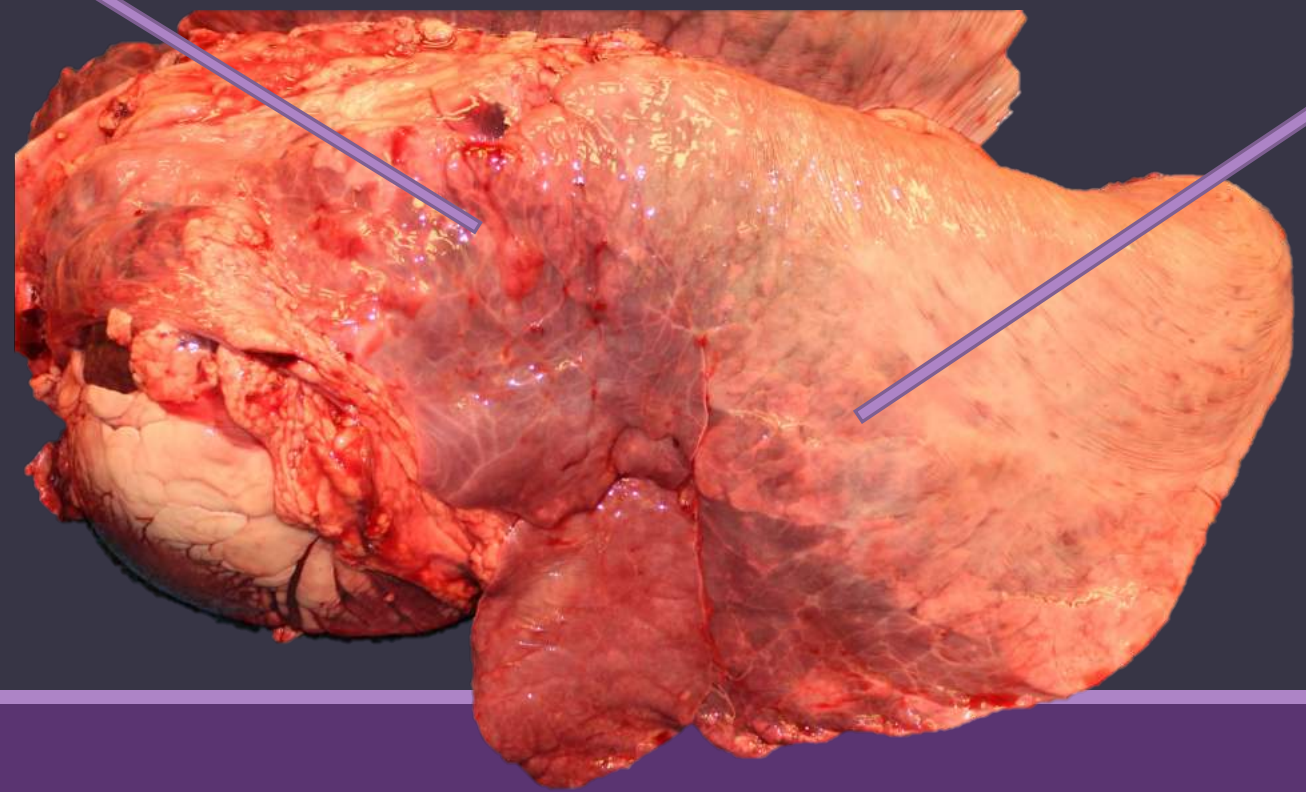


10005 abscess





EBRC 10034



Review:

Normal or
abnormal?

What structures
can you see?

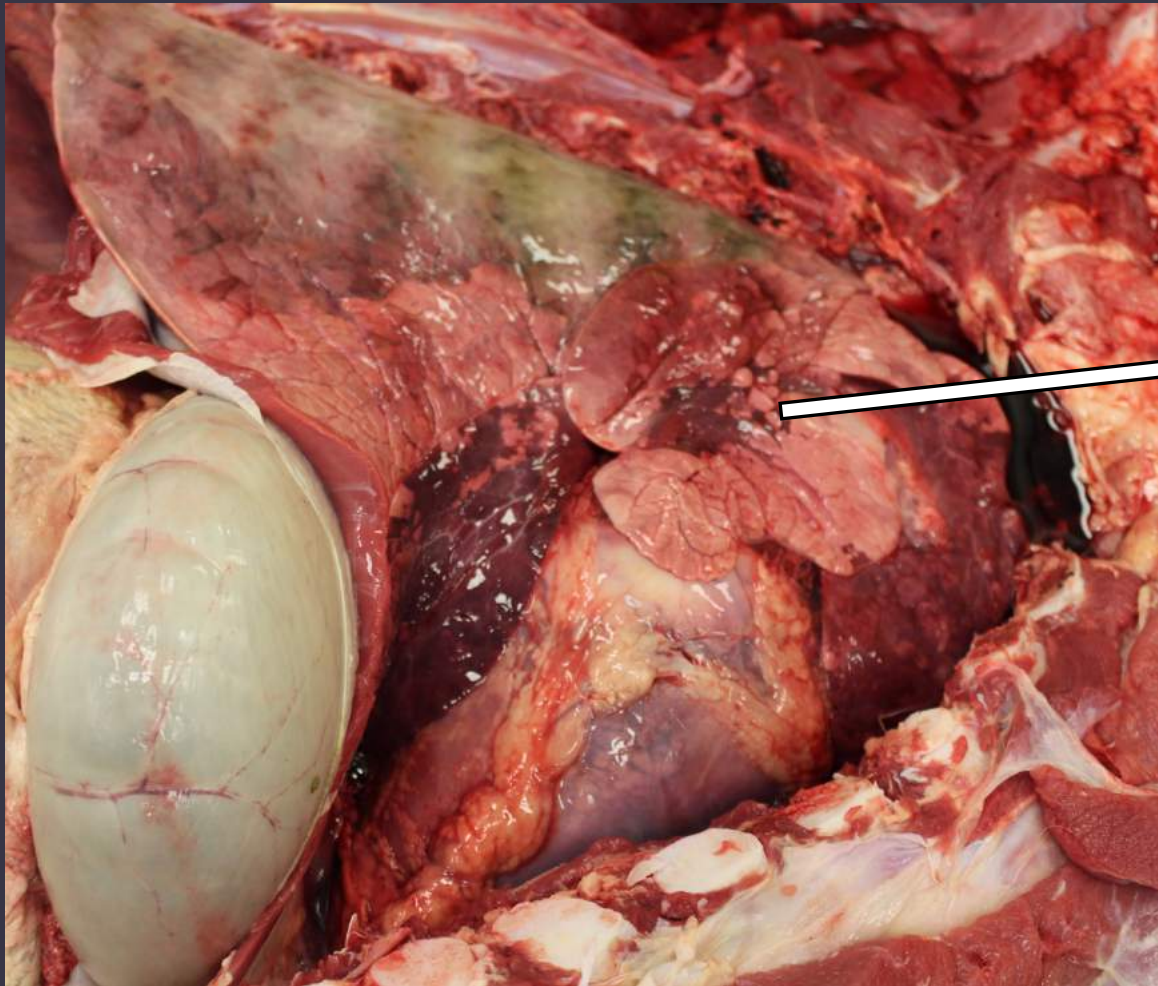


EBRC 10034



Normal or abnormal?

ERBC 10034



Which lesion is worse?



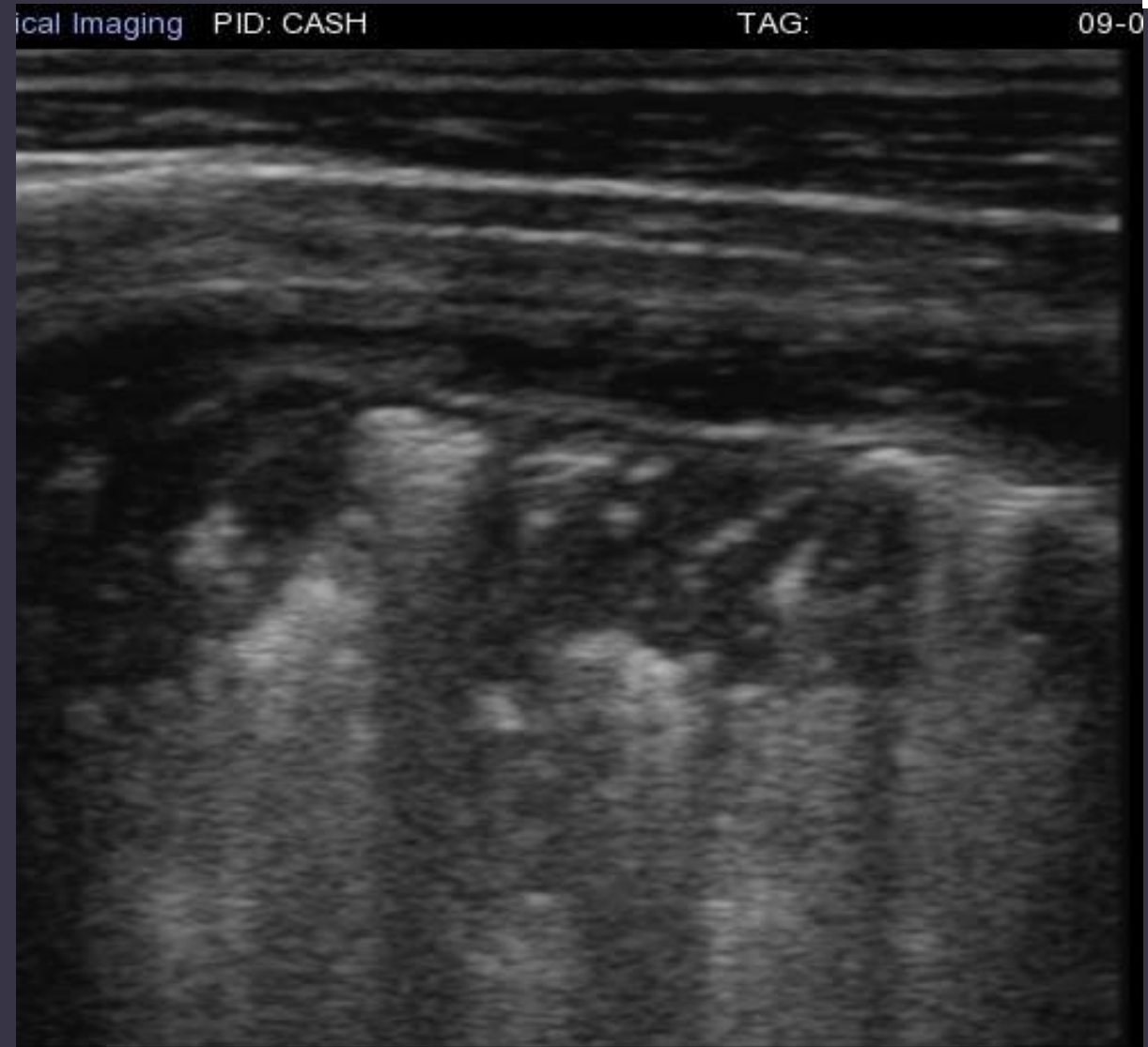
Normal



Which lesion is worse?



What are your diagnoses?



SUMMARY & TIPS

- Be systematic
- Practice imaging the cranial lungs
- Use the pleural surface as your guide
- Recommended reference:
 - On-Farm Use of Ultrasonography for Bovine Respiratory Disease. Ollivett & Buczinski. Vet Clin North Am Food Anim Pract. 2016 Mar;32(1):19-35. doi: April meeting – scanning calves at Elora Dairy
- Slides and images available