



Australian Government
Department of Agriculture,
Fisheries and Forestry



GOVERNMENT OF
WESTERN AUSTRALIA



NORTHERN
TERRITORY
GOVERNMENT



Queensland
Government

Sampling by syndrome

Mind maps and sampling guides
for common clinical syndromes
of cattle in northern Australia





This resource has mind maps of differentials and sampling guides for Significant Disease Investigations in cattle in northern Australia across five presenting syndromes (neurological signs, respiratory signs, skin lesions, sudden death and illthrift).

It follows the NABSnet approach of keeping things simple - covering the major bases without attempting to be entirely comprehensive - to provide a guide and memory jog for field veterinarians when they are doing what are often complex investigations with multiple animals involved.

- Consider the possible differentials
- Ensure you have the samples needed

Thanks to veterinary pathologists Shane Besier (DDLS WA), Ayrial Foster (Berrimah NT), Kathryn Markham (BSL Qld), Cathy Shilton (Berrimah NT) and Shirley Turner (BSL Qld) for all their input.

Lab contacts

Western Australia

DPIRD Diagnostics and Laboratory Services (DDLS)

Phone: 08 9368 3351

Email: DDLS@dpird.wa.gov.au

Specimen reception: Duty Pathologist

DPIRD Building 102, 3 Baron-Hay Crt, Sth Perth 6151

Northern Territory

Berrimah Veterinary Laboratory

Phone: 08 8999 2249

Email: bvl@nt.gov.au

Specimen reception: Duty Pathologist

Berrimah Veterinary Laboratory,
29 Makagon Rd, Berrimah, NT 0828

Queensland

Biosecurity Sciences Laboratory (BSL)

Phone: 07 3708 8762

Email: bslclo@daf.qld.gov.au

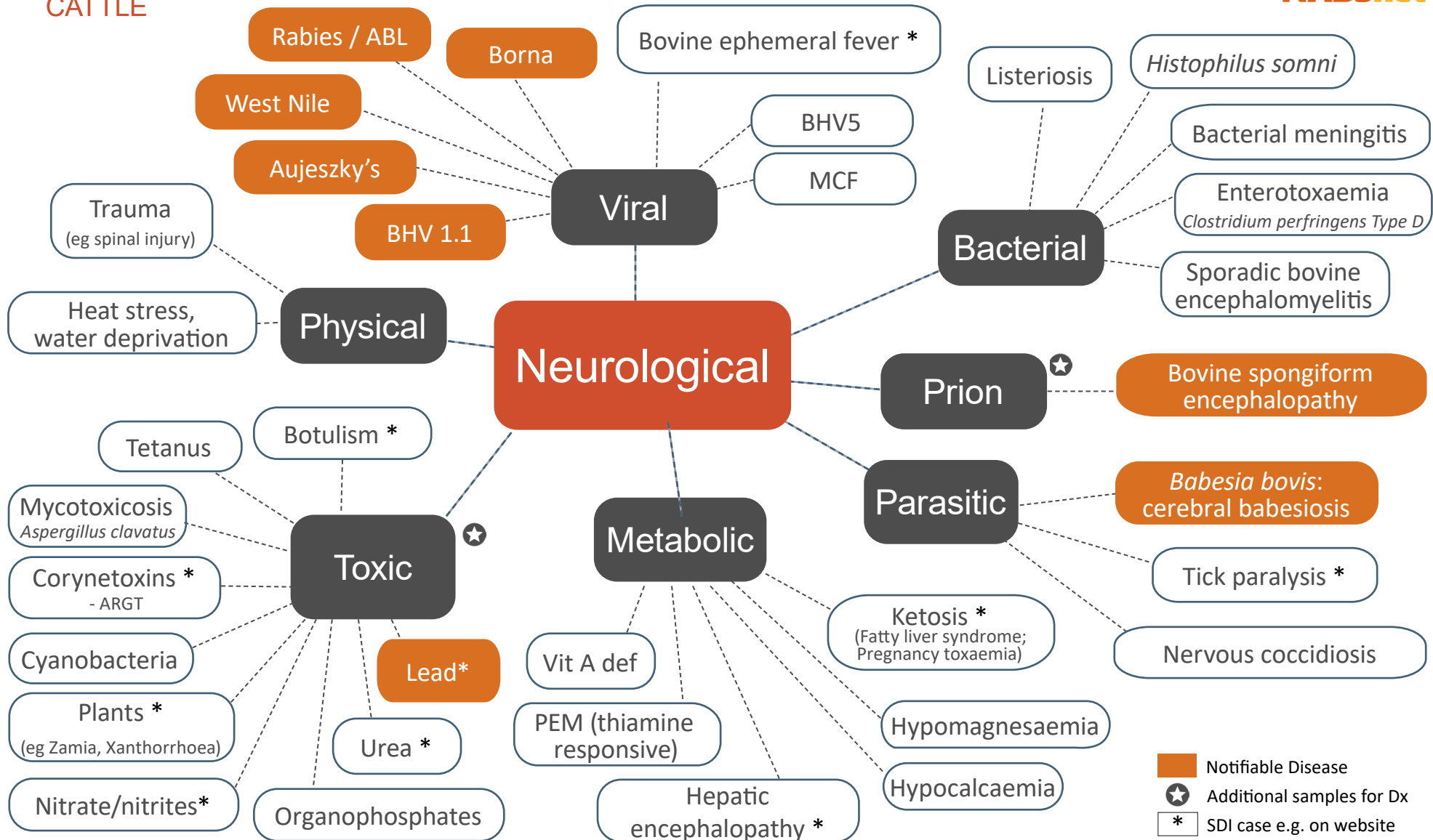
Specimen reception: Loading Dock 12

BSL, Health and Food Sciences Precinct,
39 Kessels Road, Coopers Plains, Queensland 4108

Mind map Neurological syndrome



CATTLE

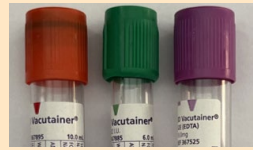


- Notifiable Disease
- ★ Additional samples for Dx
- * SDI case e.g. on website

Neurological Sampling

Ante mortem

Bloods *3
Blood smear
Faeces



Collect sufficient sample quantity for multiple tests

Post mortem



Fresh Fixed

Individual,
labelled, chilled

Pooled,
formalin

Ocular fluids	<input checked="" type="checkbox"/> frozen	
Brain	<input checked="" type="checkbox"/> ★	<input checked="" type="checkbox"/> ★
Brain squash	<input checked="" type="checkbox"/> dried	
Spinal cord (x2-3)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Liver	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Lung	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Kidney	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Spleen	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Heart	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Skeletal muscle	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Any lesions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Abomasum /forestomachs		<input checked="" type="checkbox"/>
SI / LI / IC valve	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Sampling considerations

- Several significant EADs and zoonoses.
- Need thorough history. Videos are helpful to show signs.
- CNS samples required for full investigation.
- Some causes do not have gross or histological signs.
- Brain/brainstem swabs needed for culture and PCR.
Liquid Amies swabs (eSwabs) are suitable for both. Or send swabs in solid agar for culture, and in VTM for PCR and viral culture.
- Ocular fluids for some toxicoses and metabolic diseases.
- Take bloods from live cohorts in metabolic disease.

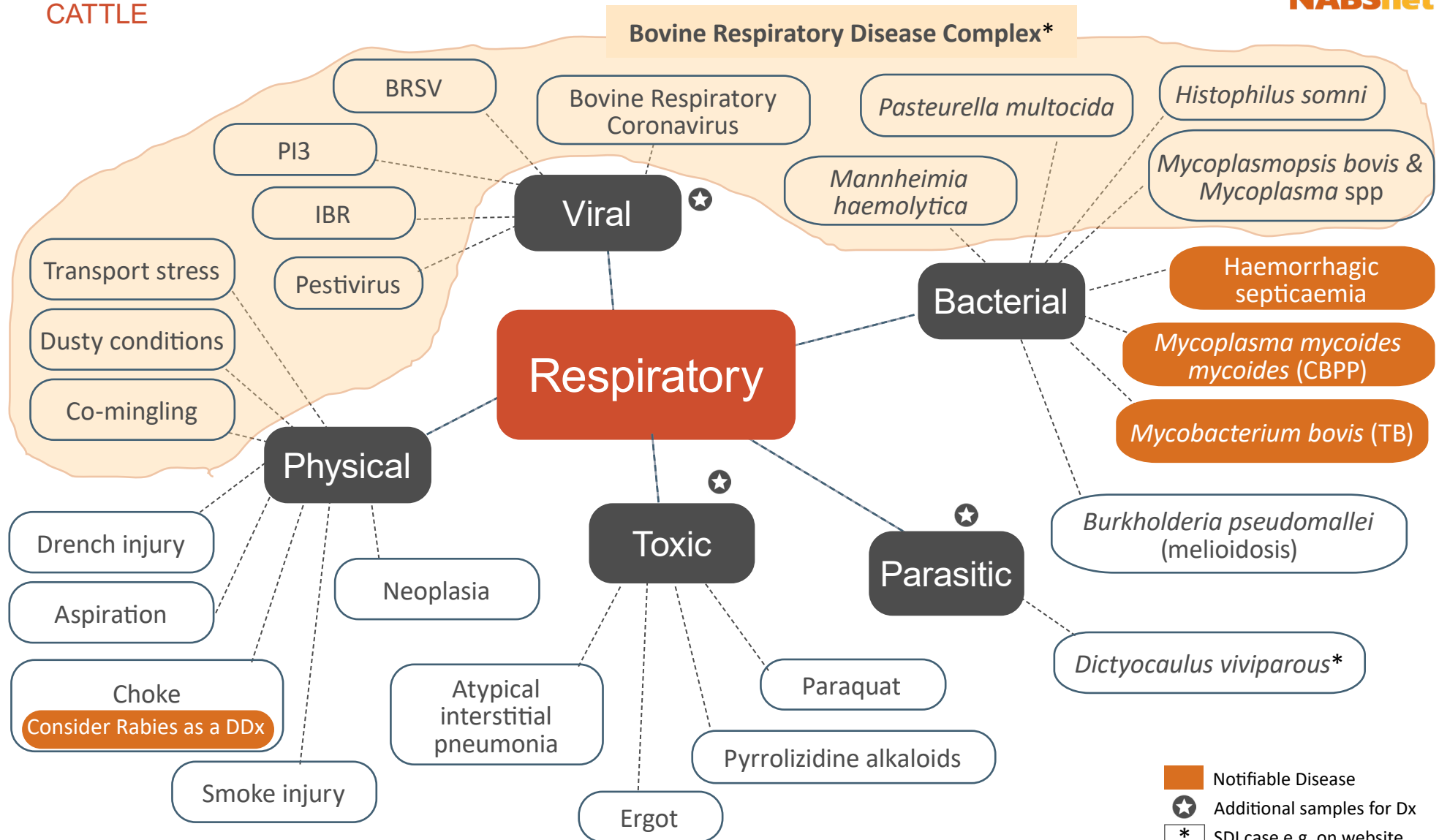
Additional samples

- ★ BSE: intact fixed brainstem required.
- ★ Rabies: **zoonosis**, fresh and fixed brain and salivary gland.
- ★ Suspect plant poisoning: (1) submit plant sample, where access is clear (2) send suspect plant fragments from rumen.
- ★ Suspect feed (eg mycotoxicoses): send feed sample, batch label and date, note batch details when problem started.
- ★ Suspect enterotoxaemia: 5-10 mL of ileal content.
- ★ Suspect toxins e.g. botulism, ARGV: 50-100 mL rumen fluid.

Mind map Respiratory syndrome



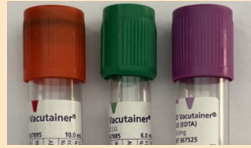
CATTLE



Respiratory Sampling

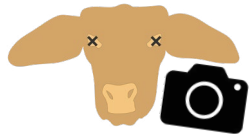
Ante mortem

- Bloods *3
- Blood smear
- Faeces
- Nasal swabs



Collect sufficient sample quantity for multiple tests

Post mortem



Fresh

Individual,
labelled, chilled

Fixed

Pooled,
formalin

	record % visibly affected	✓ ★	✓ ★
Lung		✓ ★	✓ ★
Trachea		✓	✓
Bronch lymph node		✓	✓
Pleural swab		✓ ★	
Liver		✓	✓
Kidney		✓	✓
Spleen		✓	✓
Heart		✓	✓
Brain		✓	✓
Any lesions		✓	✓

Sampling considerations

- Several significant EADs.
- BRDC has many potential pathogen combinations and physical risk factors.
- Swabs from lungs, trachea, bronchial lymph nodes and pleurae needed for culture (bacteria, mycoplasma) and PCR (viruses, mycoplasma). Liquid Amies swabs (eSwabs) are suitable for both, or send swabs in solid agar for bacterial/mycoplasma culture, and in VTM for PCR.
- Send fresh and fixed samples of affected and unaffected lung and the margins between them – lesions may be subtle. Samples just from the 'sharp' edges of the lung may miss a range of airways.
- Bloods needed for pestivirus antigen/antibodies, viral antibodies (bacteria may be secondary invaders).
- Nasal swabs from live animals can be used for PCR (viruses).

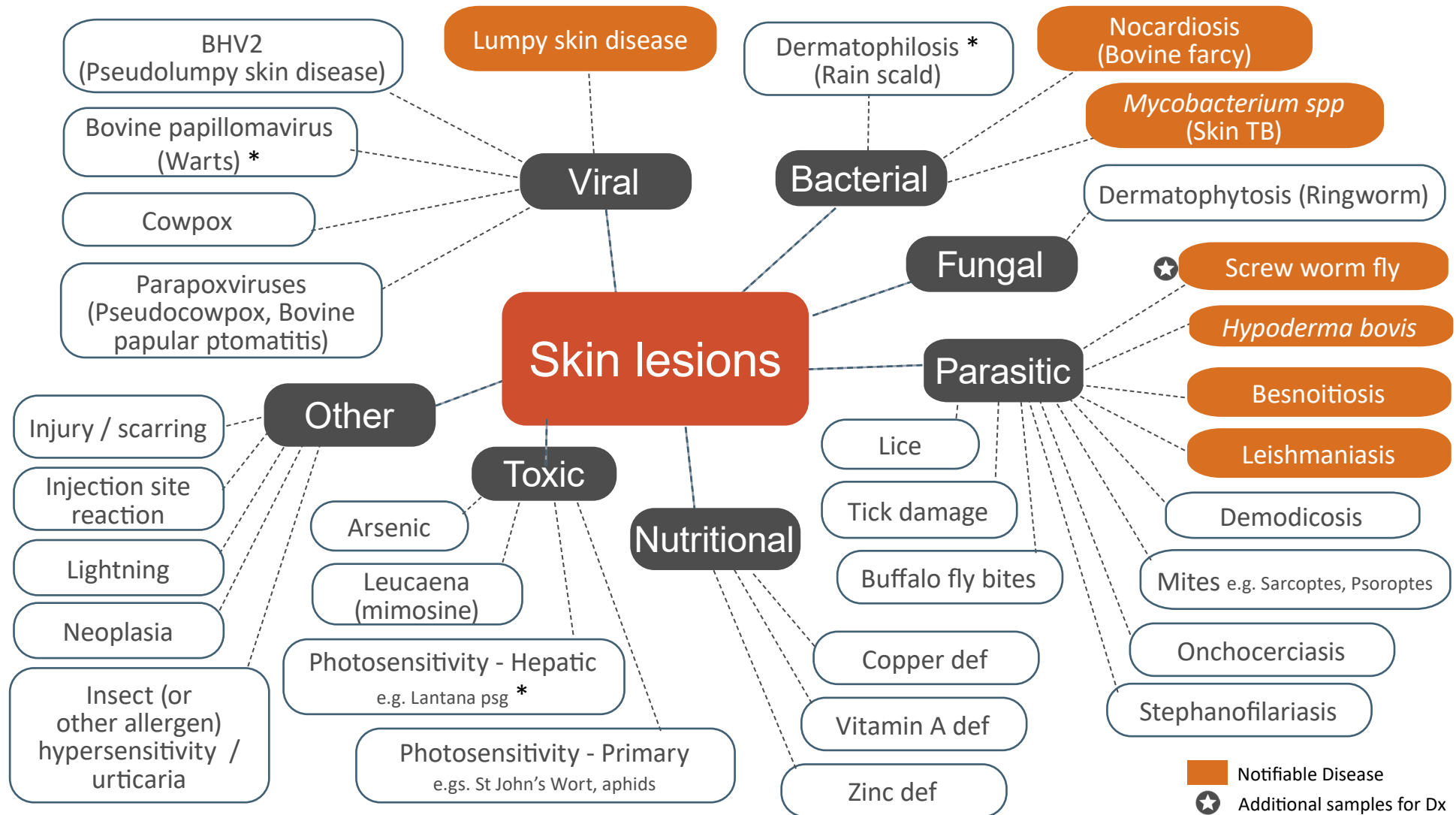
Additional samples

- ★ Suspect lungworm: send faecal samples
- ★ Suspect feed (e.g. ergot): send feed sample, batch label and date, note batch details when problem started.
- ★ Suspect toxins: 100 mL rumen fluid and 100 g liver.

Mind map Skin lesions syndrome



CATTLE



- Notifiable Disease
- ★ Additional samples for Dx
- * SDI case e.g. on website




Skin lesions Sampling

Ante mortem

Skin biopsies
Plain and formalin tubes

Photos of lesions

Bloods - serum

Collect sufficient sample quantity for multiple tests

Post mortem

	Fresh <small>Individual, labelled, chilled</small>	Fixed <small>Formalin</small>
Skin lesions	✓	✓
Mucosal lesions	✓	✓
Tissues as for other syndromes present	✓	✓

Sampling considerations

- Main significant EADs are LSD and Screw worm fly.
- Many conditions can look similar - need field *and* lab assessments (histology, microbiology and serology/PCR). Photos are very helpful for the pathologists.
- Collect samples from multiple animals.
- **Most focus is on sampling the skin lesions - including margins.**
- LSD diagnosis confirmation is by capripox PCR on skin lesions. Lesions (and scabs) stay positive for up to 35 days. Highly sensitive and specific.
- Serum can be used for back-up serology with old LSD lesions.
- BHV2 PCR on skin lesions only positive for a few weeks. Serology (VNT) may stay positive for life (limiting for endemic/chronic Dx).
- Mites and microfilaria of onchocerciasis can be seen microscopically in skin biopsies
- Skin scrapings are low value samples (only if biopsy not possible).

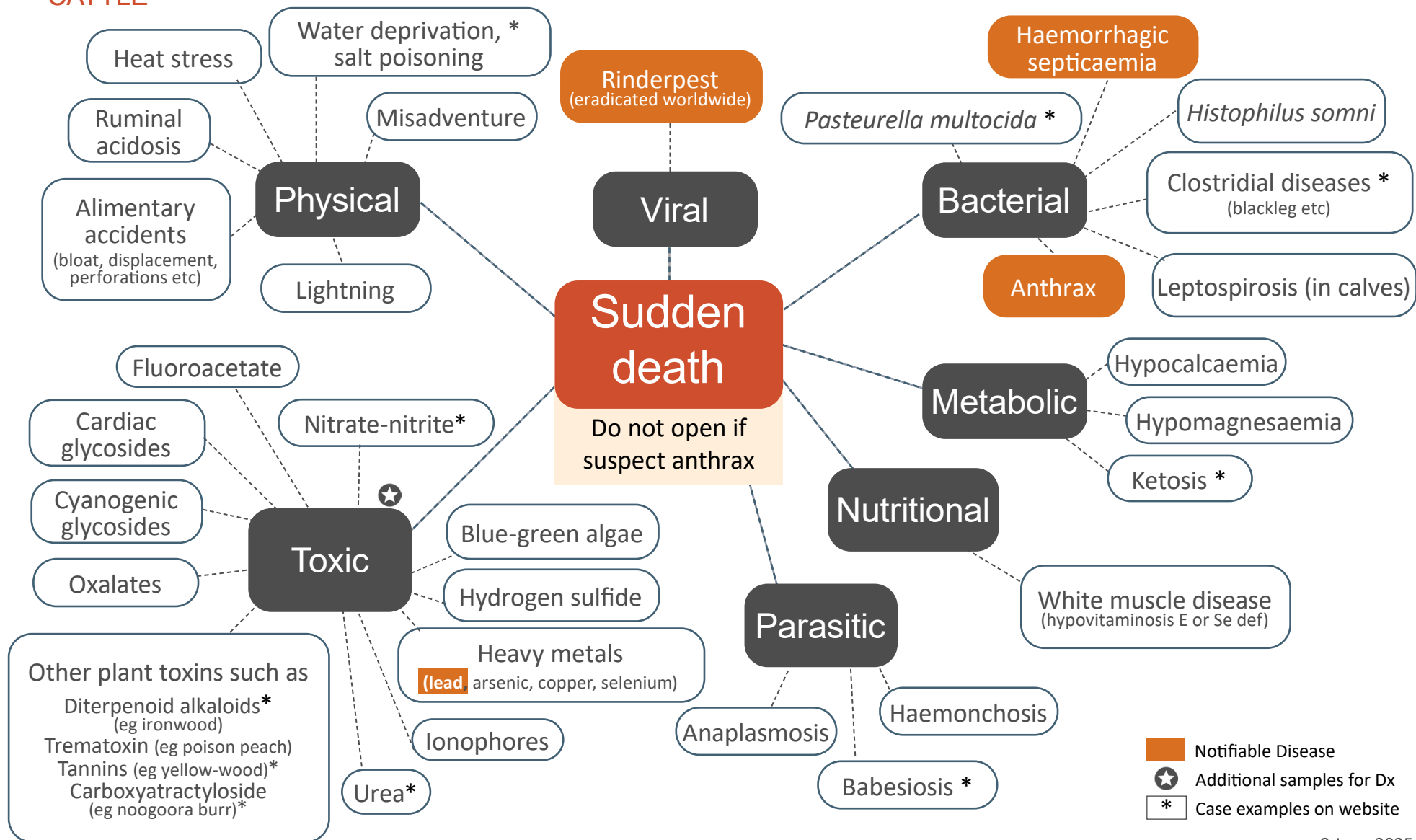
Additional samples

- ★ Suspect Screw worm fly: send maggots from live lesions. Send in 70% ethanol for entomologist to speciate. PCR now available for SWF that can be used on ethanol-fixed maggots.

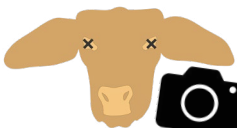

Mind map Sudden death syndrome



CATTLE



- Notifiable Disease
- ★ Additional samples for Dx
- * Case examples on website

Post mortem		
	Fresh	Fixed
	Individual, labelled, chilled	Pooled, formalin
Ocular fluids	<input checked="" type="checkbox"/> frozen	
Brain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Liver	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Lung	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Kidney	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Spleen	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Heart	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rumen contents	<input checked="" type="checkbox"/>	
Abomasum / forestomachs		<input checked="" type="checkbox"/>
SI / LI / IC valve		<input checked="" type="checkbox"/>
Skeletal muscle	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Any lesions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Collect sufficient sample quantity for multiple tests		
Ante mortem (from cohorts)		
Bloods *3		
Blood smear		

Sudden death Sampling

Sampling considerations

- Several significant EADs.
- Need thorough history.
- Differentiate between 'sudden death' and 'found dead'.
- Lab focus is on infectious, parasitic, metabolic and toxic causes.
- Ocular fluids for suspect urea/ammonia, nitrate or phalaris toxicosis and for metabolic disease.
- Some sampling of live clinically affected cohorts may be useful.
- **Do not open carcase if suspect anthrax.** Wear PPE and take thick air-dried smears of bloody exudate and soil.

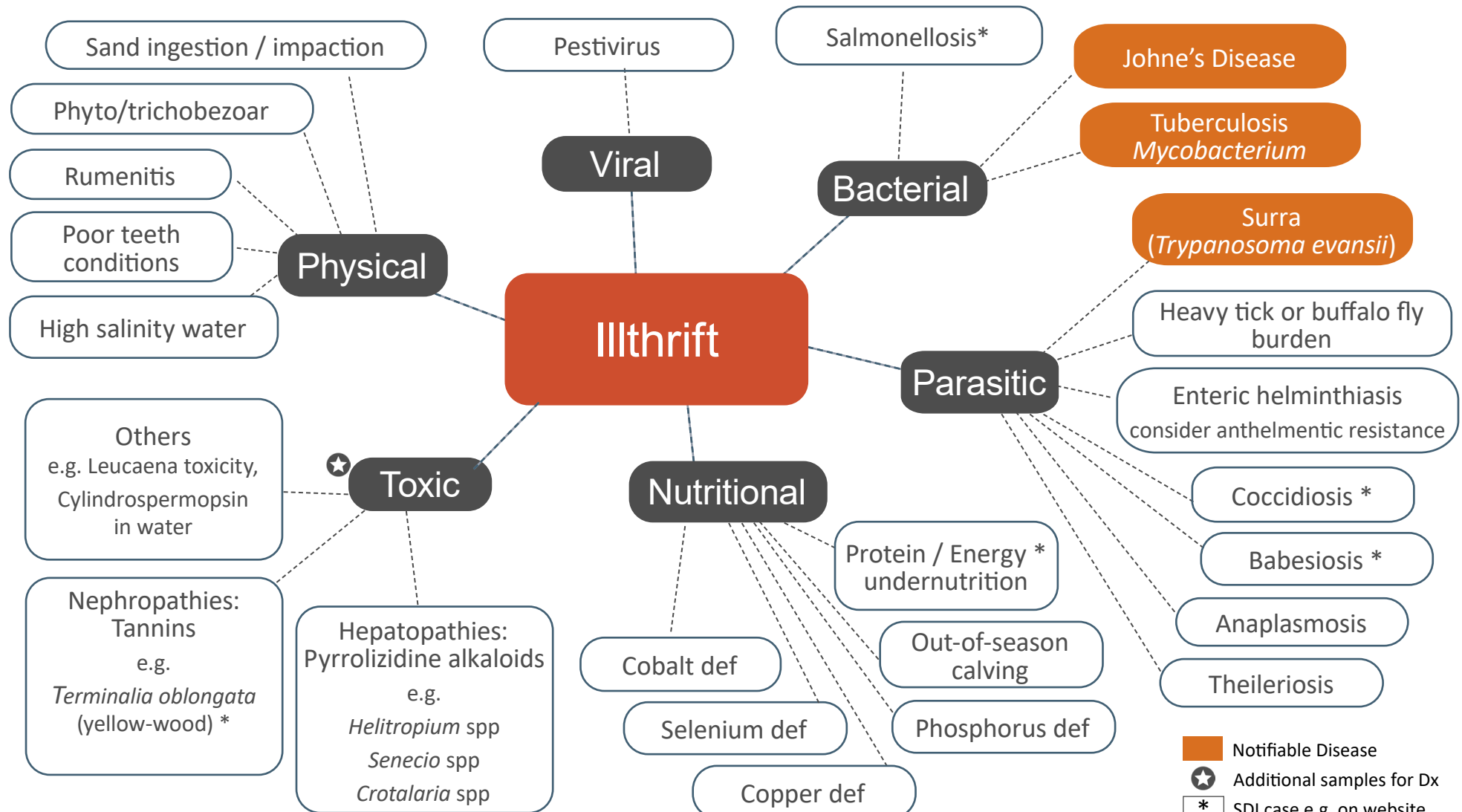
Additional samples

- ★ Tick fever exclusion: take organ smears - brain and kidney.
- ★ Suspect plant poisoning: (1) submit plant sample (or photos), where access by the stock is clear, (2) send suspect plant fragments from rumen.
- ★ Suspect feed (eg ionophores): send feed sample, batch label and date, note batch details when problem started.
- ★ Blue-green algae: rinse container in water source, sample from multiple depths on the downwind side of dam, add 5 mL of formalin to 100 mL water to preserve cells.
- ★ Other suspected toxins - request tests for these - you may need to check with the lab about what to collect and how.

Mind map Illthrift syndrome

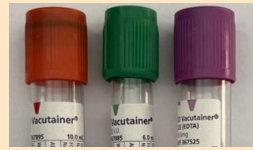


CATTLE



Ante mortem

Bloods *3
 Blood smear
 Faeces



Collect sufficient sample quantity for multiple tests

Post mortem



Fresh

Individual,
labelled, chilled

Fixed

Pooled,
formalin

	Fresh	Fixed
Brain	✓	✓
Liver	✓ ★	✓
Lung	✓	✓
Kidney	✓	✓
Spleen	✓	✓
Heart	✓	✓
Skeletal muscle	✓	✓
Any lesions	✓	✓
Bone - rib	✓ ★	
Abomasum, Forestomachs		
Sm, Large Intestine	✓	✓

Sampling considerations

- Illthrift is failure to grow or maintain weight in the presence of apparently adequate nutrition.
- Broad range of causes. Need thorough history.
- Bloods important:
 - Serum: antibodies (e.g. pestivirus, JD, surra), trace elements.
 - Lithium heparin: trace elements, vitamins, biochem.
 - EDTA: Haemoparasites, PCRs.
- Faeces for enteric parasites, Faecal Egg Count.
- Fresh gut. Fresh liver for trace elements, vitamins. Could be liver biopsy in live animals
- Fresh bone can be helpful for mineral analysis.
- Fixed samples from all main organs.

Additional samples

- ★ Suspect feed: nutritional analysis including ME, CP, NDF, trace minerals. Also assess amount of feed on offer.
- ★ Suspect toxins: gut content is generally not much help - often chronic or historical exposure and toxins rarely detectable in gut or tissues when clinically affected. Request specific tests - you may need to check with the lab about what to collect and how.
- ★ Suspect water e.g. salinity or cyanobacteria: rinse container in water source, sample from multiple depths.

NOTES

