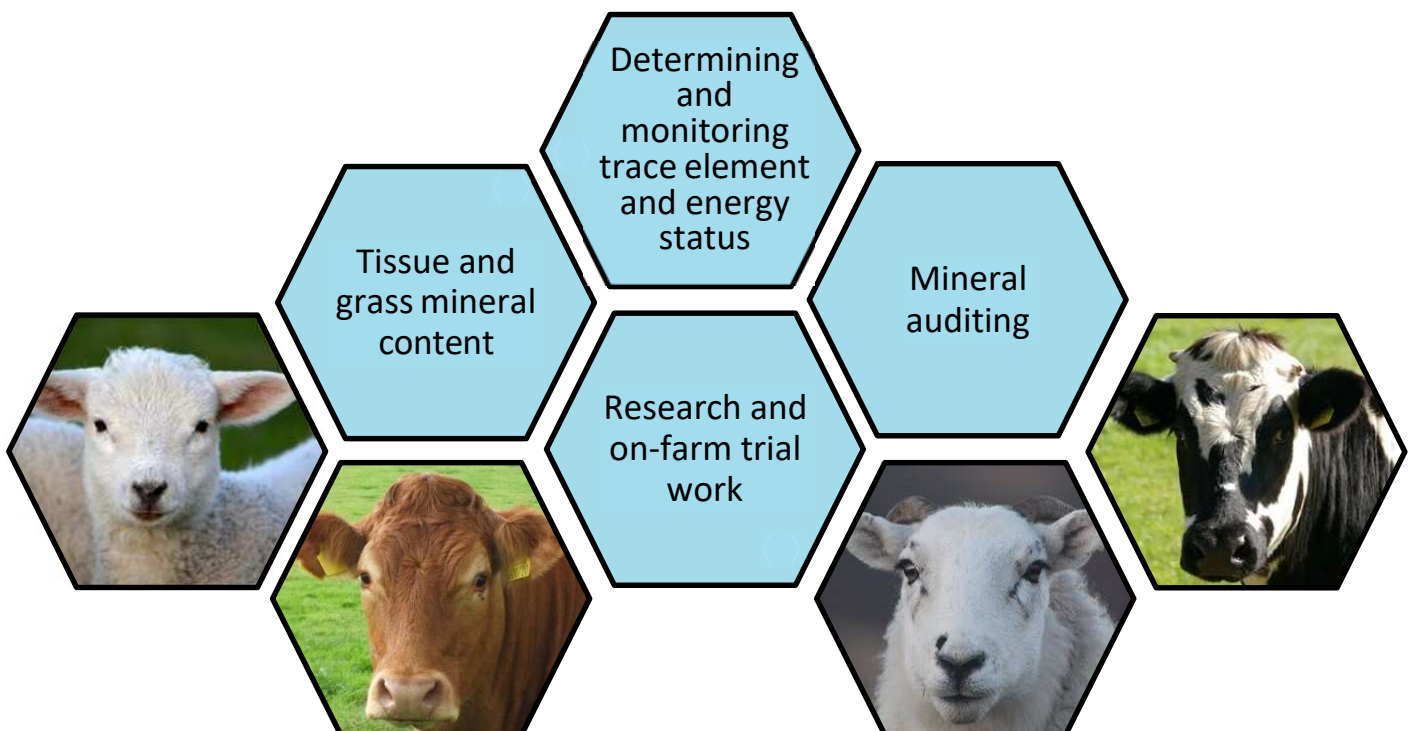




# NUVetNA

Nottingham University Veterinary Nutritional Analysis

Providing  
Nutritional laboratory support  
for:



Evidence to enable decisions and determine risk



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## Contact details

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## Background



NUVetNA was founded in 2006 by Dr Nigel Kendall at the newly formed School of Veterinary Medicine and Science, University of Nottingham. The laboratory service utilises his in-depth knowledge of mineral nutrition and livestock production to offer animal health professionals a range of services.

NUVetNA has now grown from a blood basic trace element service to offer a much wider range of analysis. This includes mineral and iodine analysis of tissues, urine, water, grass, feed and forage, as well as plasma inorganic iodine and a range of blood energy, protein and liver metabolite packages.

These analyses provide results which give quality information about the mineral status of livestock and the feed, forage and even water inputs. Results are provided for animal health professionals to interpret on farm using the on-farm information including actually looking at the animals. Remote interpretation misses this key point. It allows informed treatment plans for the animal production cycle to be devised incorporating seasonal risk awareness and enabling proactive prevention of conditions rather than diagnosing them when production and profits have already suffered.

Whilst NUVetNA is a specialist laboratory analytical service, routinely analysing samples from cattle, sheep and goats, we also have experience in analysing samples from a much wider range of animals including deer, horses, llamas and alpacas, chicken and ducks and zoo animals.

As well as providing commercial analysis services, the laboratory also supports Dr Kendall's research group. The group have carried out work investigating the sample numbers required for nutritional analysis, the seasonality of trace elements in grazing and the liver mineral status of UK cattle and sheep. The mineral composition of trees, use of willow to supply cobalt requirements for weaned lambs and duration of effective selenium and cobalt supplementation from drenches have been amongst the more recent work. The relationship between the research and commercial analysis allows both to flourish and also informs the teaching of students at Nottingham. We are always open to supporting research and case studies of mutual interest that are to be published.





## Blood trace element and metabolite analysis

Blood trace element and metabolite analysis allows for routine monitoring of animal status to indicate when diet is not optimum and generally reveals and short to medium term imbalances. We offer a trace element package, with and without plasma inorganic iodine, which analyses the nutritionally relevant minerals, as well as a wide range of other options for assessing nutritional status.

### Trace elements

Tests included in the trace element package are:

**Copper status:** plasma copper concentration (PICu), erythrocyte superoxide dismutase activity (SOD) serum caeruloplasmin activity (CP) and CP:PICu ratio

**Selenium status:** plasma selenium (PISe) and erythrocyte glutathione peroxidase activity (GSHPx)

**Other minerals:** plasma zinc (PIZn) and plasma cobalt (PICo)

**General haematology parameters:** haemoglobin concentration (Hgb) and packed cell volume/haematocrit (HCT)

Additional:

**Iodine supply:** Plasma Inorganic Iodine concentration (PII)

### Plasma Inorganic Iodine (PII)

Test included:

**Plasma Inorganic Iodine concentration**

Samples can be run individually (recommended) or as a pool. If pooling is required, clear pooling instructions need to be provided and there will be an additional pooling charge.

### Vitamin B12

Test included:

**Vitamin B12 concentration**

### Energy

Tests included in the energy package are:

**NEFA, BHB, Urea.**

### Protein

Tests included in the protein package are:

**Urea, Total Protein, Albumin and Globulin (by difference).**



### Combined energy and protein

Tests included in the combined energy and protein package are:

**NEFA, BHB, Urea, Total Protein, Albumin and Globulin (by difference).**

### Liver function

Tests included in the liver function package are:

**GGT, AST, GLDH, T-bilirubin.**

### Individual analytes

Individual analytes can be requested singly or added to the above packages.


Analytes include:

**NEFA, GLDH, CK, T-Bilirubin, Na, K, Total Protein, Albumin, Urea, AST, GGT, ALP, ALT, Ca, Mg, inorganic P, Cl, Glucose, Creatinine, BHB.**

***Note: Other analytes may be available upon request***

## Tissue mineral and iodine analysis

### Tissue mineral analysis



Tissue minerals are a good indicator of long-term status and can be especially useful for monitoring accumulation, which is potentially harmful for the animal. Tissue mineral analysis is primarily used as a herd-monitoring tool. Although primarily we analyse liver tissue for this purpose, we can also analyse a wide range of other tissues. Contact us with sample queries.

Elements included in the tissue mineral package are:

**Cu, Mn, Se and Co.**

***Note: Other elements are analysed and can be added to the package on request (e.g. Pb, As, Mo, Zn and Fe). These are charged per request, not per element.***

### Thyroid iodine analysis

The thyroid actively stores iodine and therefore thyroid tissue iodine analysis can be used as an indicator of iodine status. We can also analyse iodine in other tissues, however, not as much is known about required levels in other tissues so guidance will be limited.

Elements included in the thyroid iodine package are:

**Iodine**



## Urine analysis

Urine iodine gives an indication of dietary iodine supply similar to plasma inorganic iodine.

Measuring macro-minerals in urine is much more useful in indicating dietary excess (as they increase in urine) or dietary deficiency (as urine levels will be low as the animals try to retain the consumed minerals). Urine macro-minerals also allow you to establish or monitor Dietary Cation Anion Balance (DCAB).

Elements included in the urine macro-mineral package are:

**Ca, Mg, P, Na, K, Cl.**

Elements included in the urine iodine package are:

**Iodine**

***Please note:** As urine sampling can be tricky in sheep, a harness collection technique has been developed. Please contact us for advice and instructions.*

## Water analysis

Water is often a forgotten nutrient but is a major dietary component and so should always be considered when looking at mineral intake, especially if the source is not from a mains supply.

Elements included in the multi-mineral package are:

**Ca, Mg, P, Na, K, Cl, S, Al, Fe, Mo, Pb, Mn, Zn, Cu, Co, Se, Cd**

Elements included in the iodine package are:

**Iodine**



## Grass, forage and feed analysis

Analysing water, grass, forage and feed is essential for monitoring mineral intakes and calculating inputs for dietary formulations.

### Grass, forage and feed:

Elements included in the multi-mineral package are:

**Ca, Mg, P, Na, K, Cl, S, Al, Fe, Mo, Pb, Mn, Zn, Cu, Co, Se, Cd**

Elements included in the iodine package are:

**Iodine**

## DMS – NUVetNA collaborative forage/feedstuff analysis service

### Why?

Both laboratories run and have specialist areas, DMS could only offer a limited mineral analysis, whilst NUVetNA could not offer the macronutrient content (Energy, Protein, Fibre)

### How?

The combined service will have samples submitted to DMS at DMS, Main Site, Dalton, Thirsk, North Yorkshire YO7 3JA. DMS will receive the samples and carry out the receipt process and then send an aliquot of the samples onto NUVetNA for mineral analysis whilst retaining an aliquot carry out the requested macro nutrient options.

Results will be issued separately from both labs. However, invoicing will be carried out via DMS who will then settle with NUVetNA. For invoicing queries please contact DMS, whilst for analysis/results queries please contact the relevant lab for the analysis part. It is likely that the mineral results will be after the macronutrient results.

### The options

There are 3 options for the macronutrients and 2 mineral options:

**FORAGE-NIR** -this will be the cheaper option as it relies on previous calibrations so is appropriate for common sample matrixes such as grass, silage, whole crop and Hay. It will give results for a comprehensive list of tests, please email [info@dmscientific.co.uk](mailto:info@dmscientific.co.uk) for more information. **NIR 1** (DM, CP, ADF, NDF, Fat, Starch, TDN, ME)

**NIR Plus** (NDF Digestibility, 30hr, 120hr, 240hr, Fatty acids, VFA, Lactic acid) Example reports available on request.

**Wet Chemistry** – this is the ‘back to basics’ approach and is ideal for non-standard feedstuffs/forages. It will give results for Protein, ME, Fibre, NDF – email [info@dmscientific.co.uk](mailto:info@dmscientific.co.uk) for more information. List of UKAS accredited tests available upon request.

**Multi-mineral** – This reports an array of mineral concentrations (Ca, Mg, P, Na, K, Cl, S, Al, Fe, Mo, Pb, Mn, Zn, Cu, Co, Se, Cd).

**Iodine** – This reports the iodine concentration.

**Postal bags and sample bags available upon request from [info@dmscientific.co.uk](mailto:info@dmscientific.co.uk).**





## Trial services

We are always open to supporting case studies of mutual interest that are to be published.

The laboratory will carry out analytical and statistical support for studies as well as advising on study design. We may also be able to carry out certain studies on a contract basis.



## Sampling hints and tips

1. It is important that the correct type of tubes are used for each test/profile. Using the wrong type of tubes may affect the results/interpretation of the test. Please contact the lab if you are unsure of what is required.
2. Urine samples from sheep can be tricky and we can offer advice and guidance to help you take appropriate samples.
3. One of the best ways to monitor herd status in through analysis of abattoir recovered samples or even casualty culls. These will give a good indication of the general status of the herd/flock.
4. For grass/forage/feed 50-100g is required, however, larger amounts can be subsampled in the lab.
5. Make sure grass samples are representative of the grazing of the field. Take multiple small samples at regular intervals avoiding areas of faecal spoil or urine contamination and not too close to troughs, gates or hedges.
6. For conserved forage, try to make the sample as representative as possible. Avoid taking only one sample from one place on the clamp face. Try digging into bales in a few places or across a number of bales.
7. Tissue mineral analysis can **NOT** be run on fixed samples. Samples can be sent fresh or frozen. Freezing samples is ideal if sending of samples is delayed for any reason, such as an impending bank holiday weekend.



## Frequently asked questions

### Lab closure over holiday periods

Due to the University closing over holiday periods, the lab is closed each year for 2 weeks over Christmas, from a couple days before Christmas until usually the first Tuesday in the New Year, and over Easter, from good Friday until the following Wednesday. Please contact the lab for exact timings of when we are able to receive samples and when the batches will be run around these periods each year.

### Batch analysis

Blood services are run on a batch system of analysis, which takes place **every fortnight**. All other services are run on a **weekly basis**. Results are reported 3-4 days after the commencement of the batch analysis. Please contact us if you wish to know batch timings. This means that time from receipt of samples to sending of results is likely to vary from 3 to 19 days, dependent on sample arrival and batch times.

### Sample submission

Please submit the samples using the submission proforma supplied. If you do not have one then please e-mail [NUVetNA@Nottingham.ac.uk](mailto:NUVetNA@Nottingham.ac.uk) and we will send you one or to download visit <http://www.nottingham.ac.uk/vet/nuvetna>.

Please make sure the submission proforma is filled in **fully and legibly**. This is crucial for us to be able to process your samples, send you results and bill you efficiently. Results may be delayed if we do not have the appropriate information.

### Will I get a written report?

No, the service is run on a non-interpretative basis, therefore there is no report written and results are sent as an PDF by e-mail. However, you will receive guideline values with your results to help with your interpretation. If you are still unsure of interpretation, then we may be able to direct you to appropriate professionals who can interpret results for you. However, we cannot control the terms and conditions of this or be held accountable for what they say.

### How should the samples be packaged and sent?

All packages **MUST** conform to current regulations for animal samples (either UN 3373 category B infectious material or Exempt animal specimen – non-hazardous) and be packaged according to IATA P650 for transport. They must either be labelled as 'Biological specimen' and have the UN3373 label or be labelled as 'Exempt animal specimen – non-hazardous'. The sending and packaging regulations are summarised on the next page.

Samples should reach the laboratory within 48 hours of dispatch, ideally within 24 hours. We recommend that you use guaranteed next day delivery services. Blood samples over 7 days old will not be viable for processing and hence **will not be processed**.

**Please note: Incorrectly labelled and packaged samples can cause an increased health and safety risk for staff, and we reserve the right to refuse to process these samples.**



## Summary of packaging instructions (P650)

All samples sent to the lab must adhere to regulations for packaging of biological substances.

(for full information on the regulations see <https://www.un3373.com/category-biological-substances/category-b/>)

In short, the packaging must consist of three components:

- (a) a primary receptacle(s);
  - (b) a secondary packaging; and
  - (c) outer packaging, with cushioning, suitable to prevent damage.
- The primary receptacle (ie blood tubes or sample pots) should be well sealed and able to withstand transport without leaking.
  - Absorbent material should be used to separate and surround the primary receptacles, so that are not touching, and be sufficient to absorb the full contents if the primary receptacle is broken.
  - The wrapped primary receptacles should then be sealed into a secondary packaging, in such a way that they cannot break, be punctured or leak.
  - If using ice packs in your parcel, please make sure they are not directly touching blood tubes (this can increase haemolysis). Also, we recommend **not** using gel based cold packs as these can be punctured in transit which may compromise the samples, submission forms or outer packaging.
  - The completed submission form should be included in a separate bag (in case of leakage).
  - Secondary packaging should be secured in a rigid outer packaging with suitable cushioning, to prevent damage, and the outer packaging **must** be labelled as 'Biological specimen' and have a UN3373 label or a statement of "Exempt animal specimen – non-hazardous", depending on your clinical judgement as to the likelihood that pathogens are present.



## Price list

**Please note: all prices are ex-VAT. If you have any queries about sampling requirements, prices or require quotes for larger sample sets, then please contact the lab.**

### Blood services

Individual analytes can be added to packages or performed separately.

**Please note:**

Multiple tests can be run on a single sample, and it is not necessary to send a separate sample for additional tests, unless it is a small volume.

We prefer not use SST (serum separator gel) tubes as they can cause problems for some tests.

**Please do not pre-separate samples before submitting unless you have previously contacted us for advice.**

Base Profiles	Cost per animal 1-3	Cost per animal 4-6	Cost per animal 7+	Sample requirements
Trace elements (Cu status, Se status, Zn, Co, Hgb and Hct) With individual Plasma Inorganic Iodine (PII)	£55 £66	£40 £51	£37 £48	Heparin <b>whole blood and Serum</b>
Plasma Inorganic Iodine (PII) Pooled PII (per pool)	£32 £38	£25 £31	£23 £29	Serum or Heparin

Extras (can be added to a base profile or run separately)	Cost per test	Sample requirements
Pooled PII (Add on to trace element package)	£24 per pool	
Vitamin B12	£14	Serum or Heparin
Energy (NEFA, BHB, urea)	£9	Serum
Protein (urea, total protein, albumin, globulin by difference)	£6.50	Serum
Combined energy and protein	£15	Serum
Liver function (AST, GGT, GLDH, T-bilirubin)	£10.50	Serum
Individual analyte: NEFA	£6	Serum
Individual analytes: Tier 1 GLDH, CK, T-bilirubin, Na, K	£3.50 ea	Serum
Individual analytes: Tier 2 Total protein, albumin, Urea, AST, GGT, ALP, ALT, Ca, Mg, inorg P, Cl, glucose, creatinine, BHB	£2.50 ea	Serum (Fluoride for glucose)
* Additional ICP elements (e.g. Fe, Mn, Pb, Na, K, Ca, Mg, total phos,)	£2.50 per request	Heparin

*\* Note: these can only be added to a trace element package. Other elements may be available. Please contact us for more details.*



## Tissue mineral and thyroid iodine analysis

**Analysis can only be carried out on fresh or frozen tissue (NOT fixed).** Samples may be frozen prior to dispatch.

Analysis can be run in singleton or duplicate. Singleton analysis is appropriate where there is sufficient biological replication from the number of animals analysed and where results are to be used on a herd basis. For individual or small group numbers (<4 per management group) then duplicated analysis is recommended. **If you do not indicate a preference, we will run duplicate analysis for sample numbers less than 4.** Both types of analysis and replicates can be run from 1 sample if there is sufficient sample. Please note: a biopsy sample is only sufficient for 1 replicate of 1 type of analysis.

Package	Cost per animal 1-3	Cost per animal 4-6	Cost per animal 7+	Sample Requirements
Multi-mineral – singleton	£50	£35	£32	Minimum of 0.6g (ideally around 1g) of biopsied tissue or 5-50g of slaughter recovered/trauma cull tissue
Multi-mineral – duplicate	£62	£47	£44	
Additional elements	£2.50 per request			
Iodine – single	£51	£36	£33	
Iodine – duplicate	£64	£49	£46	

## Urine analysis

Samples may be frozen before dispatch. Both types of analysis and replicates can be run from 1 sample if there is sufficient sample. Singleton analysis is appropriate where there is sufficient biological replication from the number of animals analysed and where results are to be used on a herd basis. For individual or small group numbers (<4 per management group) then duplicated analysis is recommended. Creatinine standardised results are supplied to take account of differential dilutions found in different urine samples.

Package	Cost per animal 1-3	Cost per animal 4-6	Cost per animal 7+	Sample Requirements
Macro-mineral – singleton	£26	£19	£17	~ 5ml of urine
Macro-mineral – duplicate	£39	£32	£30	
Additional elements	£2.50 per request			
Iodine – single	£27	£20	£18	
Iodine – duplicate	£41	£34	£32	
Combined minerals / iodine (s)	£42	£35	£33	
Combined minerals / iodine (d)	£69	£62	£60	



## Water analysis

Samples may be frozen before dispatch. Both types of analysis and replicates can be run from 1 sample if there is sufficient sample. Singleton analysis is appropriate where there is sufficient biological replication from the number of animals analysed and where results are to be used on a herd basis. For individual or small group numbers (<4 per management group) then duplicated analysis is recommended.

Package	Cost per sample 1-3	Cost per sample 4-6	Cost per sample 7+	Sample Requirements
<b>Multi-mineral – singleton</b>	£25	£18	£16	~50ml of water taken into a clean tube mid flow
<b>Multi-mineral – duplicate</b>	£37	£30	£28	
<b>Additional elements</b>	£2.50 per request			
<b>Iodine – single</b>	£26	£19	£17	
<b>Iodine – duplicate</b>	£39	£32	£29	
<b>Combined minerals / iodine (s)</b>	£40	£33	£32	
<b>Combined minerals / iodine (d)</b>	£65	£58	£57	

## Grass, forage and feed analysis

Prices for the 2 types of grass, forage and feed analysis are shown below. For multi-mineral and iodine packages only, please submit samples to NUVetNA as before. For DMS combined macronutrient and multi-mineral packages, please submit samples to DMS using the address below.

Samples may be frozen prior to dispatch to allow for batching for analysis. Please use gloves when collecting the samples to avoid contamination. Analysis can be run in singleton or duplicate. Both types of analysis and replicates can be run from 1 sample if there is sufficient sample. Singleton analysis is appropriate where there is sufficient biological replication eg a number of similar fields/areas (>4), otherwise we recommend duplicate analysis. **If you do not indicate a preference, we will run duplicate analysis for sample numbers less than 4.**

Multi-mineral and iodine packages	Cost per sample	Sample Requirements
<b>Multi-mineral – singleton</b>	£45	50-100g of fresh/frozen material
<b>Multi-mineral – duplicate</b>	£70	
<b>Iodine – single</b>	£50	
<b>Iodine – duplicate</b>	£75	
<b>Multi-mineral and iodine - single</b>	£90	
<b>Multi-minerals and iodine - duplicate</b>	£120	

DMS joint Package	Cost per sample (Ex VAT)	Sample Requirements
<b>Submission fee: £10</b>		Submit 200-300g directly to DMS who will process and send on to NUVetNA
<b>NIR1 (Basic NIR)</b>	£19.99	
<b>NIR Plus (basic + NDF Digestibility etc)</b>	£31.65	
<b>Wet Chem (email <a href="mailto:info@dmscientific.co.uk">info@dmscientific.co.uk</a>)</b>		<b>Submit samples to DMS, Main Site, Dalton, Thirsk, North Yorkshire YO7 3JA.</b>
<b>Multi-mineral – singleton</b>	£40	
<b>Multi-mineral – duplicate</b>	£65	
<b>Iodine – single</b>	£45	
<b>Iodine – duplicate</b>	£70	
<b>Multi-mineral and iodine - single</b>	£85	
<b>Multi-minerals and iodine duplicate</b>	£115	



# Submission Form Blood and Urine

<p><b>Practice Details</b>          Veterinary Surgeon:          Vet mobile:          Practice Name:          Practice Address (for invoicing):</p> <p>Post Code:          Practice Tel Number:</p> <p>Email Addresses (<b>For Results</b>):</p>	<p><b>Sample Information</b>          Farm ID:</p> <p>Species: bovine/ ovine/ other (please state):</p> <p>Sample type: blood/ urine</p> <p>Sampling date:</p> <p>Posting date:</p>
--	---

Select analytical tests required using ✓ For any individual variations, please state in the boxes below.

Base profiles	
	Trace elements
	Trace elements + PII
	Pooled PII
	Individual PII
	Vitamin B12
	Energy (NEFA, BHB, Urea)
	Protein (Urea, Tp, Alb, T-bil)
	Combined energy and protein
	Liver function (GGT, GLDH, AST, T-bil)

Blood analysis: Individual analytes (in addition to selected package)			
	total protein	GGT	Na
	albumin	AST	K
	urea	GLDH	Cl
	NEFA	T-bil	Ca
	BHB	ALP	Mg
	glucose	ALT	inorg P
	creatinine	CK	

Urine	
	Macro-minerals - singleton
	Macro-minerals - duplicate
	Iodine - singleton
	Iodine - duplicate

**Note:** additional icp element requests should be included in the individual variations column below.  
 Tube requirements for the tests can be found in the service details booklet.

Sample ID	Individual variations	notes	Lab use only
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

For additional samples, please add on the back of the submission form

<p><b>Lab use only</b>          Laboratory reference: _____          Received date: _____ Processed date: _____ Initial _____</p>
---



## Submission Form

### Tissue, Grass, Feed and Water

<p><b>Practice Details</b>          Veterinary Surgeon:          Vet mobile:          Practice Name:          Practice Address (for invoicing):</p> <p>Post Code:          Practice Tel Number:</p> <p>Email Addresses (<b>For Results</b>):</p>	<p><b>Sample Information</b>          Farm ID:</p> <p>Sample type: tissue/ grass/ feed/ water/ other</p> <p>Tissue type and species:</p> <p>Sampling date:</p> <p>Posting date:</p>
--	---

Select analytical tests required using ✓ For any individual variations, please state in the boxes below.

Singleton	Duplicate	Sample type	Analysis
		Tissue	Multimineral
		Tissue	Iodine

Singleton	Duplicate	Sample type	Analysis
		Water	Multimineral
		Water	Iodine

Singleton	Duplicate	Sample type	Analysis
		Grass/Forage/Feed	Multimineral
		Grass/Forage/Feed	Iodine

**Please note:** we advise running analysis in duplicate where the number of a sample type is less than 4, and singleton where there are 4 or more.

**If submitting multiple tissue types, please specify below the type of test required for each tissue.**

**Please make sure to state the species type for tissues for guideline ranges.**

Sample ID	Individual Tissue/Sample type	notes	Lab use only
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

For additional samples, please add on the back of the submission form

<p><b>Lab use only</b>          Laboratory reference: _____          Received date: _____ Processed date: _____ Initial _____</p>
---