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CHANGES IN THIS VERSION

10.0 – Major update to reflect switch to Lithium Heparin Gel Green Tops as the required sample bottle type for most routine biochemistry tests.

Update to test bottles; Removal of reference to Consultant Chemical Pathologist, additional test protocols added, Plasma Potassium reference interval added, COVID antibodies sent to Belfast, UKAS - Gen6 Statement added and update to UKAS accreditation status for cryoglobulin, porphyrin, sweat and SPE. Sample bottle type for methanol, methotrexate and ethylene glycol, laxative screen – referral laboratory.

This document represents the Clinical Biochemistry Laboratory User Manual of the Western Health & Social Care Trust Laboratory. All procedures contained herein are mandatory.

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WHSCT CLINICAL BIOCHEMISTRY

Laboratory Users' Manual Version 10.0

NOTE THIS VERSION REFLECTS THE SWITCH TO **LiHEP GREEN TOP GEL AS THE SAMPLE BOTTLE OF CHOICE FOR MOST ROUTINE CLINICAL BIOCHEMISTRY TESTS. THIS SWITCH HAS BEEN MANDATED BY THE NI PATHOLOGY NETWORK SPECIALITY FORUM FOR CLINICAL BIOCHEMISTRY AND BRINGS THE WHSCT IN LINE WITH THE REST OF THE REGION**

A UKAS accredited medical laboratory No. 9684

The Schedule of Accreditation (i.e. list of accredited tests) can be found on the UKAS website:
<https://www.ukas.com/search-accredited-organisations/>

WHsCT Laboratory Services utilises the LabCentre (Cellular Pathology) and BSO (Clinical Biochemistry, Haematology & Transfusion and Microbiology) Laboratory Information Management Systems (LIMS). Due to the limitations of this software, we are currently unable to meet the requirements of UKAS publication GEN6 – Reference to accreditation and multilateral recognition signatory status.

GEN6 sets out the requirements of our Laboratory examination reports/results released by the laboratory containing the appropriate use of UKAS logos and identifying any tests that are accredited and those that are not.

The LIMS systems currently utilised within Laboratory Services do not allow us to present the UKAS logo within our reports. Whilst it is possible to enter a small amount of additional text without any difference in formatting at the end of each report, the referencing to the accreditation of tests could potentially interfere

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or cause the misinterpretation of pathology results. Where possible the Laboratory will include a statement in the body of the report if a test used is out of our scope of accreditation.

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CLINICAL BIOCHEMISTRY LABORATORY

Introduction

Each request submitted and accepted by the Clinical Biochemistry laboratory for examination is considered a Service Level Agreement. The Laboratory will endeavor to provide a suitable medical laboratory service for each request to ensure appropriate examination and result interpretation in line with BS EN ISO 15189:2012 Medical laboratories – Requirements for quality and competence.

Location

The WHSCT Clinical Biochemistry Laboratory is located on two sites – The South West Acute Hospital (SWAH) in Enniskillen and the Altnagelvin Hospital in Londonderry. Both laboratory sites include a 24h emergency service. The Clinical Biochemistry Laboratory in Altnagelvin is located on Floor G0 of the Laboratory & Pharmacy Services Centre. The Clinical Biochemistry Laboratory in the SWAH address is: is located in the Laboratory section on Floor -1 near the A&E department.

The Clinical Biochemistry Laboratory in Altnagelvin address is:

Department of Clinical Biochemistry
Western Health Social Care Trust
The Laboratory Building
Altnagelvin Area Hospital site
Glenshane Road
Londonderry
BT47 6SB

The Clinical Biochemistry Laboratory in SWAH address is:

Department of Clinical Biochemistry Laboratory
South West Acute Hospital
Irvinestown Road
Enniskillen
BT74 4RT

Laboratory Hours

Altnagelvin Laboratory Hours


- (a) Monday to Friday 9.00am - 5.15pm
- (b) Saturday 9.00am - 12.00noon
- (c) All other times (including Bank Holidays) a 24h emergency service is available.

SWAH Laboratory Hours

- (a) Monday to Friday 08.55am - 5.00pm
- (b) Saturday 9.00am - 12.00noon
- (c) All other times (including Bank Holidays) a 24h emergency service is available.

Clinical Services

For advice on test selection / interpretation contact the Consultant Staff.

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Laboratory Contact Details

Telephone Numbers

Altnagelvin Hospital	02871 345171	
SWAH Hospital	02866 382000	
Laboratory Reception/Results/Enquiries	Altnagelvin	Ext 213796 / 7 / 8
	SWAH	Ext 252301 / 252284
		Vocera
Clinical Biochemistry Laboratory	Altnagelvin	Ext 213961
	SWAH	Ext 252275
Clinical Biochemistry Secretary	Altnagelvin	Ext 213804
Dr Mark Lynch Consultant Clinical Scientist [Head of Department]	Altnagelvin	Ext 213806
Mrs Veronica Moore Lead BMS	Altnagelvin	Ext 213808
	SWAH	Ext 252282
Mrs Mary Burns BMS SWAH	SWAH	Ext 252283
Laboratory Fax Number	Altnagelvin	02871 611186
	SWAH	02866382660

The Clinical Biochemistry Laboratory welcomes feedback from health care professionals and patients on ways to improve the service.

Please contact any member of the laboratory team above.

Arranging clinically urgent samples

Emergencies from within Hospital site:

During normal working hours:

The laboratory **must** be telephoned about **all** emergency requests during the day.

The request form should be labeled “**Urgent**” to allow the specimen to be identified by laboratory staff.

Outside normal working hours:

On Call staff must be telephoned or bleeped to arrange all emergency work before the specimen is sent.

Emergencies from GPs and other non hospital site requestors:

During normal working hours:

GP/requestor **must** contact Clinical Biochemistry Laboratory, by telephone, to inform us that an urgent sample, requiring the results to be telephoned back, is being sent. Details of transport and approximate time of delivery to lab **must** be given.

The specimen and request form **must** be sent in an envelope to distinguish it from other routine requests.

The envelope **must** be clearly marked URGENT BIOCHEMISTRY.

The accompanying request form **must** have the name and telephone number of the person to be contacted with the results.

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If sample is to be received in late afternoon details of who to contact if Health Centre closed when results are available should also be given.

Request Forms/Specimen Information and Minimum Acceptance Criteria

All request forms and samples must be clearly identified with a set of mandatory matching identifiers. Where possible printed labels should be used on both form and sample.

Note: From 31st August 2023 the Clinical Biochemistry will strictly enforce the NI Pathology Network Minimum Acceptance Criteria (MAC) Policy for the information provided on Request form and Sample bottles for all sample requests.

Table 1 NI Pathology Network Minimum Acceptance Criteria

Mandatory Laboratory Request Minimum Acceptance Criteria [MAC]

A. MANDATORY INFORMATION ON LABORATORY REQUEST FORM						
Request Form	Blood Transfusion	Blood Science: Haematology and Clinical Biochemistry			Microbiology	Cellular Pathology: Cytology and Histology
Unique identifier Number ¹	YES	YES	YES	YES	YES	YES
Patient Official First Name	YES	YES	YES	YES	YES	YES
Surname	YES	YES	YES	YES	YES	YES
Sex	YES	YES	YES	YES	YES	YES
Date of Birth (DD/MM/YYYY)	YES	YES	YES	YES	YES	YES
Date and Time of Sample Collection	YES	YES	YES	YES	YES	YES
Requestor Name/Code	YES	YES	YES	YES	YES	YES
Source (Ward/Clinic /GP)	YES	YES	YES	YES	YES	YES
Investigation (test) Required	YES	YES	YES	YES	YES	YES
Signature/Name of staff member taking the sample	YES	NO	NO	NO	NO	YES
Anatomical Site and Specimen type	NO	NO	NO	NO	YES	YES

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B. MANDATORY INFORMATION ON SAMPLE LABEL

Sample Label	Blood Transfusion ²	Blood Science: Haematology and Clinical Biochemistry			Microbiology	Cellular Pathology: Cytology and Histology ³
Unique identifier Number ¹	YES	YES	YES	YES	YES	YES
Patient Official First Name	YES	YES	YES	YES	YES	YES
Surname	YES	YES	YES	YES	YES	YES
Sex	YES	NO	NO	NO	NO	NO
Date of Birth (DD/MM/YYYY)	YES	YES	YES	YES	YES	YES
Date and Time of Sample Collection	YES	YES	YES	YES	NO	NO
Signature/Name of staff member taking the sample	YES	NO	NO	NO	NO	NO

¹The Health & Care Number must be used unless the patient is not registered with a General Practitioner in Northern Ireland (then use the local hospital numbering system) OR in an emergency situation; use the local hospital EMERGENCY numbering system.

²Note: **All** details on the Blood Transfusion Specimen Bottle must be handwritten.

³Slides sent to Cellular Pathology **MUST** be labelled in pencil. Please ensure that the patient's full name and unique identifier Number ¹ are clearly written on each slide.

Note: Requests missing mandatory identifiers will be rejected

Specimen rejection criteria

The following requests/samples will be rejected by the Laboratory and a problem report will be issued:

- Illegible Requests
- Requests missing mandatory identifiers
- Request form and sample mismatches
- Samples collected into an incorrect sample bottle type
- Samples too old for analysis
- Samples not collected or transported under appropriate conditions
- Urine samples not received in urine Monovette tubes

Specimens from Infectious Patients

All specimens from known or potential carriers of Category III pathogens, e.g. HIV, Hepatitis B, **MUST** be clearly marked with hazard labels on both the request form and specimen tubes.

Only one "Hazard" specimen should be sent per plastic bag.

Such samples MUST NOT BE SENT VIA VTS CHUTE

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Specimen Tubes /Containers

It is essential that the specimen is collected into the correct container to ensure accurate results. The following tubes are used:

Blood

Heparin Gel Tubes: Plastic tubes with **Green tops** containing a gel separator containing heparin for plasma samples.

Gel Tubes: Plastic tubes with **Yellow tops** containing a gel separator for clotted specimens also known as SST (serum separator tubes).

Glucose Tubes: Plastic tubes with **Grey tops** containing Sodium Fluoride and Potassium oxalate.

Clotted Tubes: Plastic tubes with **Red tops** for clotted samples.

Heparinised Syringes: Plastic Syringes coated with heparin (**Needle must NOT be left on syringe**)

EDTA Tubes: Plastic tubes with **Purple tops** containing potassium EDTA.

Paediatric samples: **Small Heparinised** tubes (**Green top**) available via Supplies. When filled tube should be inserted securely into a 4mL Heparin Vacuette plastic tube and the identification label attached to this.

Small Glucose tubes (**grey top**) available from Lab Reception.

Small Serum tubes (**red top**) available from Lab Reception.

Note: As per manufacturer's recommendations --Immediately following blood collection all green, yellow, red, purple and grey topped tubes **MUST** be gently inverted (*Turn the filled tube upside-down and return to upright position*) EIGHT times before sending to Lab. Such inversion assures a proper mix of additive and blood.

In addition:

- Do not remove lids from Tubes – see below.
- Do not shake the tubes. Vigorous mixing may cause foaming or haemolysis.
- In tubes with anticoagulants (green, purple and grey tops), inadequate mixing may result in platelet clumping, clotting and/or incorrect test results.
- Insufficient mixing or delayed mixing in serum tubes (red and yellow tops) may result in delayed clotting.

Always use the correct order of draw and mix samples carefully:

- Blood Culture
- Coagulation (blue top)
- Serum (red / yellow top)
- Heparin (green top)
- EDTA (purple top)
- Glucose (grey top)

See WHSCT Tube guide and order of draw:



Western Health
Social Care - VACUE

VACUETTE® SELECTION CHART

Western Health and Social Care Trust

Version 2.0. Last updated 12.03.2024

Samples to be collected in the following ORDER OF DRAW as required:

	PPC code	GBO code	Draw Vol.	Cap Colour	Tube Type	Tests [BIOCHEMISTRY tests marked with * are run in WHSCT]	
1	KBC0000651 +A2-A10 C000151 +A2-A10	454334	3 mL	Blue	Sodium Citrate	HAEMATOLOGY TESTS: Coagulation Screen, INR, D-Dimer/ XDP, Thrombophilia Screen, Lupus Anticoagulant, Factor assays.	Invert 4-5 times
2	KBC0000339	454204	4 mL	Red	Serum	HAEMATOLOGY TESTS: Cold Agglutinin. BIOCHEMISTRY TESTS: Androstenedione, 17-Hydroxyprogesterone.	Invert 8-10 times
3	KBC000141	454228	3.5 mL	Yellow	Serum Gel	HAEMATOLOGY TESTS: Paul-Bunnell. BIOCHEMISTRY TESTS: Proteins: Serum Protein Electrophoresis* (SPE) [inc. Alb & TP], Immunoglobulins* (IgG, IgA, IgM), Serum free light chains* (FLC), Oligoclonal bands (with paired CSF), IgG subclasses (inc IgG4) ALP Isoenzymes, CK Isoenzymes, Alpha-1-Antitrypsin (AAT), Beta-2-Microglobulin (B2M), Ceruloplasmin, C3*, C4*, Haptoglobin*, Rheumatoid factor* (RF). Vitamins: Vit D (Total), Vit A, Vit E (protect from light). General Biochemistry: Lithium*, COVID Antibodies. Bone Markers: Crosslaps (CTX), Ostease, Total PINP. Specialist Endocrine: Anti-Mullerian Hormone (AMH), Thyroglobulin & Thyroglobulin Antibody, P3NP. MICROBIOLOGY TESTS: ASOT, Bloods for Virus Reference Lab, Antibody Screen for Reference Lab.	Invert 8-10 times
4	KBC000218	454247	3 mL	Green	Li Hep Gel	BIOCHEMISTRY TESTS: General Biochemistry Profiles: ELEC*: Na, K, Cl, Bicarbonate (CO2), Urea, Creatinine (eGFR), Total Protein. LFT*: TBil, ALP, Alb, AST, ALT, GGT. BONE*: Ca, Adjusted Ca, PO4, Alb, ALP. LIPID*: Total Cholesterol, HDL, Triglycerides (LDL, TChol/HDL ratio, non-HDL Chol). IRON*: Iron, Ferritin, Transferrin (Transferrin sat%). THYROID*: TSH, FT4, (+ FT3 when required) B12 & FOLATE*: Vit B12, Folate. Other: ACE, Amylase*, CK*, Beta-hCG*, DBIL*, CRP*, Ethanol*, LDH*, Lipase, Magnesium*, Paracetamol*, Pro-BNP*, Salicylate*, Troponin-T*, Urate*, Osmolality*. TDM*: Carbamazepine, Digoxin, Phenytoin, Theophylline, Valproate. [NOTE: use yellow Top for Lithium] Antibiotics: Amikacin, Gentamicin*, Tobramycin, Vancomycin*, Teicoplanin. Tumour Markers: AFP, CA19-9, CA-125, CEA, PSA* Endocrine: Anti-TPO, Cortisol*, DHEAS, FSH, LH, Oestradiol, Progesterone, Prolactin, SHBG, Testosterone, Calcitonin [On ice & received in lab within 4h], Growth Hormone (GH), IGF-1, Insulin [inc. Hypopak], C-peptide [Received in lab within 4h]. Misc: CarboxyHb* and MethHb*, Vit C (On ice & protect from light), Bile Acids (Analysed at UH Lab, SEHSCT), Amino Acids, Hydroxybutyrate*.	Invert 8-10 times
5	KBC000148	454021	4 mL	Lavender	K3 EDTA	HAEMATOLOGY TESTS: Full Blood Count, Retics, ESR, Maternal sample for Kleihauers. BIOCHEMISTRY TESTS: Ammonia* (on ice), HbA1c*, Homocysteine (on ice), Porphyrins (Protect from light). Specialist Endocrine: ACTH [On ice & must be received in lab within 30min], Aldosterone, Renin [Must be received in lab within 3h], PTH* [Must be received in lab within 12h]. Immunosuppressants: Cyclosporine, Everolimus, Sirolimus, Tacrolimus. Peptides: Gut Hormones (CgA, Neurokinin A, Gastrin, Glucagon, Pancreatic Polypeptide, Vasoactive Intestinal Peptide, Somatostatin) [4x4 mL bottles needed for full profile. On ice and received in lab within 2h] MICROBIOLOGY TESTS: Meningococcal PCR Bloods and PCR bloods for reference labs. [For Paediatric PCR bloods smaller volume pink top EDTA tubes are acceptable]	Invert 8-10 times
6	KB0000152	455098	8 mL	Pink	Cross-match	HAEMATOLOGY TESTS: Group and Screen, Crossmatch, Direct Coombs, Cord sample for Kleihauers.	Invert 8-10 times
7	KBC000147	454221	2 mL	Grey	Na Fluoride EDTA	BIOCHEMISTRY TESTS: Glucose*, Lactate*, Hydroxybutyrate*. Specialist Toxicology: Methanol, Ethylene Glycol.	Invert 8-10 times
8	KBC000154	455090	8 mL	Dark Blue	Trace Elements	BIOCHEMISTRY TESTS: Tubes available from Biochemistry Lab. Note: A Separate sample is required for Plasma Metals and Blood Metals. Plasma Metals: Aluminium, Copper, Selenium, Zinc. Blood Metals: Lead, Manganese, Chromium, Cobalt, Mercury, Cadmium, Arsenic.	Invert 8-10 times

VAWH01 Greiner Bio-One Ltd. Tel: 01403 820295. Info-uk@gbo.com

SEE WHSCT Venous Blood Collection SOP on Trust Intranet.

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Urine

Urine – Monovette® (Sarstedt) 10mL **lemon top** tube for urine sample for Albumin Creatinine Ratio. Available as stock item NSV code KCP200 or Lab Reception. Also suitable for other urine and fluid specimens.

Universal Containers: CSF specimens – do not send urine or fluid samples in universal containers. **[Note: CSF samples for CSF Spectroscopy/Xanthochromia should be shielded from light]**

24h Urine Containers: For some tests, urine containers with specific preservatives must be obtained from the laboratory.

Faeces

Faecal Occult Blood Seracult Plus FOB Cards have been replaced by QFIT testing as per CC/MEMO/2021/06/29 – all samples now sent to Causeway Laboratory



QFIT
Introduction.doc

Some tests have specific collection and transport requirements which are described under the individual test name. If in doubt, please contact the laboratory before any sample is taken. Specimen tubes/containers for the Altnagelvin Site are available from Regional Supplies Service at Campsie, unless stated above. Specimen tubes/containers for the SWAH Site are available from the laboratory unless stated above.

Transport

Transport of samples to Clinical Biochemistry

Altnagelvin Hospital based samples:

VTS Chute system: Samples should be sent to the Clinical Biochemistry Laboratory Chute Station – number 880.

Please note the following exceptions:

- a) Blood Gas (pO₂ results are affected) [There are no blood gas analysers in Labs – use POCT]
- b) CSF (Resultant haemolysis may interfere with CSF spectroscopy and also CSF samples are not readily repeatable – see below).
- c) The VTS system is not 100% reliable. Occasionally pods sent via the VTS may be subject to delay, sent to an incorrect station or be diverted to an incorrect station so samples that are extremely urgent (e.g. Resus) not readily repeatable (e.g. CSF or samples taken following suppression or stimulation tests) or relatively unstable should not be sent via VTS

Hospital Porters: Samples (including those unsuitable for VTS transport) may be sent to the Clinical Biochemistry Laboratory via Porters or other Hospital Staff. Sample should be left in Laboratory Specimen Reception Area.

GP Samples: Samples are transported to Laboratory via the normal Laboratory Transport Vans, Taxi or delivered in person as appropriate.

Urgent Samples: Laboratory staff should be informed either before samples are sent or samples should be handed directly to laboratory staff - See **Emergencies** above.



SWAH Hospital based samples:

- VTS Chute system: Pods with Red Bands are automatically sent to the Laboratory Reception docking station.
Pods with Black Bands need to be programmed to “Laboratory Reception”
Please note the following exceptions:
- Blood Gas (pO₂ results are affected)) [There are no blood gas analysers in Labs – use POCT]
 - CSF (Resultant haemolysis may interfere with CSF spectroscopy and also CSF samples are not readily repeatable – see below).
 - The VTS system is not 100% reliable – see above.
- Hospital Porters: Samples (including those unsuitable for VTS transport) may be sent to the Clinical Biochemistry Laboratory via Porters or other Hospital Staff. Samples should be left in Laboratory Specimen Hatch – adjacent to the Blood Bank – please ring buzzer as appropriate.
- GP / TCH Samples: Samples are transported to Laboratory via the normal Laboratory Transport Vans, Taxi or delivered in person as appropriate.
- Urgent Samples: Laboratory staff should be informed before samples are sent or samples should be handed directly to laboratory staff - See **Emergencies** above.

Note: Samples should be transported at RT unless as otherwise indicated.

Transport of samples on ice to Clinical Biochemistry

Please keep the paper REQUEST FORM separate from the ice as these tend to get wet when the ice melts to water and leaks out!

The ice and sample should be separated from the paper REQUEST FORM and be fully sealed in a watertight container to prevent leakage.

Samples requiring transport on ice may be sent via the VTS but the ice and sample **MUST** be contained in special ward dedicated Green Plastic Screw-Topped Ice Transport containers.

Please do not place the Paper REQUEST FORM inside these containers

Table 2 Samples requiring transport on ice

Analyte	Sample	Tube Type	Maximum Stability on ice*
ACTH	Blood	Purple Top	15 min
Calcitonin	Blood	Green Top	240 min [120 min if not on ice]
Catecholamines**	Blood	Green Top	15 min
Glucagon	Blood	Purple Top	120 min
Homocysteine	Blood	Purple Top	30 min
Vitamin C***	Blood	Green Top	60 min
Ammonia	Blood	Purple Top	60 min
Peptides (Gastrin)	Blood	Purple Top	120 min

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PTH Related Peptide (PTHrp)	Blood	Special Bottle – contact Laboratory	15 min
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*From time of venepuncture. Samples must arrive in Biochemistry within this time period or the sample will be rejected as unsuitable.

** Only as part of Clonidine suppression test

***Shield from light

Note: There are other analytes that also require transport on ice but these are only very rarely required – contact lab for advice.

Clinical Biochemistry available tests

Clinical Biochemistry Profile Tests

One or more of the following profile test groups may be requested using a single 3mL **Green Top** gel blood tube specimen [LiHep gel tube].

Table 3 Clinical Biochemistry profiles

Profile	Test
Electrolyte Profile:	Na, K, Cl, Urea, Creatinine, Total CO ₂ , Total Protein, eGFR (4vMDRD).
Liver Profile:	Total Bilirubin, ALP, GGT, AST, ALT, Albumin.
Muscle Enzymes:	Total CK, AST.
Bone Profile:	Ca, Adjusted Calcium*, Albumin, ALP, Phosphate.
Cardiac Profile:	Troponin T
Lipid Profile:	Total Cholesterol, Triglycerides, HDL, HDL/Total Chol ratio, calculated LDL.
Iron Profile:	Plasma Iron, Ferritin, Transferrin, calculated % Transferrin Saturation.
Thyroid Profile	Free T4, TSH, Free T3 (If TSH is < 0.1)
B12 and Folate	B12 and Folate

Routine blood glucose must be sent in a Sodium Fluoride blood tube (**Grey Top**) with a separate form.

* Adjusted Calcium = In-house equation – contact Laboratory for details.

Any combination of the following routine **Clinical Biochemistry** tests may be requested using one request form and ONE 3mL specimen (**Green Top**)

Tests that do not have a tick box should be clearly written in the Additional Tests area of the request form.

Table 4 Clinical Biochemistry Blood tests that might be combined using one request form and using one specimen bottle

Test	Sample	Container	Comments
Alcohol (Ethanol)	Blood	3mL Green Top	Do not use alcohol wipes.
Amylase - plasma	Blood	3mL Green Top	
Bone Profile	Blood	3mL Green Top	ALP reference interval is age and sex related.
B12 and Folate	Blood	3mL Green Top	
CRP	Blood	3mL Green Top	
Calcium	Blood	3mL Green Top	
Carbamazepine/Tegretol	Blood	3mL Green Top	Separate form and sample required for SWAH
Cardiac Troponin	Blood	3mL Green Top	
Direct/Conjugated Bilirubin	Blood	3mL Green Top	
Digoxin	Blood	3mL Green Top	Specimen taken at least 6-8h after last oral dose.
Electrolyte Profile	Blood	3mL Green Top	
Hydroxybutyrate	Blood	3mL Green Top	Ketones
Iron Profile	Blood	3mL Green Top	Fasting sample preferred
LDH	Blood	3mL Green Top	
Lipid Profile	Blood	3mL Green Top	Specimen does not need collected fasting
Liver Profile	Blood	3mL Green Top	
Magnesium	Blood	3mL Green Top	
Muscle Enzymes	Blood	3mL Green Top	Total CK
Osmolality	Blood	3mL Green Top	
Paracetamol	Blood	3mL Green Top	
Phenobarbitone	Blood	3mL Green Top	Separate form and sample required for SWAH
Phenytoin	Blood	3mL Green Top	
PSA	Blood	3mL Green Top	
Salicylate	Blood	3mL Green Top	
Theophylline	Blood	3mL Green Top	
Thyroid Profile	Blood	3mL Green Top	
Urate	Blood	3mL Green Top	
Valproic Acid/Epilim	Blood	3mL Green Top	

Tests run in WHSCT that must be taken into Yellow Top – otherwise they will be rejected

Lithium	Blood	4.0mL Yellow Top	Green tops contain Li and are unsuitable
Haptoglobin	Blood	4.0mL Yellow Top	
Rheumatoid Factor, C3, C4	Blood	4.0mL Yellow Top	
C3, C4	Blood	4.0mL Yellow Top	
Immunoglobulins G, A, M	Blood	4.0mL Yellow Top	
Free Light chains	Blood	4.0mL Yellow Top	
Serum Protein Electrophoresis SPE	Blood	4.0mL Yellow Top	

Tests run in BHSCT that must be taken into Yellow Top – otherwise they will be rejected

Vitamin D	Blood	4.0mL Yellow Top	
Vitamin A and E	Blood	4.0mL Yellow Top	Shield from light
Bone markers	Blood	4.0mL Yellow Top	
Ceruloplasmin	Blood	4.0mL Yellow Top	
Regional Immunology Tests	Blood	4.0mL Yellow Top	Most immunology Antibody tests – see Regional Immunology Lab User Manual

Not all tests listed – see alphabetical list below for full details

Separate **form(s)** and **specimen(s)** **MUST** be sent for each of the following tests.

These must not be requested with the routine tests outlined above.

Table 5 Clinical Biochemistry tests that require separate form and specimen bottle

Test	Sample	Container	Comments
Glucose - plasma	Blood	2mL Grey Top	Glucose is only stable in grey top sample.
Glucose Tolerance Test	Blood	2 x 2mL Grey Top	Both T=0 and T=120min labeled samples should be sent together with ONE form.
NT-ProBNP	Blood	3mL Green Top	
Glycated Haemoglobin - HbA _{1c}	Blood	4mL Purple Top	
Albumin Creatinine Ratio - ACR	Urine	10mL Lemon Topped urine Monovette Tube	Repeat early morning samples on 3 occasions.
Complement - C3, C4	Blood	4mL Yellow Top	
Cortisol - Blood	Blood	3mL Green Top	Random plasma cortisol samples are of very limited value.
Parathyroid Hormone PTH	Blood	4mL Purple Top	

The following tests (Protein Electrophoresis, Immunoglobulins and serum Free Light Chains) may be requested on one form and only ONE 4mL specimen (**Yellow Top**) is required.

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These must not be requested with the routine tests outlined above – Note **Green Top** bottles are unsuitable and will be rejected.

Test requested should be clearly written in the Additional tests box.

Table 6 Clinical Biochemistry protein tests that might be combined using one request form and using one specimen bottle

Test	Sample	Container	Comments
Immunoglobulins	Blood	4mL Yellow Top	In childhood reference intervals vary with age - Contact Laboratory
Serum Protein Electrophoresis SPE	Blood	4mL Yellow Top	
Serum Free Light Chains	Blood	4mL Yellow Top	

Do not send Serology / Virology / Microbiology requests to Clinical Biochemistry.

Additional tests

May be requested on a sample that has already been processed. A completed request form for the additional tests must be forwarded to the laboratory stating the **Sample ID**entification number and the fact that the request is an add on. The SID number is on Lab Result Recall screen (Lab. Ref.) or report form (Lab Number at bottom LHS). [Verbal requests for urgent off site additional tests will be taken]. Specimens are held for 4 days after analysis [5 days total]. CSF samples (both analysed and spare) are stored frozen for a month – unless otherwise indicated. However, not all tests will be stable over this period. Contact laboratory to discuss.

Endocrine and Other Common Miscellaneous Clinical Biochemistry Tests

– Tube Type, Transport and Stability – all tests in table below refer to Blood.

Note: When **Red Top** tubes are specifically required **Yellow Top** tubes are unsuitable.

Table 7 Endocrine and Other Common Miscellaneous Clinical Biochemistry Tests

Analyte	Tube Type	Stability
Aldosterone / Renin	4mL Purple Top	Send to lab immediately - within 3h (Do <u>not</u> place on ice)
Androstenedione	6mL Red Top	Stable at room temperature
Cortisol	3mL Green Top	Stable at room temperature
Follicle Stimulating (FSH) / Luteinising Hormone (LH)	3mL Green Top	Stable at room temperature
Growth Hormone	3mL Green Top	Stable at room temperature
HCG	3mL Green Top	Stable at room temperature

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Analyte	Tube Type	Stability
Insulin	3mL Green Top + 2mL Grey Top	Stable at room temperature for 4h (Grey top for glucose)
Insulin like Growth Factor IGF 1	3mL Green Top	Send to lab immediately - Plasma must be separated within 4h
C-peptide	3mL Green Top	Send to lab immediately – Plasma must be separated within 4h
NT-ProBNP	3mL Green Top	Stable at room temperature
Dehydroepiandrosterone Sulphate (DHEAS / DHAS)	3mL Green Top	Stable at room temperature
Oestradiol	3mL Green Top	Stable at room temperature
Parathyroid Hormone Parathormone (PTH)	4mL Purple Top	Stable at room temperature
Bone Markers	3mL Green Top	Send to lab immediately - Plasma must be separated within 2h
Procollagen III	4mL Yellow Top	Stable at room temperature
Progesterone	3mL Green Top	Stable at room temperature
Prolactin	3mL Green Top	Stable at room temperature
Sex Hormone Binding Globulin	3mL Green Top	Stable at room temperature
Testosterone	3mL Green Top	Stable at room temperature
Androgen Profile	6mL Red Top	Stable at room temperature
Thiopurine Methyl Transferase	4mL Purple Top	Stable at room temperature
Thyroglobulin	4mL Yellow Top	Stable at room temperature
Thyroid Hormones	3mL Green Top	Stable at room temperature
Vitamin D	4mL Yellow Top	Send to lab immediately - Serum should be separated within 6h
Bone Markers	4mL Yellow Top	Send to lab immediately - Serum should be separated within 2h

Common Paediatric Laboratory Tests

Sample Bottle / minimum volume requirements – all tests refer to Blood unless stated otherwise.

Table 8 Common Paediatric Laboratory Tests

Test	Sample Bottle	Vol	Lab	Comment / Notes
ACR (Albumin / Creatinine Ratio)	Sarstedt LEMON URINE	5mL	B	Early morning urine sample preferred
ACTH	2 x Small Pink Paed EDTA Bottle	2 x 0.5mL	B	Transport to lab immediately on ice – stable for only 15min. Both samples must be filled to mark

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Test	Sample Bottle	Vol	Lab	Comment / Notes
Allergy Screen	Adult Yellow Top Gel tube	1mL	I	Clinician needs to outline tests required - if a sample from a hospital source comes in with RAST or allergy screen they get – Inhaled allergens only. Total IgE has to be requested and food allergens have to be specified.
Alpha Feto protein	Adult Green Top Gel tube	2mL	B	Belfast Lab
Amino acids Plasma	Adult EDTA Purple Top	1mL	B	RVH Children's lab, for screening send both urine and blood.
Amino acids Urine	Sarstedt LEMON URINE	10mL	B	
Ammonia	Adult EDTA Purple Top	1mL	B	Transport to lab immediately on ice – stable for only 60min
Amylase*	Small Green Paed Li Hep tube	1mL	B	
Anti-transglutaminase Antibody	Adult Yellow Top Gel tube	0.5mL	I	Any combination of such antibodies may be requested on the same sample – 2mL blood should be sufficient for an extended Panel
Anti islet cell Antibody	Adult Yellow Top Gel tube	0.5mL	I	
Anti LKM Antibody	Adult Yellow Top Gel tube	0.5mL	I	
Anti TPO Antibody	Adult Yellow Top Gel tube	0.5mL	I	
Atypical Pneumonia	Adult Yellow Top Gel tube	2mL	M	
Anti-nuclear Antibody	Adult Yellow Top Gel tube	1mL	I	
B12 and Folate	Adult Green Top Gel tube	2mL	B	
Bilirubin Total*	Small Green Paed Li Hep tube	0.5mL	B	Light sensitive – place in envelope / Conjugated Bil may be requested on same sample
Blood Glucose	Yellow Fluor/Oxalate tube	1mL	B	Use if hypoglycaemia suspected
Bone Profile*	Small Green Paed Li Hep tube	1mL	B	Ca; PO4; Alb, ALP
Caeruloplasmin	Adult Yellow Top Gel tube	1mL	B	
Calprotectin	WHITE top Universal	5g	B	5g of faeces required
Carnitine	Adult Green Top Li Hep tube	1mL	B	RVH Children's lab
Urine Metanephrines (Replaces Catecholamines)	ACIDIFIED Lemon monovette	20mL	B	Available from lab – urine must be acidified ASAP.
Chromosomes	Adult Green Top Li Hep tube	1mL	G	Tubes stored in fridge
CMV, EBV	Adult Yellow Top Gel tube	2mL	M	
Coeliac Screen	Adult Yellow Top Gel tube	1mL	I	
Complement	Adult Yellow Top Gel tube	1mL	B	C3, C4
Conjugated Bil*	Small Green Paed Li Hep tube	0.5mL	B	Light sensitive – place in envelope / Total Bil will be analysed also
Cortisol	Adult Green Top Li Hep tube	1mL	B	
Creatine Kinase*	Small Green Paed Li Hep tube	1mL	B	Muscle enzymes
CRP*	Small Green Paed Li Hep tube	1mL	B	
Cyclosporin / Tacrolimus / Sirolimus	Small Pink Paed EDTA Bottle	0.5mL	B	
DNA	Adult EDTA Purple Top	2mL	G	Small Pink Paed EDTA Bottle -contact BCH Genetics - ext 3173
Ferritin	Adult Green Top Li Hep tube	1mL	H	
Food Allergens	Adult Yellow Top Gel tube	0.5mL	I	Specify Allergens required
Gastrin Level	Adult EDTA Purple Top	4mL	B	Fasting sample send ASAP on ice

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Test	Sample Bottle	Vol	Lab	Comment / Notes
Gentamicin Level	Small Green Paed Li Hep or Small EDTA Purple Top tube	1mL	M	
Glycosaminoglycans (GAGS) (MUCU)	Urine Lemon monovette	10mL	B	3 early morning urine samples collected on 3 separate days
HbA _{1c}	Small Pink Paed EDTA Bottle	0.5mL	B	
Hormone profile	Adult Green Top Li Hep tube	2mL	B	Includes LH, FSH, PRL, Oest
Immunoglobulins	Adult Yellow Top Gel tube	2mL	B	Electrophoresis performed
Inhaled Allergens	Adult Yellow Top Gel tube	0.5mL	I	See Allergy screen
Insulin (fasting)	Adult Green Top Li Hep tube	2mL	B	Blood Glucose in Grey Top should be taken at same time.
Insulin antibodies	Adult Yellow Top Gel tube	2mL	B	Guilford
Iron Profile	Adult Green Top Li Hep tube	2mL	B	Includes iron, transferrin, ferritin.
Lactate	Grey Top	2mL	B	Glucose may be measured on same sample
Lipid Profile*	Small Green Paed Li Hep tube	1mL	B	Total Cholesterol; Trig; HDL
Liver profile*	Small Green Paed Li Hep tube	1mL	B	Bil; ALP; ALT; AST; GGT; Alb
Magnesium*	Small Green Paed Li Hep tube	1mL	B	
Mucopolysaccharides				See Glycosaminoglycans
Organic acids (Urine)	Sarstedt LEMON URINE	10mL	B	
P and C ANCA	Adult Yellow Top Gel tube	0.5mL	I	
Parathyroid Hormone (PTH)	Adult EDTA Purple Top	2mL	B	
Serum Protein Electrophoresis(SPE)	Adult Yellow Top Gel tube	1mL	B	Immunoglobulins run with all SPE requests
TFTs	Small Green Paed Li Hep tube	1mL	B	Separate tube required
Therapeutic Drugs (except Lithium)	Small Green Paed Li Hep tube	1mL	B	In general - Sample just before next dose
Total IgE	Adult Yellow Top Gel tube	0.5mL	I	
TPMT	Adult EDTA Purple Top	2mL	B	Thio Purine Methyl Transferase
Trace Metals Selenium; Zinc; Copper; Lead	Royal Blue topped Greiner Trace Metal Tube	5mL	B	Selenium; Zinc; Copper; Lead Contact Biochemistry lab
U&E (EP)*	Small Green Paed Li Hep tube	1mL	B	Na; K; Cl; CO ₂ ; Urea; Cre; TP; Glucose
Urate*	Small Green Paed Li Hep tube	1mL	B	
Very Long Chain Fatty acids (Plasma)	Adult Green Top Li Hep tube or Adult EDTA Purple Top	2mL	B	Very Long Chain Fatty Acids
Vitamin A and E	Adult Yellow Top Gel tube	2mL	B	Light sensitive – place in envelope
Vitamin D	Adult Yellow Top Gel tube	2mL	B	Send to lab ASAP

Note: Any combination of Routine Biochemistry (see above tests in Bold*) may be requested on a single Small Green Paed Li Hep tube – for an extended panel please fill tube accordingly.

B = Biochemistry, H = Haematology, M = Microbiology, I = RVH Immunology, G = BCH Genetics


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Table 9 Blood Bottle and Relevant Test – (Note: *tests run in WHSCT)

Cap Colour	Biochemistry Tests
Red Top [Serum]	<p>Specialist Drugs: Methotrexate, Thiopentone, Lamotrigine, Levetiracetam</p> <p>Specialist Endocrine: Androstenedione, 17-Hydroxyprogesterone</p>
Yellow Top [Serum]	<p>Proteins: Serum Protein Electrophoresis* (SPE) [inc. Alb & TP], Immunoglobulins* (IgG, IgA, IgM), Serum free light chains* (FLC), Oligoclonal bands (with paired CSF), IgG subclasses (inc IgG4), ALP Isoenzymes, CK Isoenzymes, Alpha-1-Antitrypsin (AAT), Beta-2-Microglobulin (B2M), Ceruloplasmin, C3*, C4*, Haptoglobin*, Rheumatoid factor* (RF)</p> <p>Vitamins: Vit D (Total), Vit A, Vit E (protect from light)</p> <p>General Biochemistry: Lithium*, COVID Antibodies</p> <p>Bone Markers: Crosslaps (CTX), Ostase, Total P1NP</p> <p>Specialist Endocrine: Anti-Mullerian Hormone (AMH), Thyroglobulin & Thyroglobulin Antibody, P3NP</p>
Green Top [With gel] [Plasma]	<p>General Biochemistry Profiles:</p> <p>ELEC*: Na, K, Cl, Bicarbonate (CO₂), Urea, Creatinine (eGFR), Total Protein</p> <p>LFT*: TBil, ALP, Alb, AST, ALT, GGT</p> <p>BONE*: Ca, Adjusted Ca, PO₄, Alb, ALP</p> <p>LIPID*: Total Cholesterol, HDL, Triglycerides (LDL, TChol/HDL ratio, non-HDL Chol)</p> <p>IRON*: Iron, Ferritin, Transferrin (Transferrin sat%)</p> <p>THYROID*: TSH, FT4, (+ FT3 when required)</p> <p>B12 & FOLATE*: Folate, Vit B12</p> <p>Other: ACE, Amylase*, CK*, Beta-hCG*, DBIL*, CRP*, Ethanol*, LDH*, Lipase, Magnesium*, Paracetamol*, Pro-BNP*, Salicylate*, Troponin-T*, Urate*, Osmolality*</p> <p>TDM*: Carbamazepine, Digoxin, Phenobarbitone, Phenytoin, Theophylline, Valproate. <i>[NOTE: Use Gold Top for Lithium]</i></p> <p>Antibiotics: Amikacin, Gentamicin*, Tobramycin, Vancomycin*, Teicoplanin</p> <p>Tumour Markers: AFP, CA19-9, CA-125, CEA, PSA*</p> <p>Endocrine: Anti-TPO, Cortisol*, DHEAS, FSH, LH, Oestradiol, Progesterone, Prolactin, SHBG, Testosterone, Calcitonin [On ice & received in local lab within 4h], Growth Hormone (GH), IGF-1, Insulin [inc. Hypopak], C-peptide [Received in local lab within 4h]</p> <p>Misc: CarboxyHb* and MetHb*, Vit C (On ice & protect from light), Bile Acids (Analysed at UH Lab, SEHSCT), Amino Acids, Hydroxybutyrate</p>

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Table 9 Blood Bottle and Relevant Test – continued (Note: *tests run in WHSCT)

Cap Colour	Biochemistry Tests
Purple Top	<p>Ammonia* (on ice), HbA_{1c}*, Homocysteine (on ice) Specialist Endocrine: ACTH [On ice & must be received in lab within 30 min], Aldosterone, Renin [Must be received in lab within 3h] PTH* [Must be received in lab within 12 h], Porphyrins (Protect from light) Immunosuppressants: Cyclosporine, Everolimus, Sirolimus, Tacrolimus Peptides: Gut Hormones (inc. CgA, Neurokinin A, Gastrin, Glucagon, Pancreatic Polypeptide, Vasoactive Intestinal Peptide, Somatostatin) [4 adult bottles needed for full profile. On ice & received in local lab within 2h]</p>
Grey Top	<p>Glucose*, Lactate*, 3-Hydroxybutyrate* Specialist Toxicology: Methanol, Ethylene Glycol</p>
Dark Blue	<p>TRACE ELEMENTS AND METALS NOTE: A Separate sample is required for Plasma Metals and Blood Metals. Plasma Metals: Aluminium, Copper, Selenium, Zinc. Blood Metals: Lead, Manganese, Chromium, Cobalt, Mercury, Cadmium, Arsenic.</p>

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Test Protocols

Test protocols are available for a wide range of dynamic tests and test strategies including:

- Short Synacthen Test
- Fluid Deprivation Test
- Growth Hormone Suppression Test
- Oral Glucose Tolerance Test
- Investigation of Cushing's Syndrome / Dexamethasone Suppression
- TRH Test
- Gonadotropin Releasing Hormone test
- Aldosterone / Renin
- Renal Stones investigation
- Hypopacks
- Biochemical Testing for Pheochromocytoma: Urine, Plasma Metanephrines/Clonidine Suppression Test
- 72h Fast
- Tilt Test sample collection
- Preparation of samples for pyruvate analysis
- Handling and transport of CSF
- Levothyroxine Absorption test
- Lumbar Puncture Standard Operating procedure
- 5HIAA information sheet
- 24h Urine Collection – information sheet
- Sweat test – information sheet for parents/guardians and Adults
- Collection of urine samples for 28 day cortisol determination

See: WHSCT INTRANET or contact laboratory

Stability of Common Analytes

Taken from the following: WHO Use of Anticoagulants in Diagnostic Laboratory Investigations: (WHO/DIL/LAB/99.1 Rev.2 year 2002)

MS *Devgun*. Delay in Centrifugation and measurement of Serum Constituents in Normal Subjects. Clin Physiol Biochem 1989;7:189-197

DJ *Zhang* et al. Effect of serum clot contact time on Clinical Chemistry Laboratory Results. Clin Chem 1998; 44:6 1325-33. (RT = Room Temperature, d = day, w = week, y=year)

Additional information



Time and temperature effect.p

Table 10 Stability of Common Analytes

	WHO				Devgun			Zhang
	Whole Blood	Serum			Whole Blood	Serum		Whole Blood
	RT	RT	4°C	-20°C	After 7h RT	RT	4°C	RT
ELECTROLYTE								
Sodium	4d	2w	2w	1y	No change	5d	5d	At least 24h
Potassium	1h increase	6w	6w	1y	11% increase	2d	4d	3h increase
Chloride	1d decrease	7d	4w	1y	No change	3d	5d	6h decrease
Total CO ₂	Unstable decrease	1d	7d	2w	No change	2d	2d	6h decrease
Urea	1d increase	7d	4w	1y	No change	5d	5d	At least 24h
Total Protein	1d	6d	4w	1y	No change	5d	5d	6h increase
Creatinine	2-3d increase	7d	7d	3m	No change	1d	5d	At least 24h
Glucose	10min (*Grey top)	2d*	7d*	1d*				3h decrease
BONE PROFILE								
Calcium	2d decrease	7d	3w	8m	No change	3d	5d	At least 24h
Phosphate	1h increase	1d	4d	1y	11% decrease	2d	5d	3h increase
Albumin	6d	2.5m	5m	2.5m	No change	5d	5d	6h increase
ALP	4d decrease	7d	7d	2m	No change	5d	5d	At least 24h
Mg	1d increase	7d	7d	1y				At least 24h



	WHO				Devgun			Zhang
	Whole Blood	Serum			Whole Blood	Serum	Whole Blood	
	RT	RT	4°C	-20°C	After 7h RT	RT	4°C	RT
LIVER								
Bilirubin	Unstable decrease	1d	7d	6m	No Change	3d	5d	At least 24h
ALT	4d decrease	3d	7d	7d				At least 24h
AST	7d decrease	4d	7d	3m	No change	2d	5d	At least 24h
GGT	1d decrease	7d	7d	1y	No change	5d	5d	At least 24h
MISC								
CK	7d decrease	7d	1m	1m				At least 24h
CRP	3w	11d	2m	3y				
Amylase	4d decrease	7d	1m	1y				At least 24h
Ammonia	15min	15min	2h	3w				
Lactate	6h	8h	3d					
Serum OSM		3h	1d	3m				
LDH	1h increase	7d	4d	6w	No change	2d	5d	At least 24h
HbA _{1c}	3d			6m				
Urate	7d increase	3d	7d	6m				At least 24h
Cortisol	7d	7d	7d	3m				At least 24h
Troponin T	8h	24h	7d	3m				
ProBNP	2d	5d	5d	5d				
PSA	4-7d	7d	3w	1y				
HCG	1d	1d	7d	1y				
PTH	2-3d	6h	1d	4m				
RF		24h	8d	3m				
TDM								
Carbamazepine	2d	5d	7d	1m				
Phenytoin	2d	2d	1m	5m				
Digoxin		2w	3m	6m				
Valproate	2d	2d	7d	3m				
Theophylline		3m	3m	3m				
Phenobarb	2d	6m	6m	6m				
Lithium	1h decrease	1d	7d	6m				
THYROID								
FT4		2d	8d	3m				
TSH	7d	1d	3d	3m				At least 24h
LIPID								
Chol	7d increase	7d	7d	3m				At least 24h
Trigs	7d	2d	7d	1y				At least 24h
HDL	2d increase	2d	7d	3m				6h increase
PROTEINS								
C3*	1d	4d	8d	8d				
C4	1d	2d	8d	3m				
Haptoglobin	8d	3m	8m	3m				At least 24h
IgA	8d	8m	8m	8m				At least 24h
IgG	11d	4m	8m	8m				At least 24h
IgM	17d	2m	4m	6m				At least 24h
IOP								
Fe	2h increase	7d	3w	1y				6h increase
Transferrin	11d	4m	8m	6m				At least 24h
Ferritin		7d	7d	1y				At least 24h
B12		15min	1d	2m				
Folate		30min	1d	2m				

*C3 – In house studies suggest samples need to be separated on day of collection and stored at 4°C.

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Turnaround Times (TAT)

Table 11 Turnaround Times (TAT) – For Tests performed in Altnagelvin

Test/Profile	TAT (Routine)*	TAT (In-Patient)	TAT (URGENT)
Electrolyte Profile	<36h	<4h	<1.5h
Blood Sugar	<36h	<4h	<1.5h
LFT	<36h	<4h	<1.5h
Direct / Conjugated Bilirubin	<36h	<4h	<3h
Bone Profile	<36h	<4h	<1.5h
NT Pro BNP	<36h	<4h	<3h
Muscle Enzymes (CK)	<36h	<4h	<1.5h
Lipid Profile	<36h	<4h	<1.5h
Iron Profile (Ferritin)	<36h	<4h	<1.5h
Paracetamol/Salicylate/Ethanol	<36h	<4	<1.5h
Amylase	<36h	<4h	<1.5h
Magnesium	<36h	<4h	<1.5h
Uric Acid	<36h	<4h	<1.5h
Ammonia			<3h
Lactate			<1.5h
Hydroxybutyrate			<3h
C-Reactive Protein	<36h	<4h	<1.5h
Thyroid Profile	<36h	<4h	<1.5h
Cortisol	48-72h		
Carbamazepine / Theophylline / Valproic Acid / Digoxin / Phenytoin / Vancomycin / Phenobarbitone / Lithium	<36h	<5h (Dig <6h)	<4h
Gentamicin	<36h	<4h	<2h
Troponin T	<36h	<4h	<1.5h
PSA, Total	< 24h	< 24h	
LDH	<36h	<4h	<1.5h
PTH	<36h	<6h	<3h
B12 and Folate	<36h	<4h	
Beta HCG	<36h	<12h	<1.5h
Serum Protein Electrophoresis / IgA, M, G Free Light Chains	<7d		
Anti-SARS-CoV-2 antibodies	<4d		
Bence Jones Protein	<28d		
Complement - C3 and C4	<7d		
Alpha-1-Acid Glycoprotein	<7d		
Haptoglobin	<3d		
Albumin Creatinine Ratio	<4d		
Urinary Protein	<4d		
Cryoglobulins	<4wk		
Hb A _{1c}	<4d		
Blood gas / CoOx	<1h Use POCT – No analysers in Laboratory		
CSF Xanthochromia			<4h
pH Faecal/Urine	<24h		
CSF protein, glucose and lactate			<1.5h
Osmolality Plasma and Urine		<4h	<2h
Urine Electrolytes		<8h	<2h

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Test/Profile	TAT (Routine)*	TAT (In-Patient)	TAT (URGENT)
Pleural Fluid		<4h	
Creatinine Clearance	<4d	<4d	
Porphyrins / Porphobilinogen	5d		<6h
Sweat Test (Sweat Chloride)	Arranged with requesting physician / ward		
Rheumatoid Factor	<36h	<4h	<3h

Table 12 Turnaround Times (TAT) – For Tests performed in SWAH

Test/Profile	TAT (Routine)*	TAT (In-Patient)	TAT (URGENT)
Electrolyte Profile	<36h	<4h	<1.5h
Blood Sugar	<36h	<4h	<1.5h
LFT	<36h	<4h	<1.5h
Direct / Conjugated Bilirubin	<36h	<4h	<3h
Bone Profile	<36h	<4h	<1.5h
NT Pro BNP	<36h	<4h	<3h
Muscle Enzymes (CK)	<36h	<4h	<1.5h
Lipid Profile	<36h	<4h	<1.5h
Iron Profile (Ferritin)	<36h	<4h	<3h
Paracetamol/Salicylate/Ethanol	<36h	<4	<1.5h
Amylase	<36h	<4h	<1.5h
Magnesium	<36h	<4h	<1.5h
Uric Acid	<36h	<4h	<1.5h
Ammonia			<3h
Lactate			<1.5h
Hydroxybutyrate			<3h
C-Reactive Protein	<36h	<4h	<1.5h
Thyroid Profile	<36h	<4h	<1.5h
Carbamazepine / Theophylline / Phenytoin / Digoxin / Gentamicin / Lithium	<36h	<5h (Dig <6h)	<4h
Troponin T	<36h	<4h	<1.5h
PSA, Total	< 24h	<24h	
LDH	<36h	<4h	<1.5h
NT-ProBNP	<36h	<4h	<3h
PTH	<36h	<6h	<3h
B12 and Folate	<36h	<4h	
Beta HCG		<12h	<1.5h
Urinary Protein	<4d		
HbA _{1c}	<4d		
Blood gas / CoOx	<1h Use POCT – No analysers in Laboratory		
Osmolality Plasma and Urine		<4h	<2h
Urine Electrolytes		<8h	<2h
Pleural Fluid		<4h	
Creatinine Clearance	<4d	<4d	
CSF protein, glucose and lactate			<1.5h
Sweat Test (Sweat Chloride)	Arranged with requesting physician / ward		

*Note: does not include allowances for weekends and holidays

Increase in TAT will occur if incorrect type or number of samples and request forms, insufficient or illegible

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data, incorrect positioning of 2D barcode or use of handwriting or eye readable labels on scan-able forms.

Telephone Limits

The following results will be telephoned to source ASAP if not already known.

Table 13 Telephone Limits

Analyte	Lower Limit	Upper Limit
Sodium mmol/L	<125	>155
	≤130 for <16Yrs	>150 for <16Yrs
Potassium mmol/L	<3.0	>6.0
	<2.0 Post Dialysis	>6.4 Dialysis only
Urea mmol/L		>25.0 (>50.0 renal patients)
		≥10 for <16yrs
Creatinine umol/L		>300 (>1000 renal patients)
		>100 for <16yrs
AKI Alert 3	AKI3 except for ICU and known Renal Patients	
Chloride mmol/L		>120
CO2 mmol/L	<15	>40
Calcium (Adjusted) mmol/L	≤1.8	>3.0
Glucose mmol/L	≤2.5	≥25.0
		≥15.0 if <16yrs
TDMs all mg/L unless stated	Carbamazepine ≥12.0	
	Theophylline ≥25.0	
	Phenobarbitone ≥40.0	
	Phenytoin ≥25.0	
	Digoxin ≥2.5 ug/L	
	Lithium >1.0 mmol/L	
	Valproate >120 – contact Consultant Staff	
	Trough Gentamicin >1.0	
	Peak and Random Gentamicin >10.0	
	Trough Vancomycin >20.0 and <15.0	
Peak and Random Vancomycin levels >26.0		
Blood gas / CoOx	All results	
Sal and Para mg/L		Sal ≥300
		Paracetamol ≥10
Ethanol mg/L		≥4000 >100 for <16 years
Troponin T ng/L		All GP samples >14
Ammonia umol/L		>72
Lactate mmol/L		>3.0
Hydroxybuty rate mmol/L		>1.5



Analyte	Lower Limit	Upper Limit	
Amylase U/L		≥500	
Triglyceride mmol/L		>20.0	
Magnesium mmol/L	<0.5	>1.5	
Phosphate mmol/L	<0.4		
Plasma Osmo mosm/kg	<265	>300	
Total Bilirubin umol/L		>100 >250 Neonates	
Con Bilirubin umol/L		≥25 Neonates	
AST U/L		≥600	
ALT U/L		≥525	
CK U/L		≥5000	
CRP mg/L		≥300 GP results only	
Thyroid Function Tests	Following Scenarios	FT4 pmol/L	TSH mU/L
	A	>40	<0.30
	B	<5.2	>40
	C	<5.2	Normal or low

Uncertainty of Measurement

Uncertainty of Measurement, traceability and numerical significance are separate but closely related concepts that affect both the format and information conveyed in a quantitative test report.

Uncertainty of Measurement provides a quantitative assessment of the quality of a test result. Current international standards (ISO 15189) require laboratories to provide estimates of uncertainty of measurement. An estimate of measurement uncertainty provides an interval of values within which the true value is believed to lie with a stated probability, and is therefore a quantitative indication of the reliability of a measurement.

Traceability and uncertainty are fundamental properties of all quantitative measurements. Because all measurements are made relative to a scale or defined standard, they are by definition *traceable* to this scale or standard. Traceability relates a measurement result to a stated metrological reference through an unbroken chain of calibrations or comparisons, each of which may contribute a stated level of uncertainty to the final test result. This unbroken chain of comparisons (leading back to a reference value) allows different laboratories to compare results and relate them to a common measuring scale.

A further tool to aid clinicians in the interpretation of results is the use of reference change values (RCV). These are of considerable use for the monitoring of patients, either in acute settings or in long term monitoring. Changes in serial results from an individual may be due to pathological improvement or deterioration in the individual, but may also be due to the following factors:

- Pre-analytical variation (CV_P)
- Analytical imprecision (CV_A)
- Within subject intra-individual variation (CV_I)



For a change to be significant, the difference in results must be greater than this inherent variation, or RCV, which can be calculated as:

$$RCV = 2^{1/2} Z(CV_P^2 + CV_A^2 + CV_I^2)^{1/2}$$

Where Z is the number of standard deviations appropriate to the desired probability (i.e. 1.96 for P<0.05 and 2.58 for P<0.01)

If you require further information or explanation on any of aforementioned or require detailed estimates for any particular analyte or measurand please contact the Clinical Biochemistry Laboratory.

Consent

For in house tests: Specific written consent is not required for any test performed in the WHSCT Clinical Biochemistry Laboratories with the specific exception of sweat testing. Parental consent is mandatory for all sweat tests and should be obtained prior to booking an appointment on a minor (<16y).

For tests sent to or referred to other Laboratories: It is the responsibility of the requester to ensure that the patient has been informed of, and has consented to, any such tests as required.

Note: All genetic testing requires consent, for which there is a 'Consent Form' section at the bottom of the Medical Genetics request form. In this regard it is the responsibility of the referring clinician to inform the patient:

- a) *of the genetic tests to be performed*
- b) *of the requirement to store genetic material*
- c) *that results will be forwarded to their Consultant and GP*
- d) *that results will be used for the benefit of other family members*

If the Consent Form is not completed, then the Regional Genetics Laboratories will assume that the provision of a sample implies that the referring clinician has obtained consent for genetic testing, storage of genetic material and for further family testing.

Confidentiality of Service User Information


The Clinical Biochemistry Laboratory adheres to the Western Health & Social Care Trust's Policy on the Data Protection Act 1998 and Protection of Personal Information, which outlines the legal requirement for both the Trust and its' staff to treat personal information confidentially and ensure all information is held securely.

Comments/Complaints/Compliments procedure

The Clinical Biochemistry Laboratory adheres to the Western Health & Social Care Trust's Policy and procedure for the management of complaints and compliments. Copies of the policy are available upon request from the laboratory or via the Trust Intranet.

We aim to provide high quality services. If you have a comment, compliment or complaint about one of our services, please let us know by contacting a member of Laboratory staff.

Details regarding the origin and nature of quoted reference intervals are available upon request – please contact Clinical Biochemistry Consultant Staff.

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Reference Intervals

Table 14 Reference Intervals [Note: Unless indicated Plasma (green Top) and Serum (yellow top) intervals are the same]

Reference Intervals (Adult Blood unless indicated)						
Profiles/ Test	Test	Age	Sex	Reference Interval	Units	
EP	Sodium			133 - 146	mmol/L	
	Sodium	under 16 years		135 - 146	mmol/L	
	Potassium (serum – yellow top)			3.5 - 5.3	mmol/L	
	Potassium (plasma – green top)			3.5 - 4.6	mmol/L	
	Chloride			95 - 108	mmol/L	
	CO2			22 - 29	mmol/L	
	Urea			2.5 - 7.8	mmol/L	
	Creatinine:					
			0 to 14d	Female	27 - 78	umol/L
			14d to 2yr	Female	8 - 31	umol/L
			2 to 5yr	Female	16 - 36	umol/L
			5 to 12yr	Female	26 - 51	umol/L
			12 to 15yr	Female	38 - 69	umol/L
			15 to 19yr	Female	41 - 71	umol/L
			Adult	Female	45 - 84	umol/L
			0 to 14d	Male	27 - 78	umol/L
			14d to 2yr	Male	8 - 31	umol/L
			2 to 5yr	Male	16 - 36	umol/L
			5 to 12yr	Male	26 - 51	umol/L
			12 to 15yr	Male	38 - 69	umol/L
			15 to 19yr	Male	53 - 92	umol/L
		Adult	Male	59 - 104	umol/L	
		Protein, Total			60 - 80	g/L
	Osmolality - Plasma			275 - 295	mOsm/kg	
	eGFR			>60	mL/min/1.73m2	
Glucose	Fasting Glucose (Non pregnant adult)			4.0 - 6.0	mmol/L	

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Reference Intervals (Adult Blood unless indicated)					
Profiles/ Test	Test	Age	Sex	Reference Interval	Units
	(For gestational diabetes – see below)				
LFT	Bilirubin, Total			<21	umol/L
	ALP			30 - 130	U/L
	ALP - Age and sex related reference intervals – see table below				
	AST			10 - 40	U/L
	ALT			10 - 35	U/L
	GGT			10 - 50	U/L
	Albumin			35 - 50	g/L
	Bilirubin, Direct			1 - 7	umol/L
BP	Calcium			2.20 - 2.60	mmol/L
	Phosphorous			0.80 - 1.50	mmol/L
Cardiac	Troponin T			0 - 14	ng/L
Lipid	Total Cholesterol			2.8 - 5.0	mmol/L
	HDL Cholesterol			1.0 - 2.5	mmol/L
	Triglyceride			0.4 - 1.7	mmol/L
	LDL Cholesterol (Calc)			1.0 - 3.0	mmol/L
	Chol / HDL Ratio			-	
	Non HDL Chol			2 - 5	mmol/L
BGAS (Arterial)	pH			7.35 - 7.45	
	pO ₂			11.0 - 14.4	kPa
	pCO ₂			4.3 - 6.4	kPa
	Bicarbonate			22 - 29	mmol/L
	Base Excess			-3.0 to +3.0	
	Carboxyhaemoglobin - COHb - non smoker			0 - 2	%
	Carboxyhaemoglobin - COHb - smoker			4 - 9	%
	MetHaemoglobin - (MetHb)			0 - 2	%
	Oxyhaemoglobin			94 - 98	%
CSF	CSF - Protein			0.15 - 0.40	g/L
	CSF - Glucose			2.5 - 4.4 (>75% of plasma glucose)	mmol/L

Reference Intervals (Adult Blood unless indicated)						
Profiles/ Test	Test	Age	Sex	Reference Interval	Units	
	CSF - Lactate			>4.2 suggests bacterial aetiology in suspected meningitis	mmol/L	
TDM	Carbamazepine - Tegretol			4 - 12	mg/L	
	Digoxin			0.5 - 2.0 Target range in heart failure 0.5 - 1.0	ug/L	
	Lithium			0.4 - 1.0	mmol/L	
	Lithium	Elderly		0.4 - 0.8	mmol/L	
	Phenobarbitone			10 - 40	mg/L	
	Paracetamol (4h)	Therapeutic levels		10 - 30	mg/L	
		Toxic levels		> 200 4h post intake, >50 12h post intake indicates a definite risk of hepatotoxicity.	mg/L	
	Phenytoin			5 - 20	mg/L	
	Salicylate	Therapeutic	Adult	30 - 100 for antipyretic/analgesic 150 - 300 for anti-inflammatory	mg/L	
		Toxic levels		> 300 > 700 often lethal	mg/L	
	Theophylline		Adult	10 - 20	mg/L	
	Theophylline		Neonate	5 - 10	mg/L	
	Valproic Acid - Epilim			There is no well defined therapeutic or toxic range		
	Gentamicin/Vancomycin		See - WHSCT Secondary Care Antimicrobial Therapy Guidelines – available on Trust net – under Medicines / Management of infection – see appendix 1 and 2			
	IRP	Iron			10 - 30	umol/L
Transferrin				1.8 - 3.8	g/L	
Transferrin Saturation (Fasting)				Female >50% / Male >55% consistent with iron overload		
Ferritin		Up to 55 years	Female	13 - 150	ug/L	
Ferritin		Over 55 years	Female	13 - 300	ug/L	
			Male	30 - 300	ug/L	
Thyroid	TSH			0.27 - 4.20	mIU/L	



Reference Intervals (Adult Blood unless indicated)						
Profiles/ Test	Test	Age	Sex	Reference Interval	Units	
	Free T4			12.0 - 22.0	pmol/L	
	Free T3			3.1 - 6.8	pmol/L	
	Thyroid - Age and sex related reference intervals – see table below					
B12 and Folate	Vitamin B12		Male and female	191 - 663	ng/L	
	Folate		Male and female	3.0 – 26.8	ug/L	
Other	Magnesium			0.70 - 1.00	mmol/L	
	LDH			135 - 225	U/L	
				[interval in use from 18/06/2015 – following introduction of IFCC assay - prior to this date interval was 240 – 480 U/L]		
	Ammonia	Prem Neonate		<150	umol/L	
	Ammonia	Term Neonate		<100	umol/L	
	Ammonia	1month to adult		18 - 72	umol/L	
	Amylase - Plasma			25 - 125	U/L	
	CK – Creatine Kinase			Male	40 - 320	U/L
				Female	25 - 200	U/L
	CRP - C Reactive Protein			0 - 5	mg/L	
	Cortisol			Time dependent [30min SST normal cortisol response greater than 450nmol/L]		
	HCG (Non Pregnant)			<5	U/L	
	Hydroxybutyrate, Beta			0.1 - 0.3	mmol/L	
	Lactate			0.5 - 2.2	mmol/L	
	Parathyroid Hormone (PTH)			15 - 65	ng/L	
			PTH reference interval appropriate for normocalcaemia only			
	pH - Faecal			5 - 9		
	pH - Urine			4.8 - 7.8		
	PSA					
		<40yr	Male	>2.50 Use Clinical Judgement	ug/L	

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Reference Intervals (Adult Blood unless indicated)						
Profiles/ Test	Test	Age	Sex	Reference Interval	Units	
	Note: PSA are referral ranges not reference intervals.	40-49yr	Male	>2.50	ug/L	
		50-59yr	Male	>3.50	ug/L	
		60-69yr	Male	>4.50	ug/L	
		70-79yr	Male	>6.50	ug/L	
		80+yr	Male	>6.50 Use Clinical Judgement	ug/L	
	Urate			Male	200 - 400	umol/L
				Female	140 - 360	umol/L
				In Gout the target Uric Acid level is less than 360 umol/L.		
	NT- ProBNP:					
		HF highly unlikely <50 >450	HF Highly likely	<45 yrs	5 - 115	ng/L
		HF highly unlikely <50 >450	HF Highly likely	45 - 54 yrs	5 - 172	ng/L
		HF highly unlikely <75 >900	HF Highly likely	55 - 64 yrs	5 - 263	ng/L
		HF highly unlikely <75 >900	HF Highly likely	65 - 74 yrs	5 - 349	ng/L
	HF highly unlikely <250 >1800	HF Highly likely	>75 yrs	5 - 738	ng/L	
Proteins	Glycated Haemoglobin HbA _{1c} DCCT			4.0 - 6.0	%	
	Glycated Haemoglobin HbA _{1c} IFCC			20 - 42	mmol/mol	
				(A DCCT Target of <7% equates to a IFCC target of <53 mmol/mol) See table below for interpretation guidance		
	Complement C3			0.8 - 1.7	g/L	
	Complement C4			0.14 - 0.54	g/L	
	Protein Electrophoresis - Albumin			35 - 50	g/L	
	Protein Electrophoresis - Globulins			18 - 36	g/L	
	Protein Electrophoresis - Total Protein			60 - 80	g/L	
	Kappa FLC			3 - 19	mg/L	

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Reference Intervals (Adult Blood unless indicated)					
Profiles/ Test	Test	Age	Sex	Reference Interval	Units
	Lambda FLC			6 - 26	mg/L
	Kappa/Lambda Ratio			0.3 - 1.7	
	Haptoglobin		Female	0.4 - 1.6	g/L
	Haptoglobin		Male	0.5 - 2.0	g/L
	Rheumatoid Factor			0 - 13	IU/mL
Urine	Amylase - 24h urine			<390	U/24h
	Calcium - 24h urine			2.5 - 7.5	mmol/24h
	Creatinine Clearance			80 - 160	mL/min
	Electrolytes – Random/24h urine			Contact Consultant staff	
	Magnesium - 24h urine			2.4 – 6.5	mmol/24h
	Osmolality - urine			Contact Consultant staff	
	Phosphate - 24h urine			15 - 50	mmol/24h
	Urate - 24h urine			1.5 - 4.5	mmol/L
	Microalbumin - Alb/Creat Ratio (ACR)		Female	<3.5	mg/mmol
	Microalbumin - Alb/Creat Ratio (ACR)		Male	<2.5	mg/mmol
	Microalbumin - Albumin - Urine			<20	mg/L
	Protein, Total - 24h urine			0.05 - 0.14	g/24h
	Protein, Total – Protein/Creatinine Ratio (PCR)			<14	mg/mmol



Table 15 ALP - Age and sex related reference intervals

Age	ALP – Male (U/L)	ALP – Female (U/L)
Neonates	Up to 600	Up to 600
Infants	70 - 550	70 - 550
2-5y	140 - 320	140 - 335
5-6y	130 - 350	130 - 345
6-7y	140 - 335	130 - 400
7-8y	135 - 430	140 - 400
8-9y	130 - 415	140 - 400
9-10y	140 - 345	140 - 450
10-11y	140 - 415	140 - 500
11-12y	140 - 445	140 - 460
12-13y	150 - 490	120 - 336
13-14y	140 - 515	80 - 284
14-15y	130 - 510	50 - 212
15-16y	105 - 455	45 - 150
16-17y	65 - 320	40 - 120
17-18y	55 - 220	40 - 120
18-19y	50 - 190	40 - 120
19-20y	40 - 155	40 - 120
Adult	30 - 130	30 - 130
>55y	40 - 135	40 - 150

Table 16 Thyroid - Age and sex related reference intervals

Assay	Male	Female	Age
TSH	0.70 - 15.20 mIU/L	0.70 - 15.20 mIU/L	0 - 6 days
	0.72 - 11.00 mIU/L	0.72 - 11.00 mIU/L	>6d ≤3 mth
	0.73 - 8.35 mIU/L	0.73 - 8.35 mIU/L	≥3 ≤12 mth
	0.70 - 5.97 mIU/L	0.70 - 5.97 mIU/L	>1 ≤6 y
	0.60 - 4.84 mIU/L	0.60 - 4.84 mIU/L	≥6 ≤11 y
	0.51- 4.30 mIU/L	0.51- 4.30 mIU/L	>11 ≤20 y
	0.27 - 4.20 mIU/L	0.27 - 4.20 mIU/L	Adults
			Pregnancy
		0.33 - 4.59 mIU/L	1st trimester
	0.35 - 4.10 mIU/L	2nd trimester	
	0.21 - 3.15 mIU/L	3rd trimester	
FT4	11.0 - 32.0 pmol/L	11.0 -32.0 pmol/L	0 - 6 days
	11.5 - 28.3 pmol/L	11.5 - 28.3 pmol/L	>6d ≤3 mth
	11.9 - 25.6 pmol/L	11.9 - 25.6 pmol/L	≥3 ≤12 mth
	12.3 - 22.8 pmol/L	12.3 - 22.8 pmol/L	>1 ≤6 y
	12.5 - 21.5 pmol/L	12.5 - 21.5 pmol/L	≥6 ≤11 y
	12.6 - 21.0 pmol/L	12.6 - 21.0 pmol/L	>11 ≤20 y
	12.0 - 22.0 pmol/L	12.0 - 22.0 pmol/L	Adults
			Pregnancy
		12.1 - 19.6 pmol/L	1st trimester
	9.6 - 17.0 pmol/L	2nd trimester	
	8.4 - 15.6 pmol/L	3rd trimester	





Assay	Male	Female	Age
FT3	2.7 - 9.7 pmol/L	2.7 - 9.7 pmol/L	0 - 6 days
	3.0 - 9.3 pmol/L	3.0 - 9.3 pmol/L	>6d ≤3 mth
	3.3 - 9.0 pmol/L	3.3 - 9.0 pmol/L	≥3 ≤12 mth
	3.7 - 8.5 pmol/L	3.7 - 8.5 pmol/L	>1 ≤6 y
	3.9 - 8.0 pmol/L	3.9 - 8.0 pmol/L	≥6 ≤11 y
	3.9 - 7.7 pmol/L	3.9 - 7.7 pmol/L	>11 ≤20 y
	3.1 - 6.8 pmol/L	3.1 - 6.8 pmol/L	Adults
			Pregnancy
		3.8 - 6.0 pmol/L	1st trimester
	3.2 - 5.5 pmol/L	2nd trimester	
	3.1 - 5.0 pmol/L	3rd trimester	

Table 17 Age related reference intervals – Immunoglobulins

Age	IgA (g/L)	IgG (g/L)	IgM (g/L)
Cord	<0.02	5.2 - 18.0	0.02 - 0.2
0 - 2 wks	0.01 - 0.08	5.0 - 17.0	0.05 - 0.2
2 - 6 wks	0.02 - 0.15	3.9 - 13.0	0.08 - 0.40
6 - 12 wks	0.05 - 0.40	2.1 - 7.7	0.15 - 0.70
3 - 6 mths	0.10 - 0.50	2.4 - 8.8	0.20 - 1.00
6 - 9 mths	0.15 - 0.70	3.0 - 9.0	0.40 - 1.60
9 - 12 mths	0.20 - 0.70	3.0 - 10.9	0.60 - 2.1
1 - 2 yrs	0.3 - 1.2	3.1- 13.8	0.5 - 2.2
2 - 3 yrs	0.3 - 1.3	3.7- 15.8	0.5 - 2.2
3 - 6 yrs	0.4 - 2.0	4.9 - 16.1	0.5 - 2.0
6 - 9 yrs	0.5 - 2.4	5.4 - 16.1	0.5 - 1.8
9 - 12 yrs	0.7 - 2.5	5.4 - 16.1	0.5 - 1.8
12 - 15 yrs	0.8 - 2.8	5.4 - 16.1	0.5 - 1.9
15 - 45 yrs	0.8 - 2.8	6.0 - 16.0	0.5 - 1.9
over 45 yrs	0.8 - 4.0	6.0 - 16.0	0.5 - 2.0

Table 18 Oral Glucose Tolerance Test - WHO classification

Interpretation	0min	120min
Normal	<6.1	<7.8
Diabetes Mellitus	≥7.0	or ≥11.1
Impaired Glucose Tolerance (IGT)	<7.0	and ≥7.8 and <11.1
Impaired Fasting Glucose (IFG)	≥6.1* to <7.0	and <7.8

*The WHSCT shared care guidelines have adopted a lower cut-off for the diagnosis of impaired fasting glucose (≥5.6 to <7mmol/L) following recommendations by the American Diabetes Association.

The WHSCT have adopted the following International Association of Diabetes and Pregnancy Study Group (IADPSG) values for the diagnosis of Gestational Diabetes for the 75g OGTT:

Fasting	≥5.1 mmol/L
1h	≥10.0 mmol/L
2h	≥8.5 mmol/L

Diagnosis of Gestational Diabetes made if glucose values exceeded at any time point.

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Table 19 Interpretation of Sweat Chloride results

Age	Sweat Chloride (mmol/L)	Comment
<6 m	<30	"Cystic fibrosis is unlikely but requires genetic and clinical correlation"
<6 m	30 - 60	"Intermediate result which requires further cystic fibrosis assessment such as a repeat test and/or further investigations"
<6 m	>60 but <150	"Supports a diagnosis of cystic fibrosis"
>6 m	<40	"Cystic fibrosis is unlikely but requires genetic and clinical correlation"
>6 m	40 - 60	"Intermediate result which requires further cystic fibrosis assessment such as a repeat test and/or further investigations"
>6 m	>60 but <150	"Supports a diagnosis of cystic fibrosis"
All ages	>150	"Non-physiological sweat chloride result i.e. chloride >150mmol/L"

Table 20 Interpretation of Pleural Fluid results

Pleural Fluid	Comment
Pleural Fluid Gross Appearance:	The following descriptions are used: Clear, Cloudy, Purulent, Milky, Blood Stained, Straw Coloured, Amber Coloured.
Pleural Fluid Total Protein:	Results <25 g/L suggest transudate Results >35 g/L suggest exudates Total protein between 25 – 35 g/L – use Light's criteria – below.
Light's A fluid is classified as an exudate if any of the following criteria are met:	A Pleural Fluid: Plasma Protein Ratio greater than 0.5. (fluid protein ÷ plasma protein) A Pleural Fluid LDH activity above 150 U/L (2/3 ULN) A Pleural Fluid:Plasma LDH Ratio greater than 0.6. (Note: Patients with CHF on diuretics may show an increase in Pleural fluid protein values).
Pleural Fluid Cholesterol:	>1.6 mmol/L suggests exudate.
Pleural Fluid Albumin Gradient: (useful for patients on diuretics)	Plasma fluid albumin gradient = Plasma albumin minus fluid albumin <12 g/L indicates an exudate and >12 g/L a transudate.
Pleural Fluid Glucose (`Is it rheumatoid?'):	>5.3 mmol/L suggests transudate. >1.6 mmol/L RA is unlikely cause
Pleural Fluid pH (`Does this parapneumonic effusion need draining?'):	<7.30 suggests the presence of an inflammatory or infiltrative process. <7.20 require drainage – not 100% sensitive.
Pleural Fluid Lipids (`Is it a chylothorax?'):	Triglyceride values > cholesterol suggests chylothorax. BTS guidelines – Triglyceride values >1.24 – chylothorax Triglyceride values <0.54 – psuedochylothorax Cholesterol values >5.18 – chylothorax Cholesterol values <5.18 – psuedochylothorax
Pleural Fluid Amylase (`Is pancreatitis the cause?'):	>125 U/L or the fluid / Plasma ratio is >1.0.
Pleural Fluid Creatinine / Urea:	Increased pleural fluid urea or creatinine may be specific for diagnosis of urinothorax, when fluid accumulates in the pleural space in urinary tract obstruction.



Pleural Fluid	Comment
Pleural Fluid Bilirubin / Tumour markers:	Not useful.

Table 21 Interpretation of Ascitic / Peritoneal Fluid results

Ascitic / Peritoneal Fluid	Comment				
Ascitic Fluid Gross Appearance:	The following descriptions are used: Clear straw coloured, Blood-stained, Turbid, Tea coloured, Black, Dark molasses, Green/brown				
Ascitic Fluid LDH:	>225 U/L (ULN) associated with malignancy (Not generally useful)				
Ascitic Fluid Glucose:	Fluid/Blood glucose ratio (GREY TOPs) of <0.7 - Tuberculous ascites (Not generally useful)				
Ascitic Fluid Amylase:	>125 U/L – suggest pancreatitis (Not specific - values usually extremely elevated >500). Amylase activity in ascites of non-pancreatic origin ~half the plasma value.				
Ascitic Fluid Creatinine:	Increased values may indicate the presence of urine.				
Ascitic Fluid Triglyceride:	>2.25 mmol/L and > corresponding plasma concentration - Chylous ascites (Values up to 4.5mmol/L may be seen in with cirrhosis)				
Ascitic Fluid Bilirubin:	>103 umol/L and > plasma value is consistent with intrahepatic or gallbladder fistula or upper gut perforation.				
Ascitic Fluid Total protein:	Not recommended (>30 g/L - infection / malignancy <30 g/L - chronic liver disease/cirrhosis (<25 g/L greater probability))				
Ascitic Fluid Tumour markers / Cholesterol / pH / Lactate / Enzymes	Not useful				
Plasma Ascites Albumin Gradient (PAAG):	PAAG = Plasma Albumin – Fluid Albumin <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">PAAG <11 g/L [decreased portal pressure]</th> <th style="text-align: center;">PAAG >11 g/L [increased portal pressure]</th> </tr> </thead> <tbody> <tr> <td>Malignancy – peritoneal (due to abnormal capillary permeability) Tuberculosis / Infection Pancreatitis Nephrotic syndrome</td> <td>Malignancy – hepatic metastases (intrahepatic venous compression leading to portal hypertension) Cirrhosis / Liver disease Congestive cardiac failure</td> </tr> </tbody> </table>	PAAG <11 g/L [decreased portal pressure]	PAAG >11 g/L [increased portal pressure]	Malignancy – peritoneal (due to abnormal capillary permeability) Tuberculosis / Infection Pancreatitis Nephrotic syndrome	Malignancy – hepatic metastases (intrahepatic venous compression leading to portal hypertension) Cirrhosis / Liver disease Congestive cardiac failure
PAAG <11 g/L [decreased portal pressure]	PAAG >11 g/L [increased portal pressure]				
Malignancy – peritoneal (due to abnormal capillary permeability) Tuberculosis / Infection Pancreatitis Nephrotic syndrome	Malignancy – hepatic metastases (intrahepatic venous compression leading to portal hypertension) Cirrhosis / Liver disease Congestive cardiac failure				

Interpretation of HbA_{1c} Results

Adapted from NI Pathology Network Clinical Biochemistry Speciality Forum -- HbA_{1c} Interpretation Guide Version 2.0 June 2023

Hb A_{1c} reference intervals, diagnostic cut offs and treatment targets all assume that the patients concerned have both a normal haemoglobin (Hb A0) and a normal associated red blood cell (RBC) lifespan.

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In patients with haemoglobin variants and/or altered RBC survival (Table 22):

- Hb A_{1c} should **not** be used for diagnosis.
- Care should be taken when Hb A_{1c} is used for monitoring (Table 23)

Table 22 Clinical conditions affecting Hb A_{1c} measurement

Increase	Decrease	Variable
Iron deficiency anaemia	Iron treatment	Haemoglobin Variants**
Vitamin B12 deficiency	Vitamin B12 treatment	Blood Transfusion
CKD 4 and 5	Liver disease	
Splenectomy	EPO treatment	
Venesection	Haemolytic anaemia, Low Hb levels *	
	Splenomegaly	
	Medications: antiretrovirals, ribavirin, dapsone	

*RBC lifespan does not interfere analytically but the result obtained may not reflect the “true” glycation rate for the patient.

** Haemoglobin Variants occur in approximately 6% of the NI population. Haemoglobin variants may have different glycation rates and/or altered RBC survival and thus their Hb A_{1c} results need to be interpreted with caution as this may result in misleadingly higher or lower Hb A_{1c} results.

The routine methodology in use in the laboratory (Sebia Capillary Electrophoresis) can detect haemoglobin variants and these will be flagged up as report comments – see table 24. Some of these variants will interfere analytically with the routine method result and some will not.

For those variants that **do not** cause any analytical interference in the routine methodology the result will be reported and flagged with a comment as per Table 24 below.


For those variants that **do** interfere analytically with the routine method the sample will be rerun using an alternative methodology (Boronic acid) and the result from this method reported and flagged with a comment as per Table 24. In some cases it will not be possible to report any Hb A_{1c} results from either method.

Hb A_{1c} results reported by the laboratory will be analytically correct, but it is important to bear in mind that although such results will be analytically correct the presence of the variant will affect how these result should be interpreted physiologically, especially if the reported result does not fit with the patient’s clinical condition or other glucose measurements. See [Alternative methods used when Hb A_{1c} monitoring is invalid or physiologically misleading.](#)

Please note: Sebia Capillary Electrophoresis can also detect Hb A2. High Hb A2 levels (>3%) may be due to Vitamin B12 / Folate deficiency; Antiretroviral treatments; Hyperthyroidism and Beta-Thalassaemia. High levels will be flagged up using the associated comments – see Table 24. The advice is to evaluate the clinical context and consider possible clinical relevance.

Alternative methods used when Hb A_{1c} monitoring is invalid or physiologically misleading

- Quality-controlled blood glucose profiles using personal glucose meters
- Serum Fructosamine (yellow top tube). This is useful for monitoring patients with variants that interfere with Hb A₀ and Hb A_{1c} results. Please contact laboratory to discuss.
- Unexplained discrepancies between Hb A_{1c} and other glucose measurements should always be investigated. Seek advice from Clinical Biochemistry.

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The patient's own analytically valid Hb A_{1c} results can be used to monitor trends on an individual basis but traditional reference intervals, diagnostic cut offs and treatment targets should not be used.

Guidance is available at: <http://www.nice.org.uk/Guidance/NG28> : [2011 WHO report: Use of Glycated Haemoglobin \(Hb A1c\) in the Diagnosis of Diabetes Mellitus.](#)



Table 23 Results from samples with a haemoglobin variant or analytical issue are reported using the following comments

Code	Comment	Explanation
HBA1	Patient has Hb variant – see lab manual for guidance.	A variant has been detected, but it does not interfere analytically with the routine method Hb A _{1c} result.
HBA2	HbA1c analysed by alternate method.	A variant has been detected that interferes analytically with the routine Hb A _{1c} result. The Hb A _{1c} has been analysed by an alternate Boronic acid method.
HBA3	A1c may not reflect true glycaemic status – see lab manual.	No variant has been detected, but the Hb A _{1c} is physiologically unreliable for another reason (see Table 22)
HBA4	Unable to report Hb A _{1c} result – see lab manual for guidance.	In cases where Hb A _{1c} cannot be measured, the Clinical Biochemistry Laboratory should be contacted to discuss alternative measurements.
HBA5	HbA1c analysed by alternate method – see lab manual.	Sample volume received was too low for analysis using routine method. Reported HbA1c has been analysed by alternative Boronic acid method and will be equivalent to those from the routine method.
HBA6	High HbA2: ?Low B12/Fol; Retrovirals; High T4; Thalassaemia.	Chromatogram shows Hb A2 greater than 3% - causes include Vitamin B12/Folate deficiency; Antiretrovirals; Hyperthyroidism and Beta-Thalassaemia. If no clinical suspicion of these conditions, no further action required.
HBA7	If no clinical suspicion of these, no further action needed.	

Reference intervals for Common Tests sent to other laboratories

Requests forwarded to BHSCT will be available in the actual results report obtained from the laboratory or you can access via link below

(Belfast Link Labs unless stated – as per BLL User Manual – Adult Intervals)- see hyperlink below – click on lab manual

[Belfast Trust Laboratories User Manual | Belfast Health & Social Care Trust \(hscni.net\)](#)

Common requests from SEHSCT

The following test are run in Ulster Hospital Laboratory and results are available on ECR

Test	Reference interval	Units
Bile Acids	0 - 10 (Fasting)	umol/L
	0 - 14 (Non-Fasting)	umol/L
Calprotectin (Faecal)	<60	ug/g
	Possible inflammatory disease >60	ug/g



New Patient
Pathway_Version 2_C

How to interpret Calprotectin - see Document New Patients Pathway

Details regarding the origin and nature of quoted reference intervals are available upon request – please contact Clinical Biochemistry Consultant Staff.

ALL OTHER TEST REFERENCE Intervals Contact Laboratory

Pathology harmony

To keep in line with other UK Clinical Biochemistry Laboratories the following Pathology Harmony reference intervals and units were adopted by the WHSCT from 20 Oct 2010.
[Pathology Harmony- see www.pathologyharmony.co.uk is a UK wide DoH initiative to harmonise several aspects of work including reference intervals within the clinical Laboratory]

Table 24 Pathology Harmony reference intervals

Analyte (Serum unless stated)	New UK wide Pathology Harmony Reference Intervals for non-pregnant Adults		Old WHSCT Reference Intervals (Same units unless stated)
Sodium	133 – 146	mmol/L	136 - 145
Potassium	3.5 – 5.3	mmol/L	3.5 – 5.1
Chloride	95 – 108	mmol/L	98 – 107
Bicarbonate	22 – 29	mmol/L	22 – 29
Urea	2.5 – 7.8	mmol/L	2.5 – 6.4
Phosphate	0.8 – 1.5	mmol/L	0.8 – 1.55
Magnesium	0.7 – 1.0	mmol/L	0.75 – 1.25
Albumin	35 – 50	g/L	35 – 50
Total Protein	60 – 80	g/L	64 – 83
Osmolality	275 – 295	mmol/kg	285 – 295
ALP	30 – 130	U/L	40 – 130
CK	40 – 320 Male 25 – 200 Female	U/L	40 – 170
Adjusted Calcium	2.2 – 2.6	mmol/L	2.10 – 2.55
Total Bilirubin	Less than 21	µmol/L	1 – 17
Urate	200 – 400 Male 140 – 360 Female	µmol/L	180 – 420
Carbamazepine	4 – 12	mg/L	8 – 12 single drug 4 – 8 multiple drug
Phenobarbitone	10 – 40	mg/L	10 – 40
Phenytoin	5 – 20	mg/L	10 – 20
Theophylline	10 – 20	mg/L	10 – 20
Lithium	0.4 – 1.0	mmol/L	0.4 – 1.0 (0.4 – 0.8 elderly)

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Analyte (Serum unless stated)	New UK wide Pathology Harmony Reference Intervals for non-pregnant Adults		Old WHSCT Reference Intervals (Same units unless stated)
24h Urine Calcium	2.5 – 7.5	mmol/24h	2.5 – 7.5
24h Urine Phosphate	15 – 50	mmol/24h	12.9 – 42.0
24h Urine Urate	1.5 – 4.5	mmol/24h	Less than 4.8
24h Urine Magnesium	2.4 – 6.5	mmol/24h	3.0 – 5.0
BNP	Units changed to ng/L from pg/mL Same number – no significant change		

Examinations performed within WHSCT and referred to other laboratories

Note: In the following table, outlining sample requirements, a number of tests are forwarded to various regional laboratories in Belfast [See under Sent to]. Such tests are not booked into or reported by the WHSCT Clinical Biochemistry Laboratory and any queries regarding these tests should be made directly to the relevant Belfast laboratory.

Table 25 Examinations performed within WHSCT and those referred or forwarded to other laboratories

Test	Sample	Volume	Container	Comments	Sent to
ACTH - Adrenocorticotrophic Hormone	Blood	4mL	EDTA/Purple Top	EDTA bottle must be filled completely to mark and transported to Lab on ice - within 30min	Endocrine Lab, RVH
Albumin (ALB)				See Bone Profile	
Albumin Creatinine Ratio (ACR)	Urine	10mL Early Morning Sample	Lemon Top Sarstedt Monovette Urine Tube	Repeat early morning samples on 3 occasions.	Altnagelvin
Alcohol (Ethanol)	Blood	4mL	Green top LiHep	Do not use alcohol wipes.	
Aldosterone (Renin)	Blood	4mL	EDTA/Purple Top Note: Red tops no longer accepted for aldosterone	Contact laboratory about patient preparation. EDTA sample bottle must be filled completely to mark and transported to lab within 3h. (Do not place on ice) Renin analysed on same specimen	Endocrine Lab, RVH
Alkaline Phosphatase Isoenzymes	Blood	4mL	SST/Yellow Top		Biochemistry Lab, RVH
Alpha Fetoprotein - Ante-Natal	Blood	4mL	SST/Yellow Top	Contact laboratory for interval in pregnancy	Dept of Genetics, BCH
Alpha Fetoprotein - Cancer Studies	Blood	4mL	Green top LiHep		Belfast Link Labs



Test	Sample	Volume	Container	Comments	Sent to
Alpha Fetoprotein - Hydatidiform Mole	Blood	6mL	Clotted/Red Top	Mole follow-up studies	Oncology, Charing Cross Hospital
Alpha Fetoprotein – Liquor	Liquor	5mL	Universal Container	Contact laboratory for reference intervals	Belfast Link Labs
Alpha Galactosidase	Blood	4mL	EDTA/Purple Top	Fabry's disease	Willink Genetics Unit, Manchester
Alpha-1-Antitrypsin	Blood	4mL	SST/Yellow Top		Biochemistry Lab, RVH
Alpha-1-Antitrypsin Phenotype	Blood	4mL	SST/Yellow Top		Biochemistry Lab, RVH
Alpha-1-Antitrypsin (GI protein loss)	Faeces	10g (min 2g)	Universal Container	Must reach laboratory within 1h.	PRU St Georges's London
Aluminium	Blood	5mL	Special tube - contact lab		Trace Metal Lab Belfast Link labs
Amino Acids - Blood	Blood	2.5mL	Green top LiHep	If Requested by Belfast. Give full clinical details including feeding and drugs. Ideally should examine urine at the same time.	Childrens Biochemistry Lab RVH
Amino Acids - Routine Screen	Blood	1mL	Green top LiHep	For screening purposes send EDTA plasma with urine. Give full clinical details including feeding and drugs.	Childrens Biochemistry Lab RVH
Amino Acids - Urine	Urine	10mL	Lemon Top Sarstedt Monovette Urine Tube	Give full clinical details including feeding and drugs. Ideally should examine plasma and urine at the same time.	Childrens Biochemistry Lab RVH
Aminophylline				See Theophylline	
Ammonia	Blood	4mL	EDTA/Purple Top	Transport sample to lab on ice without delay. Within 60min. Inform Lab prior to venepuncture. Do not use sterets/alcohol at site of venepuncture.	
Amphetamines	Urine - Random	10mL	Lemon Top Sarstedt Monovette Urine Tube		Toxicology Lab, Belfast Link Labs
Amylase - plasma	Blood	4mL	Green top LiHep		
Amylase – Random urine	Urine	10mL	Lemon Top Sarstedt Monovette Urine Tube	Needs a paired Green top LiHep for plasma amylase	
Amylase - 24h urine	Urine	24h collection	Plain 24h Urine Bottle		
Anaphylaxis	Blood	4mL	SST/Yellow Top	3 samples required: ASAP post reaction (within 1h), 2h post and 24h post. Samples	Immunology Belfast Link Labs

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Test	Sample	Volume	Container	Comments	Sent to
				analysed for Mast Cell Tryptase. Note: Procedure for the Notification and Initial Investigation of Suspected Anaphylaxis form must be completed – contact Laboratory.	
Androgen Profile	Blood	3mL	Green top LiHep	Includes: Testosterone, Sex Hormone Binding Globulin, Free Androgen Index, DHEA Sulphate.	Endocrine Lab, RVH
Androstenedione	Blood	6mL	Clotted/Red Top		Endocrine Lab, RVH
ACE Angiotensin Converting Enzyme	Blood	3mL	Green top LiHep		Biochemistry Lab, RVH
Anti-SARS-CoV-2 antibodies N (COVID antibodies)	Blood	4mL	SST/Yellow Top	Results reported as DETECTED or NOT DETECTED	Belfast Link labs
APO A1	Blood	4mL	SST/Yellow Top		Uni Hospital Wales
APO B	Blood	4mL	SST/Yellow Top		Uni Hospital Wales
APO E Genotype	Blood	4mL	EDTA/Purple Top	Contact Laboratory	St. Thomas' Hospital, London
Ascitic Fluid				See Fluid Analysis	
Ascorbic Acid				See Vitamin C	
Auto Antibody Screen	Blood	4mL	SST/Yellow Top	Full clinical history must be given	Dept of Immunology, RVH
Bence Jones Protein	Urine - Random	10mL	Lemon Sarstedt Monovette Urine Tube	An early morning urine specimen is preferred.	Altnagelvin
Beta HCG - Antenatal	Blood	3mL L	Green top LiHep		
Beta HCG - Cancer studies	Blood	4ml	SST/Yellow Top		Endocrine Lab, RVH / Charing Cross Hospital
Beta-2-Microglobulin	Blood	4mL	SST/Yellow Top	Reference interval is age related. Contact laboratory.	Biochemistry Lab, RVH
Bile Acids	Blood	3mL	Green top LiHep	Look up results in ECR	Ulster Hospital
Bilirubin Direct (Conjugated)	Blood	3mL	Green top LiHep	Same specimen may be used for Total and Direct Bilirubin	
Bilirubin Paediatric	Blood	0.5mL	Capiject Tube/Green	Same specimen may be used for Total and Direct Bilirubin	
Bilirubin Total	Blood	3mL	Green top LiHep	Same specimen may be used for Total and Direct Bilirubin	
Biotinidase	Blood	3mL	Green top LiHep		Sheffield Childrens Biochemistry Lab



Test	Sample	Volume	Container	Comments	Sent to
Blood Gas Analysis NOT UKAS – accredited	Blood	2mL	1mL Heparinised Blood Gas Syringe, capillary tube, microsampler	If required – use POCT devices – there are no blood gas analysers in the Lab. Allow no air to mix with specimen or be trapped in syringe. Needle must NOT be left on syringe, use syringe cap. Do not send on ice.	POCT
NT- ProBNP (B-Type Natriuretic Peptide)	Blood	3mL	Green top LiHep	Samples must reach lab within 24h.	
Bone Markers CTX serum crosslaps BAP Ostase Bone specific ALP P1NP	Serum`	4mL	SST/Yellow Top	Timing of sample: (08:00am to 11:00 am) & FASTING. Samples should be taken at the same time and conditions for all measurements. Sample should reach lab within 2h. Belfast analyses all 3 markers on one tube [BAP and Ostase are shorthand for bone specific ALP]	Belfast Link Labs
Bone Profile	Blood	3mL	Green top LiHep	ALP interval is age and sex related.	
Breast Cancer Marker BrCa1	Blood		EDTA/Purple Top	Phone Dr Morrison BCH 329241 ext 2764 first.	Dept of Genetics, BCH
C Reactive Protein (CRP)	Blood	3mL	Green top LiHep		
C1 Esterase Inhibitor	Blood	4mL	SST/Yellow Top		Immunology, RVH
C3 Nephritic Factor (C3NeF)	Blood	4mL	SST/Yellow Top		Immunology, RVH
CA - 15-3	Blood	4mL	SST/Yellow Top	Contact laboratory for further information.	Oncology, Charing Cross Hospital
CA - 19-9	Blood	3mL	Green top LiHep	Contact laboratory for further information.	Belfast Link Labs
CA-125	Blood	3mL	Green top LiHep	Contact laboratory for further information.	Belfast Link Labs
Caffeine	Blood	6mL	Clotted/Red Top	Gel tube not suitable.	Birmingham
Calcitonin	Blood	3mL	Green top LiHep	Send to laboratory on ice within 4h. [Note: sample stable at RT for 2h]	Endocrine Lab, RVH
Calcium - Plasma	Blood	3mL	Green top LiHep		
Calcium - Urine	Urine – 24h	24h collection	Issued from Laboratory	24h bottle contains dilute HCl acid	
Calculi Analysis (Renal Stones)	Calculi		Universal Container		Belfast Link Labs



Test	Sample	Volume	Container	Comments	Sent to
Calprotectin	Faeces	5g	Universal Container	Look up results in ECR	Ulster Hospital Laboratory
Carbamazepine (Tegretol)	Blood	3mL	Green top LiHep	Take specimen immediately before next oral dose - Trough	
Carboxy Haemoglobin (COHb - CoOx) NOT UKAS – accredited in Altnagelvin	Blood		1mL Heparinised Blood Gas Syringe, capillary tube, micro sampler or 3mL Green top LiHep	If required – use POCT devices – there are no blood gas analysers in the Lab. Needle must NOT be left on syringe, use syringe cap.	POCT
Carnitine	Blood	1mL	Green top LiHep		Sheffield Childrens
Carotene (Vit A + E)	Blood	4mL	SST/Yellow Top	No longer available - Vit A and E analysed. Send in envelope to shield from light –.	Biochemistry Lab, RVH
Catecholamines - Blood	Blood		Contact Laboratory	See CC/CP/024 – Plasma metanephrines now first choice.	St Helier Blood Sciences Laboratory
Catecholamines - Urine				See Metanephrines	
CEA (Carcino Embryonic Antigen)	Blood	3mL	Green top LiHep		Belfast Link Labs
Ceruloplasmin	Blood	4mL	SST/Yellow Top		Biochemistry Lab, RVH
Chloride - Sweat	Sweat			See Sweat Test	Altnagelvin
Cholecalciferol				See Vitamin D	
Cholesterol - Total	Blood	3mL	Green top LiHep	Total cholesterol > 5.0 mmol/L may indicate an increased risk of vascular disease.	
Cholinesterase Activity	Blood	4mL	SST/Yellow Top	Samples should be collected the day after any induced apnoea. Or 6 weeks after if FFP or cholinesterase preparation used to treat.	Cholinesterase Investigation Unit, Bristol
Cholinesterase Phenotyping	Blood	4mL	SST/Yellow Top	See above	Cholinesterase Investigation Unit, Bristol
Chondroitin Sulphate				See Mucopolysaccharides Screen	Childrens Biochemistry, RVH
Chromium (+ Cobalt)	Blood	5mL	Special tube - contact lab	Results available via NIECR	Trace Metal Lab Charing cross
Citrate – 24h Urine	Urine – 24h	24h collection	Issued from Laboratory	24h bottle contains Thymol	Belfast Link Labs
CKMB Isoenzyme	Blood	4mL	SST/Yellow Top	Only assayed if Total CK is > 170 U/L	Biochemistry Lab, RVH

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Test	Sample	Volume	Container	Comments	Sent to
Clozapine	Blood	4mL	EDTA/Purple Top	Whole blood	Department of Clinical Biochemistry, City Hospital, Dudley Rd, Birmingham, B18 7QH
Clobazam	Blood	6mL	Clotted/Red Top	Gel tube not suitable. See Benzodiazepine	Clinical Biochemistry Dept, City Hospital, Birmingham
Clonazepam	Blood	3mL	Green top LiHep	Contact laboratory before proceeding. Poisons unit Tel 01719555095 must be contacted first.	Kings College Toxicology
Cobalt (+Chromium)	Blood	5mL	Special tube - contact lab		Trace Metal Lab Charing cross
Complement - C3, C4	Blood	4mL	SST/Yellow Top	Send immediately to Lab	Altnagelvin
Copeptin				Contact Laboratory	
Copper - Blood	Blood	4mL	Special Container. Contact Laboratory	If other Trace metal samples are required then special tube required – contact lab	Trace Metal Lab, Belfast Link Labs
Copper - Urine	Urine – 24h	24h collection	Plain 24h Urine Bottle		Trace Metal Lab, Belfast Link Labs
Cortisol - Blood	Blood	3mL	Green top LiHep	Random plasma cortisol samples are of very limited value.	Altnagelvin
Cortisol - Urine	Urine – 24h	24h collection	Plain 24h Urine Bottle		Endocrine Lab, RVH
C-Peptide	Blood	3mL	Green top LiHep	Specimen must be sent to laboratory without delay. Plasma should be separated within 4h.	Endocrine Lab, RVH
Creatine Kinase (CK)	Blood	3mL	Green top LiHep		
Creatinine Clearance	Blood and Urine – 24h	3mL 24h collection	Green top LiHep Plain 24h Urine Bottle	Specimen of blood for plasma creatinine must be collected during the period of urine collection.	
Cryoglobulins	Blood			Contact Laboratory	Altnagelvin
CSF - Cerebral Spinal Fluid	CSF	1mL	Universal Container	Do not send via pneumatic tube	
CSF Protein Electrophoresis (Oligoclonal Bands)	CSF and Blood	0.5mL 4mL	Universal Container SST/Yellow Top	Do not send via pneumatic tube	Biochemistry Lab, RVH
CSF Tau Protein (Asialylated transferrin)	Nasal Fluid	0.5mL 4mL	Universal Container	For CSF Rhinorrhoea	Neuroimmunology & CSF Laboratory, (Box 76) 9th floor



Test	Sample	Volume	Container	Comments	Sent to
					UCL Queen Square Institute of Neurology Queen Square London WC1N 3BG
CSF Xanthochromia	CSF	1mL	Universal Container	Samples should be shielded from light. Do not send via pneumatic tube	Altnagelvin
Cyclosporin	Blood	4mL	EDTA/Purple Top	Sent to various centres depending on source of request.	Freemans Kings College Harefield Newcastle Belfast
Cystine	Urine – 24h	24h collection	Plain 24h Urine Bottle		Belfast Link labs
Cystine Screen	Urine - Random	10mL	Lemon Top Sarstedt Monovette Urine Tube	Early morning sample preferred.	Belfast Link Labs
Dehydroepiandro- sterone Sulphate DHEAS (DHAS)	Blood	3mL	Green top LiHep		Endocrine Lab, RVH
Digoxin	Blood	3mL	Green top LiHep	Take sample at least 6 - 8h after last oral dose.	
Drug Overdose / Poisoning	Blood Urine	3mL 10mL	Green top LiHep Lemon Sarstedt Urine tube	Indicate suspected drug ingested if known	Toxicology Lab, Belfast Link labs
Drugs of Abuse Screen - Amphetamine, Barbiturates, Benzodiazepines, Cannabinoids, Cocaine Metabolites, Opiates, LSD.	Urine - Random	10mL	Lemon Top Sarstedt Monovette Urine Tube	Indicate which drug group patient is suspected of abusing. Not available as an emergency test.	Toxicology Lab, Belfast Link Labs
Electrolyte Profile	Blood	3mL	Green top LiHep		
Electrolytes Urine	Urine – 24h Urine - Random	24h collection / 10mL	Plain 24h Urine Bottle Lemon Top Sarstedt Urine Tube		
Ethosuximide - Zarontin	Blood	6mL	Clotted/Red Top		Toxicology Lab, Belfast Link Labs
Ethylene Glycol	Blood	2mL	Sodium Fluoride/Grey Top	Contact Laboratory	Toxicology Lab, Belfast Link Labs
Faecal Fat Excretion				No longer done.	
Fatty Acids, Very long chain	Blood	2mL	Green top LiHep	Contact 02872222148	Sheffield Children's Laboratory




Test	Sample	Volume	Container	Comments	Sent to
Fluid Analysis NOT UKAS - accredited	Drain Fluid	10mL	Lemon Top Sarstedt Monovette Urine Tube / 1mL heparinised gas syringe - for pH	One or all of: pH, Total Protein, Amylase, Triglyceride, LDH. If pH required an extra 2mL is needed collected in a heparinised syringe. Plasma sample should also be sent.	Altnagelvin
		2mL	Green top LiHep		
	Blood	4mL			
Folate	Blood	3mL	Green top LiHep	Analysed with Vitamin B12. Fasting sample required. Folate relatively unstable – samples should reach lab within 4h.	
Free Androgen Index- FAI		See Androgen Profile			
Free Light Chains	Blood	4mL	SST/Yellow Top	May be requested on same sample as Protein electrophoresis	Altnagelvin
Fructosamine	Blood	4mL	SST/Yellow Top		Clinical Biochemistry Dept, City Hospital, Birmingham
FSH - Follicle Stimulating Hormone	Blood	3mL	Green top LiHep		Endocrine Lab, RVH
Galactose-1-Phosphate	Blood	1mL	Green top LiHep	EDTA/Purple Top not suitable	Dept. of Newborn Screening and Biochemical genetics, Birmingham Children's Hospital
Galactose-1-Phosphate Uridyl Transferase GPUT (Beutler Test)	Blood	0.5mL	Green top LiHep	EDTA/Purple Top not suitable	Childrens Biochemistry Lab, RVH
Gastrin	Blood	4mL	EDTA/Purple Top	See Gut Hormone profile	Regulatory Peptide Lab, RVH
Gentamicin	Blood	3mL	Green top LiHep	EDTA/Purple Top also suitable.	
Glucagon				See Gut Hormone Profile	
Glucose - plasma	Blood	2mL	Sodium Fluoride/Grey Top	Sodium fluoride/grey top sample is stable after 30min. Hypoglycaemia cannot be reliably diagnosed on a SST/yellow top sample.	
Glucose Tolerance Test	Blood	2 x 2mL	Sodium Fluoride/Grey Top	Time 0 and time 120min	
Hb A _{1c} Glycated Haemoglobin -	Blood	4mL	EDTA/Purple Top		
Glycosaminoglycans (GAGS)				See Mucopolysaccharides	

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Test	Sample	Volume	Container	Comments	Sent to
Gold	Blood	5mL	Special tube - contact laboratory		Trace Metal Lab, Belfast Link labs
Growth Hormone	Blood	3mL	Green top LiHep	Contact laboratory. Random levels of limited value.	Endocrine Lab, RVH
Gut Hormone Profile: Glucagon, Secretin, VIP, Pancreatic Polypeptides, Gastrin	Blood	16 mL (for full profile)	EDTA/Purple Top x 4	VIP only - 2 x EDTA PP only - 1 x EDTA Gastrin only - 1 x EDTA Samples should be sent on ice. Green top LiHep also suitable for Gastrin but not other gut hormones. Stable on ice for 2h.	Regulatory Peptide Lab, RVH
Haemochromatosis - Gene analysis	Blood	4mL	EDTA/Purple Top		Haematology Dept, Belfast Link Labs
Haptoglobin	Blood	4ml	SST/Yellow Top		Altnagelvin
HCG - Human Chorionic Gonadotrophin	Blood	3mL	Green top LiHep	Tumour marker requests referred to Belfast Link labs	Altnagelvin, SWAH, Belfast Link Labs
Homocysteine	Blood	4mL	EDTA/Purple Top	Transport sample to lab on ice within 30min. Inform Lab prior to venepuncture.	Belfast Link Labs
Hydroxybutyrate, Beta	Blood	3mL 2mL	Green top LiHep or Sodium Fluoride/Grey Top		
5-HydroxyIndole Acetic Acid (5-HIAA)	Urine – 24h	24h collection	Plain 24h Urine Bottle	Avoid foods rich in 5-HT before and during collection. Contact Laboratory for full list.	Biochemistry Lab, RVH
17-Hydroxy Progesterone	Blood	1mL	Clotted/Red Top	Yellow or green not suitable. Used for diagnosis of CAH. Sample should be taken between 8 and 9am. Infant should be 2 days old. Minimum of 1mL of serum required. Haemolysed samples unsuitable. Samples batched and <i>This is a specialised test provided by the Regional Endocrine Laboratory, Kelvin Building, Royal Victoria Hospital, Belfast.</i> <i>Due to the specialist nature of this assay samples are batched and analysed approximately every 10-14 days.</i> <i>If you require a sample to be analysed urgently for 17OHP please contact the laboratory</i>	Endocrine Lab, RVH



Test	Sample	Volume	Container	Comments	Sent to
				<p>to discuss, otherwise it will be analysed in the next routine batch (ie not treated as urgent). Please phone: Kirsty Spence (Principal Clinical Scientist) on 028961 51487 Neil Gilmore (Clinical Scientist) 028961 51488 Margaret McDonnell (Consultant Clinical Scientist) on 028961 51486</p> <p>NB babies must be at least 48h old before collection of sample for this test.</p>	
Hydroxyproline	Urine – 24h	24h collection	Plain 24h Urine Bottle	Avoid meat, fish and gelatine for 24h before and during collection	Biochemistry Lab, RVH
Hypertension Compliance screen	Urine - Random	10mL	Lemon Top Sarstedt Urine Tube	<p>NCAT Request form should be filled out</p>  <p>NCAT Request form .docx</p>	Pathology/Special Chemistry University Hospitals of Leicester Pathology Services
Hypo -Pack				Contact Laboratory	Childrens Biochemistry Lab, RVH
IgE – Total or RAST	Blood	4mL	SST/Yellow Top		Immunology, RVH
IgG Subclasses	Blood	4mL	SST/Yellow Top		Biochemistry Lab, RVH
Imipramine	Blood	6mL	Clotted/Red Top	Gel tube unsuitable. Sample should be taken pre-dose. Contact BCH, Ext.3168.	Kings's College
Immunoglobulins	Blood	4mL	SST/Yellow Top	In childhood reference intervals vary with age.	Altnagelvin
Indicans	Urine – 24h	24h collection	Plain 24h Urine Bottle		Biochemistry Lab, RVH
Insulin - Pro		See Proinsulin			
Insulin + C-Peptide	Blood	3mL 2mL	Green top LiHep Sodium Fluoride/Grey Top	Sodium Fluoride/grey Top for glucose MUST be taken at the same time. Send specimens to Laboratory immediately.	Endocrine Lab, RVH
Insulin Antibodies	Blood	4mL	SST/Yellow Top		SAS Peptide Hormone Section Clinical Laboratory Royal Surrey County Hospital

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Test	Sample	Volume	Container	Comments	Sent to
					Egerton Road Guildford
Insulin Receptor Antibodies	Blood	4mL	SST/Yellow Top		Endocrinology Laboratory Addenbrooke's Hospital Hills Road Cambridge CB2 2QQ
Insulin-Like Growth Factor (IGF-1)	Blood	3mL	Green top LiHep	Send to lab immediately.	Endocrine Lab, RVH
Iron (Fe)	Blood	3mL	Green top LiHep	For suspected Iron deficiency, measure Ferritin only. For suspected overload request Iron Overload Profile.	
Iron Profile (Iron, Ferritin, TSat%)	Blood	3mL	Green top LiHep	Sample should be taken after overnight fast.	
Lactate	Blood	2mL	Sodium Fluoride/Grey Top	Samples should be sent to Lab at RT within 1h. Samples received >6h will not be processed. [Lactate levels in whole blood may increase by up to 20% 6h].	
Lactate NOT UKAS – accredited	CSF	1mL	Universal Container		
Lamotrigine (Lamictal)	Blood	6mL	Clotted/Red Top	Gel tube unsuitable. Sample before next dose	Toxicology Lab, Belfast Link Labs
Lanoxin				See Digoxin	
Largactil	Blood	6mL	Clotted/Red Top	Chlorpromazine	Toxicology Lab, Belfast Link Labs
Laxative Screen	Urine	10mL	Lemon Top Sarstedt Monovette Urine Tube	Prior approval by Consultant required	Chemical Pathology Reception Dept of Clinical Biochemistry Turnberg Building Salford Royal Hospital Stott Lane Salford, M6 8HD
LDH (Lactate Dehydrogenase)	Blood	3mL	Green top LiHep		
Lead - Blood	Blood	4mL	EDTA/Purple Top Or special Trace metal tube		Trace Metal Lab Belfast Link labs
Lead - Urine	Urine – 24h Urine – Random	24h collection 10mL	Plain 24h Urine Bottle Lemon Top Sarstedt Monovette Urine Tube		Trace Metal Lab Belfast Link labs

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Test	Sample	Volume	Container	Comments	Sent to
Leucocyte Lysosomal Enzymes	Blood	4mL	EDTA Purple Top		Willink Biochemical Genetics Unit, Manchester
Levetiracetam (Kepra)	Blood	6mL	Clotted/Red Top	Gel tube unsuitable. Sample before next dose. May be analysed on same sample as Lamotrigine if patient on both drugs	Toxicology Lab, Belfast Link Labs
Lipase	Blood	3mL	Green top LiHep		Biochemistry Lab, RVH
Lipid Profile	Blood	3mL	Green top LiHep	Specimen should be collected after an overnight fast.	
Lipoprotein Electrophoresis	Blood	4mL	EDTA Purple Top	Specimen should be collected after an overnight fast.	Belfast Link Labs
Lithium	Blood	4mL	SST/Yellow Top	Take sample 12h after last dose.	
Liver Profile	Blood	3mL	Green top LiHep	ALP reference interval is age related.	
Luteinising Hormone (LH)	Blood	3mL	Green top LiHep		Endocrine Lab, RVH
Magnesium - Blood	Blood	3mL	Green top LiHep		
Magnesium - Urine, 24h	Urine – 24h	24h collection	Issued from Laboratory	24h bottle contains dilute HCl acid.	
Magnesium - Urine, Random	Urine - Random	10mL	Lemon Top Sarstedt Monovette Urine Tube	Interpretation dependent on plasma magnesium and magnesium intake.	
MELAS Genetic testing	Urine-Early Morning	20mL	Universal Container	Samples posted to Newcastle so should be collected Mon-Fri	Newcastle Mitochondrial Service
Mercury	Urine	10mL	Lemon Top Sarstedt Monovette Urine Tube	METAL BEDPAN MUST NOT BE USED TO COLLECT URINE. Contact. BCH Ext. 2017 for details.	Trace Metal Lab, Belfast Link Labs
Metanephrines - Paediatric	Urine - Random	15mL	Contact Laboratory	Sample must be collected into acid. (500uL of 40% HCl to 15 mL of urine)	Biochemistry Lab, RVH
Metanephrines - Urine	Urine – 24h	24h collection	Issued from Laboratory	24h bottle contains dilute HCl acid. Repeat twice if clinical suspicion is high. Patients should avoid stimulants (e.g. coffee) and paracetamol on day of and day before test.	Biochemistry Lab, RVH
Metanephrines - Plasma	Blood	4mL	EDTA Purple Top	See – CC/CP/024. Samples should be collected following an overnight fast and after patient has been	Department of Blood Sciences Freeman Hospital Freeman Road



Test	Sample	Volume	Container	Comments	Sent to
				supine for a minimum of 30min. [Record if supine or seated]. Collect one Purple Top EDTA whole blood (minimum volume 1mL) and Gently invert 8 times), place on ice and transport to the Clinical Biochemistry Laboratory to arrive within 2h of sampling -- record time of collection on request form.	Newcastle upon Tyne NE7 7DN
Methaemoglobin (MetHb) (MetHb - CoOx) NOT UKAS – accredited	Blood	2mL 3mL	1mL Heparinised Blood Gas Syringe, capillary tube, microsampler or Green top LiHep	If required – use POCT devices – there are no blood gas analysers in the Lab. Needle must NOT be left on syringe, use syringe cap.	POCT
Methanol	Blood	2mL	Sodium Fluoride/Grey Top	BY SPECIAL ARRANGEMENT ONLY	Toxicology Lab, Belfast Link Labs
Methotrexate	Blood	6mL	Clotted/Red Top	Samples should be taken at 24h intervals after high dose therapy until serum level is <0.1 umol/L	Belfast Link Labs
Methylmalonic Acid	Urine - Random	10mL	Lemon Top Sarstedt Monovette Urine Tube		Childrens Biochemistry Lab, RVH
Muco polysaccharides (Glycosaminoglycans) (GAGS)	Urine - Random	10mL	Lemon Top Sarstedt Monovette Urine Tube		Childrens Biochemistry Lab, RVH
Myoglobin				No longer available. Plasma CK offered in place. Rhabdomyolysis renal failure unlikely if CK <5000 U/L.	
Occult Blood	Faeces	Send in Seracult Card		Should avoid red meat, dark fish, uncooked vegetables, Iron supplements and alcohol for 3 days before and during collection. Note: False positive rate is reported by manufacturer as 1-2%	
Oestradiol	Blood	3mL	Green top LiHep	State menstrual phase on form. Gel tube unsuitable.	Endocrine Lab, RVH
Oligoclonal Bands				See CSF Protein Electrophoresis	
Organic Acids	Urine - Random	10mL	Lemon Top Sarstedt	Full clinical details required.	Childrens Biochemistry Lab, RVH



Test	Sample	Volume	Container	Comments	Sent to
			Monovette Urine Tube		
Osmolality, Plasma	Blood	3mL	Green top LiHep		
Osmolality, Urine	Urine - Random	1 mL at least	Lemon Top Sarstedt Monovette Urine Tube	Appropriate urine osmolality depends on clinical status. Contact laboratory.	
Ostase				See Bone markers	
Oxalate	Urine – 24h	24h collection	Issued from Laboratory	24h bottle contains Thymol – see renal stone investigations	Belfast Link Labs
Oxyhaemoglobin (OHb – CoOx) NOT UKAS – accredited	Blood	2mL 3mL	1mL Heparinised Syringe, capillary, microsamplers or Green top LiHep	If required – use POCT devices – there are no blood gas analysers in the Lab. Needle must NOT be left on syringe, use syringe cap.	POCT
Pancreatic Polypeptides				See Gut Hormone Profile	
P-ANCA C-ANCA Vasculitis screen	Blood	4mL	SST/Yellow Top		Immunology Lab, Belfast Link Labs
Paracetamol	Blood	3mL	Green top LiHep	Sample should be taken at least 4h after drug ingestion.	
Paraquat	Urine - Random	10mL	Lemon Top Sarstedt Monovette Urine Tube	Analysis of urine is the first line test. (Blood - Green top LiHep or EDTA/Purple Top)	Toxicology Lab, Belfast Link Labs
Parathyroid Hormone (Parahormone, PTH)	Blood	4mL	EDTA/Purple Top	A Green top LiHep should also be taken for simultaneous Bone profile.	
pH – Faecal NOT UKAS – accredited	Faeces	10g	Universal Container	Samples must be received in lab within 1h of collection.	Altnagelvin
pH- Blood				See Blood Gas Analysis	
pH –Urine NOT UKAS – accredited	Urine	10mL	Lemon Sarstedt Monovette Urine		Altnagelvin
Phenobarbitone	Blood	3mL	Green top LiHep	Take specimen immediately before next oral dose - trough	Altnagelvin
Phenytoin	Blood	3mL	Green top LiHep	Take specimen immediately before next oral dose - trough	
Phosphate - Urine, 24h	Urine – 24h	24h collection	Issued from Laboratory	24h bottle contains dilute HCl acid.	
Phosphate - Urine, Random	Urine - Random	10mL	Lemon Top Sarstedt Monovette Urine Tube	Plasma and Random Urine Phosphate may be used to calculate renal tubular phosphate threshold. Contact Laboratory	Altnagelvin
Pleural Fluid				See Fluid Analysis	



Test	Sample	Volume	Container	Comments	Sent to
Porphyria Screening [PBG and TUP]	Urine	10mL	Lemon Sarstedt Monovette Urine	All samples should be light protected. If the clinical suspicion of porphyria is high, please contact Consultant staff as first line tests may on occasion give negative results.	Altnagelvin
Porphyria Typing	Blood	4mL	EDTA/Purple Top	All samples should be light protected. If the clinical suspicion of porphyria is high, please contact Consultant staff as first line tests may on occasion give negative results.	Medical Biochemistry, Cardiff.
	Urine	10mL	Lemon Sarstedt Monovette Urine		
	Faeces	10g	Universal		
Procollagen 3	Blood	4mL	SST/Yellow Top		Biochemistry Lab, RVH
Progesterone	Blood	3mL	Green top LiHep		Endocrine Lab, RVH
Prolactin	Blood	3mL	Green top LiHep	Levels up to 1000 mU/L can be induced by stress. Contact RVH ext 3180	Endocrine Lab, RVH
Protein – Random Urine	Urine	10mL	Lemon Top Sarstedt Monovette Urine Tube		
Protein – 24h Urine	Urine	24h collection	Plain 24h Urine Bottle		
Protein Electrophoresis	Blood	4mL	SST/Yellow Top		Altnagelvin
PSA - Prostate Specific Antigen	Blood	3mL	Green top LiHep	Free PSA: no longer available in NI	
Pyruvate	Blood	1mL	Contact Lab, special bottle required.	Not generally required. Lactate alone usually sufficient.	Childrens and newborn screening Lab. Newcastle
Reducing Substances - Faeces	Faeces	1g	Universal container	Send to lab within 60min of collection	Childrens, RVH
Reducing Substances - Urine	Urine - Random	10mL	Lemon Top Sarstedt Monovette Urine Tube	Send to lab immediately.	Childrens, RVH
Renal Stones				See Calculi Analysis	
Renal Stone Investigations	Urine - 24h	24h collection x 2	24h urine container with Thymol Issued from Laboratory	Two 24h urine collections required: Collected at least one week apart [Thymol] See – CC/CP/017	Biochemistry Lab, RVH



Test	Sample	Volume	Container	Comments	Sent to
	Urine Random – early am	10mL	Lemon Top Sarstedt Monovette Urine Tube	Random am urine for pH and cystine screen – bottle should be filled to top to avoid air.	
Renin (Aldosterone)	Blood	4mL	EDTA/Purple Top	Contact laboratory about patient preparation. EDTA sample bottle must be filled completely to mark and transported to lab within 3h. (Do not place on ice) Aldosterone analysed on same specimen	Endocrine Lab, RVH
Rivotril				See Clonazepam	
Rheumatoid Factor	Blood	4mL	SST/Yellow Top	Test introduced 25/10/2021	
Salicylate	Blood	3mL	Green top LiHep		
Secretin				See Gut Hormone Profile	
Selectivity of Proteinuria	Blood Urine - Random	4mL 10mL	SST/Yellow Top Lemon Top Monovette Urine Tube	Send urine and blood samples together.	Biochemistry Lab, RVH
Sirolimus	Blood	4mL	EDTA/Purple Top	Take sample before next dose. State if on combination or mono therapy. Results are recorded in Lab computer.	Toxicology Lab, Belfast Link Labs
Sweat Test		Contact Lab		Sweat Chloride measured since July 2020	
Tacrolimus (FK 506)	Blood	4mL	EDTA/Purple Top		Toxicology Lab, Belfast Link Labs
Testosterone	Blood	3mL	Green top LiHep		Endocrine Lab, RVH
Theophylline Aminophylline, Nuelin	Blood	3mL	Green top LiHep	Measure 5 days after starting oral treatment and at least 3 days after any dose adjustment. A blood sample should usually be taken 4–6h after an oral dose of a modified-release preparation. Trough levels should be taken immediately before next oral dose. If aminophylline is given intravenously, a blood sample should be taken 4–6h after starting treatment.	
Thiamine - Vitamin B1		3mL	Green top LiHep	Not available routinely	
Thio Purine Methyl Transferase	Blood	4mL	EDTA/Purple Top	Results are recorded in Lab computer.	Clinical Biochemistry Dept,

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Test	Sample	Volume	Container	Comments	Sent to
(TPMT)				RECENT BLOOD TRANSFUSIONS MAY MASK A DEFICIENT TPMT RESULT.	City Hospital, Birmingham
Thiopurine Metabolites	Blood	4mL	EDTA/Purple Top	Results are recorded in Lab computer.	Clinical Biochemistry Dept, City Hospital, Birmingham
Thyroglobulin	Blood	4mL	SST/Yellow Top	Haemolysis invalidates result	Endocrine Lab, RVH
Thyroid Antibody TPO - Thyroid Peroxidase Antibody	Blood	3mL	Green top LiHep		Endocrine Lab, RVH
Thyroid Antibody TSHR – TSH Receptor Antibody	Blood	4mL	SST/Yellow Top		PRU Sheffield
Thyroid Profile FT4 + TSH (+ FT3)	Blood	3mL	Green top LiHep		
Thyroid Profile Alternative method FT4 + TSH (+ FT3)	Blood	3mL	Green top LiHep	Sent to Glasgow for analysis on Abbott Architect analyser From 18/10/21	Clinical Biochemistry Lab Glasgow
Trace metals				See individual metals	
Transferrin	Blood	3mL	Green top LiHep	Offered as part of Iron Profile	
Trimethylamine	Urine - Random	5mL	Lemon Top Monovette Urine Tube SST/Yellow Top		Childrens Biochemistry, RVH
Troponin T	Blood	3mL	Green top LiHep		
TSH Binding Inhibitor Immunoglobulin (TBII)	Blood	6mL	Clotted/Red Top	If on neonate, samples required from mother also.	SAS Lab, RVI, Newcastle
Urate, Blood	Blood	3mL	Green top LiHep	In gout the target Uric Acid level is <360 umol/L. Samples from patients on Rasburicase should be collected in Green top LiHep and sent to lab on ice within 1h up to 4-5d after last dose (1/2 life 18h).	
Urate, Urine	Urine – 24h	24h collection	Issued from Laboratory	24h bottle contains dilute NaOH.	
Valproic Acid Sodium Valproate, Epilim	Blood	3mL	Green top LiHep	Only of value in assessing compliance -- there is no well defined therapeutic or toxic range.	Altnagelvin
Vancomycin	Blood	3mL	Green top LiHep	EDTA/Purple Top also suitable.	Altnagelvin
Vasoactive Intestinal Peptide (VIP)				See Gut Hormone Profile	
Vasopressin				Replaced by Copeptin	

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Test	Sample	Volume	Container	Comments	Sent to
Vitamin A	Blood	4mL	SST/Yellow Top	Analysed with Vit E. Send in envelope to shield from light.	Biochemistry Lab, RVH
Vitamin B1				See Thiamine	
Vitamin B12	Blood	3mL	Green top LiHep	Analysed with Folate. Fasting sample required.	
Vitamin C	Blood	3mL	Green top LiHep	Contact laboratory in advance. Specimen must be transported to lab on ice within 60min and shielded from light. EDTA/Purple Top not suitable	Biochemistry Lab, RVH
Vitamin D	Blood	4mL	SST/Yellow Top	Specimen must be transported to the laboratory within 3h. Current assay measures 25OH D2 and D3.	Endocrine Lab, RVH
Vitamin E	Blood	4mL	SST/Yellow Top	Analysed with vitamin A. Send in envelope to shield from light.	Biochemistry Lab, RVH
Zarontin				See Ethosuximide	
Zinc	Blood	4mL	Special Container. Contact Laboratory		Trace Metal Lab, Belfast Link Labs

For tests not listed above – contact Clinical Biochemistry Laboratory