Biochemistry User Guide

Contents

Contact details of key members of staff

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The contact number for the biochemistry department is 0161 446 3298.
The full contact details of all laboratory personnel can be found on the staff directory.

The location of the laboratory

The Biochemistry laboratory is situated within the Pathology Department (Department 45) located at the Wilmslow Road end of the 1st floor corridor, above main out-patients. Follow signs for Pathology.

Services offered by the laboratory

A comprehensive service is available for clinical biochemistry testing, including routine profiles, endocrinology, therapeutic drug monitoring, specialist proteins and tumour marker analyses. Full details of tests routinely available, sample requirements and expected turn-around times are detailed in the Biochemistry Test Directory.

For any test not listed, please contact Biochemistry (ext 3298) to discuss test availability and specimen requirements.

Point of care testing (POCT) analysers are available on CCU and the surgical theatres. A POCT analyser is also available on OAU out of hours. Training for use of POCT devices is compulsory. Please contact Dr Sally Thirkettle (POCT co-ordinator) to arrange training if required (ext 3298).

Glucose meters for POCT blood glucose are available on all wards and in certain departments. Support and training is provided by the biochemistry POCT co-ordinator (ext 3298)

Times of opening of the laboratory

Mon – Fri
07:00 – 08:30 – limited service
08:30 – 17:00 – routine service
17:00 – 21:00 – limited service
21:00 – 07:00 – urgent requests for the immediate management of the patient only
Sat/Sun
08:00-17:00 - limited service
17:00 – 08:00 - urgent requests for the immediate management of the patient only

Selected **urgent** Biochemistry, Haematology and Transfusion tests required for the immediate management of the patient are available from the on-site laboratory overnight:

The test repertoire available from 21:00 – 07:00):

FBC	
Coagulation screen	
Crossmatch	Only if Hb < 8 and patient symptomatic (NB Transfusion policy discourages transfusion overnight unless essential)
Issue of platelets	
Issue of blood products	
Christie profile / U&E	
Glucose	
Magnesium	
Amylase	
ALT	
CRP	
Creatine Kinase	
Uric acid	
Lipase	
Ammonia	
Lipid profile	
CSF glucose	
CSF protein	
Urine U&E	
Vancomycin	
Gentamicin	
Troponin I	
Serum / Urine Osmolality	
Pregnancy Test	
Cortisol	
Amikacin	Not provided on site - Urgent requests for these tests will be referred to external hospital for processing.
Digoxin	
Ethanol	
Lithium	
Salicylate	
Paracetamol	
Theophylline	
Co-oximetry (methaemoglobin, carboxyhaemoglobin)	
Phenytoin	

For Haematology/Biochemistry samples

After 21:00 all samples should be sent to the lab via POD 222. There is no need to ring to notify the lab unless your request requires immediate attention, in which case you should call the Biomedical Scientist on 07387140948 as staff may be occupied elsewhere.

Requests for Blood / Blood Products

The Biomedical Scientist must be contacted on 07387140948 if Blood / Blood Products are required between 21:00 – 07:00. Requests that are sent for provision of products outside of this time do not require pre-notification.

Point of Care (POCT) Testing

Three blood gas analysers are available permanently sited on CCU, Surgical Theatres and OAU. Please use an alternative analyser if any one of these is not operating.

Analysis can only be done by staff that have completed the appropriate training.

Sodium, potassium, urea (CCU only), creatinine (CCU only), chloride, bicarbonate, calcium (ionised), glucose, lactate pH, pO_2 and pCO_2 and co-oximetry are available on the POCT analysers.

In the unlikely event that all 3 POCT analysers are not working and a blood gas result is required out of hours, please contact the on-call BMS at Manchester Royal Infirmary (MRI) (0161 276 4375 or via MRI switchboard 0161 276 1234 and ask for bleep 2722) prior to taking the sample. To minimise the time delay between taking the sample and subsequent analysis at MRI, also ensure transport has been arranged via Christie switchboard prior to taking the sample. Ideally the sample should be transported on ice to minimise sample deterioration.

In the event there is no transmission of results to the CWP, please retain your result print-outs form the blood gas analysers.

Consent

It is the responsibility of the requesting clinician to obtain consent from the patient for the collection of blood specimens. For certain tests (e.g. genetic testing) a consent form may be required in addition to the request form.

Privacy Policy

For details of the Synlab Group Privacy Policy – please click the following link - https://www.synlab.com/privacy-policy

Instructions for requesting tests

Patient preparation and blood sampling:

Trust I.V. policies managed by clinical skills team can be found on HIVE.

Any patient preparation requirements for tests are detailed in the A-Z Biochemistry Test Directory.

Please contact the Duty Biochemist on ext 3298 to discuss patient preparation, specimen type and stability for infrequently requested tests.

All specimens must be fully labelled and accompanied by a completed combined Haematology/Biochemistry request form. Inadequately or incorrectly labelled samples will not be processed

The request form

Forms should be labelled on both copies with an addressograph label showing patients Christie Hospital number, patients full name full name and date of birth. Hand-written forms must have the Christie hospital number, patients full name,and date of birth. Tests required must be clearly indicated. High risk status MUST be indicated where appropriate on the form. The form should also include consultant (4 letter code), location and requestor's contact number to ensure the results is delivered to the appropriate destination (including phoning of abnormal results). The date and time the specimen was taken, reason for request / clinical information and signature of sample taker should also be provided.

Referred tests require NHS Number, Full name and date of birth. On both sample and corresponding request form, otherwise the request will be rejected.

A high risk label should be included on the request if active blood borne virus infection is present (which does not include people with treated or otherwise cleared Hepatitis B or C who have had negative Hep B surface antigen or negative Hep C PCR)

Order Comms

For samples received via the Order Comms system, acceptance criteria for electronic requests is a function of sample receipt and check of the label on the tube for correct tube type. Samples are run as identified via the unique number linked to the correct patient in the LIMS.

Where demographic labels are used, Patient full name, Christie Hospital number and Date of Birth must be clearly legible on the sample sticker.

The lab will not accept any manual modifications to the sample label.

CWP eForm:

CWP e-Request Form in use in the Endocrine Unit and Pre-operative assessment Clinic. Additional hand written requests are not permitted nor accepted on the eForm. The reflective testing function on CWP can be used to request additional tests if they are required.

The specimen

Details of specimen type and volume required are detailed in the Biochemistry Test Directory. All specimens must have the full name, hospital number and date of birth completed by hand - addressograph labels should not be used. High Risk status must be indicated by a label on the sample if appropriate Specimens from patients receiving GMOs as part of treatment must be identified with the 'GMO' label. Where possible the date and time specimens were taken, location of patient and signature of specimen taker should also be completed.

NB. At no time should blood be transferred from one container to another. This may result in contamination of the specimen with inappropriate anticoagulant and will invalidate the results obtained.

Urgent Samples

Requests to process samples urgently will only be accepted if there has been a prior phone call to the laboratory or there was a personal request to the liaison officer when the sample was delivered. Other requests, including those with ‘urgent’ or ‘please phone’ written on the request form will not be treated as urgent requests by the laboratory.

Instruction for transportation of samples

Various personnel within the Trust will be involved in transport of specimens to and from the laboratory either by hand or via the POD system. In order to protect theirs and others safety the following guidelines should be followed:

Cover any cuts and grazes with a waterproof dressing. Touch specimen containers as little as possible, washing hands as soon as practicable afterwards. Diagnostic samples must be sealed in the plastic bag attached to the request form. Carry all specimens in the trays or boxes, where provided, never in pockets. If a specimen leaks into a tray or box, tell the laboratory reception staff and ask them to make it safe.

If a specimen is dropped or broken, do not touch it or try to clear up the mess. Stay with the specimen to prevent other people touching it and send someone to the laboratory for help. If you spill the specimen onto your overall, you must remove it at once and then wash your hands and put on a clean overall. Report the accident to a supervisor as soon as possible. Handle specimen containers gently at all times.

The use of the pneumatic tube system for the transport of specimens to the Biochemistry laboratory must be performed in accordance with Trust policy.

Do not send blood gas samples or samples on ice via the POD system.

Patient collected samples

Instructions for the collection of 24-hour urine samples by patients and their delivery to the laboratory can be found on The Christie intranet site.

Reporting of Results

Some results are automatically validated if they fulfil stringent pre-set criteria; otherwise they are clinically validated by appropriately qualified laboratory personnel. Comments may be appended and additional analyses undertaken based on the clinical details provided and on previous results.

Results are transmitted to the Clinical Web Portal (CWP) and printed form. Interim and final results are flagged in the appropriate column. Please note: Interim results may be subject to change; therefore clinicians are advised to contact the laboratory before making any clinical decisions based on an interim result.

The laboratory will endeavour to telephone results when they have changed significantly from a previous episode or are grossly abnormal, to facilitate this please ensure the correct patient location is provided on the request form.

Telephoning Limits

The following results will be telephoned by the laboratory to the requesting location under the following circumstances:

Acute Kidney Injury (AKI) alerts are automatically generated on the CWP using the NHS England AKI Algorithm based on the serum creatinine result.

Methotrexate results >10 umol/L will be phoned directly to the responsible Registrar or Consultant.

Please note that the primary method for transmission of all results is to the Clinical Web Portal (CWP).Whilst internal and external quality assurance programmes are in

operation to ensure accuracy and precision of results, occasionally random errors may occur and escape detection. The clinician is often best placed to detect such errors. Therefore if there is any doubt about a result, it is vital the laboratory is contacted (ext 3298) at once to investigate and re-test samples where possible.

Certain factors may affect and possibly invalidate some test results, causing potential biological and analytical interference. For example, blood transfusion and other intravenous fluids, antibiotics, anticoagulants, drugs, timing of specimen in relation to drug dose, type of tube. Please remember to give details of recent or current treatment on the request forms.

Test	**Threshold for telephoning result to requester**		**Exceptions/notes**
	Lower limit	*Upper limit*	
Adjusted Calcium (mmol/L)	≤1.80	≥3.00	Do not telephone result if the adjusted calcium is <1.8 but has been lower in last 7 days Do not telephone result if the adjusted calcium is ≥3.0 but has been higher in last 7 days
ALT and AST		>500 IU/L	Telephone all ALT and AST >500 IU/L in children up to the age of 16 years of age.
Ammonia (µmol/L)		>100	Telephone all ammonia results >100
Amylase/lipase		~ >5xULN (Amylase >500) (Lipase > 250)	Do not telephone the result if it has been higher than the current result in the last 7 days (inpatient only)
Bicarbonate	<15		Telephone all bicarbonate results <15
Cortisol (nmol/L)	<50		Telephone all cortisol results <50 unless the cortisol is part of a dexamethasone suppression test When phoning result query whether patient is on dexamethasone which may cause suppression of the HPA axis.
Cortisol (nmol/L)	>1200		Telephone result and query whether patient is on prednisolone or hydrocortisone
Cortisol SST	<500		Telephone SST result if peak cortisol is <500. This shows a sub-optimal response to Synacthen.
COVID-19 Rapid test			Telephone all positive results to the clinical team and report the details to the Incident Control Room. the-christie.incidentcontrolroom@nhs.net
Creatinine (µmol/L)		≥354	Do not telephone result if creatinine has been higher in last 7 days. Do not telephone if the result is

			expected clinically, e.g. – known CKD, renal dialysis or the patient has had a higher result in past 6 weeks. Telephone the creatinine result if the result has triggered a new stage 3 AKI alert (this can be found on CWP).
CRP		≥300	Do not telephone the result if it has been higher than the current result in the last 48 hours
Cyclosporin		≥ 500	
Digoxin (µg/L)		≥2.5	Do not telephone the result if it has been higher than the current result in the last 7 days. Telephone any digoxin ≥2.5 if the potassium <3 mmol/L.
Ferritin		> 5000	
Gentamicin (mg/L)		Trough ≥1.0	Telephone all gentamicin results ≥1.0
Glucose (mmol/L)	≤3	≥20	Consider glucose results as part of a dynamic function test (e.g. OGTT, ITT) on a case-by-case basis. Check that the glucose result has been repeated on the analyser before telephoning result.
HbA1c		≥120	Always phone HbA1c ≥120 to the requester and Louise Hopewell DM Nurse Specialist (07990530161)
Lactate		≥2.0	Telephone all results ≥2.0. Sample must be analysed ASAP (within 20 minutes)
Lithium (mmol/L)		≥1.5	Telephone all lithium results ≥1.5
Methotrexate (µmol/L)		>10	Telephone all methotrexate results >10 to the responsible Registrar or Consultant. Methotrexate should not be measured post treatment with glucarpidase.
Magnesium	≤0.3		Do not telephone result if previous results have been <0.4 in the last 2 days.
Paracetamol (mg/L)	If detectable Or less than 4		Do not telephone the result is if it has been higher than the current result in

	hours since ingestion (if time of ingestion known)		the last 24 hours
Phenytoin (mg/L)		≥25	Telephone all phenytoin results ≥25
Phosphate	≤0.30		Telephone all phosphate results ≤0.3
Potassium (mmol/L)	≤2.5	≥6.5	Telephone all potassium results outside of these limits
Salicylate (mg/L)	If detectable		Do not telephone the result is if it has been higher than the current result in the last 24 hours
Sodium (mmol/L)	≤125	≥160	Do not telephone result if the sodium has been <125 in the last 7 days and the current result is ≥120 (inpatient only) Do not telephone sodium result if sodium has been >160 in last 7 days and current result ≤165 (inpatient only) Telephone result if sodium rises greater than 8 mmol/litre in 12 hours
Theophylline (mg/L)		≥25	Telephone all theophylline results ≥25
Total CK (IU/L)		>2000	Do not telephone the result is if it has been higher than the current result in the last 7 days
Troponin I		>45	Telephone all Troponin I results >45 ng/L
Urea (mmol/L)	NA	≥30	Do not telephone results ≥30 if the result is expected clinically, e.g. – known CKD, renal dialysis or the patient has had a higher result in past 6 weeks.
Uric Acid		~ >2xULN (>700 U/L).	Telephone all uric acid results >700
Vancomycin (mg/L)		Trough >20.0	Telephone all vancomycin results >20.0

Uncertainty of measurement

All biochemical results are subject to a degree of uncertainty of measurement. This may be due to a range of factors, including:

- Biological variation within individuals
- Analytical measurement imprecision
- Pre-analytical factors

If you require more information regarding the effects of these factors on the outcome of an individual test result please contact the Duty Biochemist on ext 3298.

Clinical advice and interpretation

Clinical advice on examinations and interpretation of results is available by contacting the Clinical Scientist in the laboratory (ext 3298). Interpretative comments are included in the laboratory reports of a number of specialist tests.

Interpreting elevated glucose results

Diagnosis of diabetes should be based on two independent glucose measurements, unless the patient has symptoms of diabetes. Patients may develop a temporary diabetic state or have impaired glucose metabolism if they are unwell and on certain medication, particularly high dose steroids.

Venous plasma glucose concentration 4.1 - 6.0 mmol/L (fasting) or 4.1 – 7.7 (non-fasting) is normal; 11.1 mmol/L or greater is diagnostic for diabetes mellitus.

Between these levels it is possible that the patient has impaired glucose metabolism which can be classified according to the WHO guidelines for interpretation of Oral Glucose Tolerance Test and diagnosis of diabetes as either:

1. Impaired Fasting Glycaemia:
   Fasting venous plasma glucose of 6.1 - 6.9 mmol/L *and* (if measured)
   2 hr post 75g glucose load <7.8 mmol/L

2. Impaired Glucose Tolerance:
   Fasting venous plasma glucose <7.0 mmol/L *and*
   2 hr post 75g glucose load of 7.8 - 11.0 mmol/L.

3. Diabetes Mellitus:
   Venous plasma glucose of 11.1 mmol/L or greater, at any time *or*
   Fasting venous plasma glucose of 7.0 mmol/L or greater *or*
   2 hr post 75g glucose load ≥ 11.1 mmol/L

Guidance on Diabetes Mellitus

For further details regarding management see:

- NICE NG17 (2016) - Type 1 diabetes in adults: diagnosis and management;
- NICE NG28 (2017) - Type 2 diabetes in adults: management;
- NICE NG18 (2016) - Diabetes (type 1 and type 2) in children and young people: diagnosis and management.

Interpreting pleural fluid results

Light's Criteria are the most frequently used criteria for differentiating an exudate from a transudate; a fluid is deemed an exudate if any of the following apply:

- The ratio of pleural fluid protein to serum total protein is greater than 0.5
- The ratio of pleural fluid LDH to serum LDH greater than 0.6
- The pleural fluid LDH is greater than 2/3 of the upper reference limit for serum LDH

Light's criteria are highly sensitive in identifying an exudate; however their specificity is low particularly in patients with heart failure. Patients are more likely to have a false positive if they have received intravenous diuretics within the 24 hours preceding the pleural tap.

Normal pH of pleural fluid is approximately 7.6. A pH < 7.3 is associated with inflammatory states. If a pleural effusion is infected, the British Thoracic Society guidelines recommend that if the pH <7.2, tube drainage may be required.

Guidance on Lipids

For details regarding guidance on lipid disorders and their management refer to NICE CG181 - Cardiovascular disease (CVD): risk assessment and reduction, including lipid modification (July 2014) and European Guidelines on cardiovascular disease prevention in clinical practice (European Heart Journal 2016; 37:2315–2381).

Targets for the General population (based on Heart UK)

- Total cholesterol (TC) – ideally should be <5 mmol/L
- LDL-Cholesterol (LDL-C) - ideally it should be <3 mmol/L.
- HDL-Cholesterol (HDL-C) - ideally it should be >1 mmol/L (men)
- TC:HDL ratio – a ratio >6 is considered high risk - the lower this figure, the better.
- Triglyceride (TG) - ideally it should be <1.7 mmol/L on a fasting sample or <2.3 mmol/L on a non-fasting sample.

Familial hypercholesterolaemia (FH)

- If cholesterol >7.5 mmol/L or there is a family history of premature coronary heart disease consider diagnosis of FH.

- Diagnosis of FH is based on the Simon Broome criteria;

  Definite FH:
  a) Total cholesterol > 6.7 mmol/L or LDL-C >4.0 mmol/L in a child <16 years or Total cholesterol >7.5mmol/L or LDL-C > 4.9 mmol/L in an adult (levels either pre-treatment or highest on treatment).
  PLUS
  b) Tendon xanthomas in patient, or in 1st degree relative (parent, sibling, child), or in 2nd degree relative (grandparent, uncle, aunt)
  OR
  c) DNA-based evidence of an LDL receptor, apo B-100 or PCSK-9 mutation.

  Possible FH:
  a) Total cholesterol or LDL-C as above
  PLUS
  b) Family history of myocardial infarction below age of 50 in 2nd degree relative or below age 60 in 1st degree relative
  OR
  c) Family history of raised cholesterols: >7.5 mmol/L in adult 1st or 2nd degree relative or > 6.7 mmol/L in child or sibling under 16.
- For FH the target is 50% reduction of original LDL-C using high-intensity statins.

When to refer to a specialist:
Exclude possible common secondary causes of dyslipidaemia (such as excess alcohol, uncontrolled diabetes, hypothyroidism, liver disease and nephrotic syndrome) before referring for specialist review.

- Arrange for specialist assessment of people with a total cholesterol concentration of more than 9.0 mmol/L or a non-HDL cholesterol concentration of more than 7.5 mmol/L even in the absence of a first-degree family history of premature coronary heart disease.
- Refer for urgent specialist review if a person has a triglyceride concentration of more than 20 mmol/L that is not a result of excess alcohol or poor glycaemic control.

Monitoring patients on statins

- If patients report muscle pain or weakness while taking a statin, explore other possible causes of muscle pain or weakness and raised CK if they have previously tolerated statin therapy for more than 3 months.
- Do not measure CK levels in asymptomatic people who are being treated with a statin.
- Measure baseline liver transaminase enzymes (ALT). Measure liver transaminase within 3 months of starting treatment and at 12 months.

Common causes of secondary hyperlipidaemia
Hypercholesterolaemia: hypothyroidism; anorexia nervosa, drugs e.g. cyclosporin
Low HDL-C: smoking, obesity, insulin resistant conditions (type 2 DM, metabolic syndrome), and specific genetic mutations such as Tangier disease. Medications

which can reduce HDL levels include beta blockers, thiazide diuretics, androgens, progestogens and anabolic steroids.
High HDL-C: can be due to secondary causes such as excessive alcohol intake, exercise and medication such as oral oestrogen replacement.
Hypertriglyceridaemia: liver disease; diabetes mellitus; alcohol abuse; calorie excess/ obesity; chronic kidney disease; autoimmune conditions; pregnancy especially in third trimester; rarely hypothyroidism.
Mixed hyperlipidaemia: nephrotic syndrome; cholestatic jaundice; obesity; drugs e.g. corticosteroids, high dose thiazides, cyclosporin, tacrolimus.

Common interferences in biochemistry tests

Interferent	Analyte affected	Effect
Haemolysis	Potassium	Increase
	Urea	Decrease
	Phosphate	Increase
	Magnesium	Increase
	AST	Increase
	ALP	Decrease
	CK	Increase
	LDH	Increase
	Triglycerides	Increase
	Ammonia	Increase
EDTA contamination (e.g. FBC tube used)	Potassium	Increase
	Calcium	Decrease
	ALP	Decrease
	Magnesium	Decrease
Prolonged delay in transport to laboratory	Potassium	Increase
	Phosphate	Increase
	LDH	Increase
	Bicarbonate	Decrease
	Ammonia	Increase
Inappropriate sampling site, e.g. sample taken from drip arm	Increase in drip analyte (e.g. sodium, glucose). Dilutional effect on other analytes.	

The potential for biotin interference in immunoassays.

Immunoassays across a range of different manufacturer platforms are subject to interference by exogenous biotin supplementation. Laboratory professionals and clinical users of laboratory services must be aware of this potential interference to avoid patient harm.

The Biotin-Streptavidin couple is used in the assay design of many immunoassays. There is the potential for significant interference in immunoassays for a number of commonly requested tests in Biochemistry if patients are taking large doses of biotin/vitamin B7. Depending on the assay format, interference may produce a positive or negative bias; competitive assays have been shown to primarily result in a positive bias and for sandwich assays a negative bias.

Biotin is a water-soluble B-vitamin (B7) and although biotin levels from a normal diet and that found in low dose multivitamins is thought not to interfere, the use of biotin has recently gained increasing popularity as an over-the-counter supplement marketed as a beauty product for healthy hair, skin and nails. Many of these supplements include biotin at concentrations up to as much as 10 mg readily available from health food stores and online. High-dose biotin (100 mg) is sometimes prescribed in the treatment of metabolic disorders.

The duration of time required to pass between a patient's last dose of biotin and the time when biotin is expected to reach levels that do not result in erroneous results depends on a variety of factors including the biotin dose, how long the patient has been taking biotin, as well as the half-life of biotin in serum. Healthy subjects who take a single 1 mg or 100 mg oral dose of biotin have mean peak serum biotin concentrations of 8.6 and 495 ng/mL, respectively, occurring between 1-3 hours post-dose and declining with half-lives of 8 to 19 hours. A pharmacokinetic study also showed that serum biotin concentration was dose proportional, with median peak biotin concentration (1-h post-dose) of 41 ng/mL, 91 ng/mL and 184 ng/mL for the 5, 10 and 20 mg dosing groups, respectively. Supra-physiological doses of biotin for either cosmetic use or pharmacologic use can result in serum concentrations as high as 1160 ng/mL one hour after a single oral biotin dose of 300 mg.

Biotin oral dose (mg)	Reported peak serum biotin concentration (ng/mL)
1*	8.6
5**	41
10**	91
20**	184
100*	495
300*	1160

Table 1: Peak serum biotin at varying oral doses. *single oral dose of biotin. **Median peak serum biotin based on consecutive daily dosing (q.d.).

Over the counter biotin supplements are typically 5-10mg oral tablets. Pharmacokinetic data suggests that the corresponding peak serum concentration from these doses could be up to approximately 90 ng/mL. Assays that are potentially susceptible to interference from a 5-10 mg dose of biotin due to a low manufacturer-reported interference threshold are highlighted Yellow in the Table below:

Analyte	MAX serum/plasma biotin concentration cut-off (ng/mL)	MAX serum/plasma biotin concentration cut-off (nmol/L)	Analyser	Type of assay	Will biotin interference increase or decrease the analyte result?
AFP	NA*	NA*	Siemens Centaur XP	Sandwich	↓
CA125	NA*	NA*	Siemens Centaur XP	Sandwich	↓
CA15-3	NA*	NA*	Siemens Centaur XP	Sandwich	↓
CA19-9	NA*	NA*	Siemens Centaur XP	Sandwich	↓
CEA	NA*	NA*	Siemens Centaur XP	Sandwich	↓
Cortisol	NA*	NA*	Siemens Centaur XP	Competitive	↑
Cyclosporin	≤50	≤205	Siemens Centaur XP	Competitive	↑
FSH	NA*	NA*	Siemens Centaur XP	Sandwich	↓
FT3	NA*	NA*	Siemens Centaur XP	Competitive	↑
FT4	≤1500	≤6140	Siemens Centaur XP	Competitive	↑
Gentamicin	NA*	NA*	Siemens Centaur XP	Competitive	↑
Total hCG	NA*	NA*	Siemens Centaur XP	Sandwich	↓
iPTH	≤1500	≤6140	Siemens Centaur CP	Sandwich	↓
LH	NA*	NA*	Siemens Centaur XP	Sandwich	↓
Oestradiol	≤1500	≤6140	Siemens Centaur XP	Competitive	↑
Progesterone	NA*	NA*	Siemens Centaur XP	Competitive	↑
Prolactin	NA*	NA*	Siemens Centaur XP	Sandwich	↓
PSA	NA*	NA*	Siemens Centaur XP	Sandwich	↓

Testosterone	≤50	≤205	Siemens Centaur XP	Competitive	↑
Troponin I	≤1500	≤6140	Siemens Centaur XP	Sandwich	↓
TSH	NA*	NA*	Siemens Centaur XP	Sandwich	↓
Vancomycin	NA*	NA*	Siemens Centaur XP	Competitive	↑
Folate	≤50		Siemens Centaur XP	Competitive	↑
ACTH	≤1500	≤6140	Immulite 2000	Sandwich	↓
Calcitonin	≤1500	≤6140	Immulite 2000	Sandwich	↓
Thyroglobulin	≤5	≤20	Immulite 2000	Sandwich	↓
Thyroglobulin autoantibodies	NA*	NA*	Immulite 2000	Sandwich	↓

Table 2: Manufacturer-reported interference thresholds. *Assays that do not use the Biotin-Streptavidin couple.

If you have a test result that does not fit with the clinical picture, it is worthwhile excluding biotin ingestion as a potential cause of test interference, by asking the patient / parent / carer about any over the counter supplements or checking for a biotin prescription.

Though manufacturer's have not given any official guidance regarding the minimum intervals for blood sampling following last biotin dose, some have informally suggested that assays with an interference threshold <50 ng/mL (see Table 2) could be classified as more susceptible. However, recent independent pharmacokinetic data does provide some useful guidance on washout periods required for assays with biotin interference:

- For assays with an interference threshold of ≥30 ng/mL, for patients taking biotin doses of up to 5 mg b.i.d. or 10 mg q.d., an 8-hour washout period is sufficient to mitigate the risk of biotin interference.
- For a minority of assays with an interference threshold of <30 ng/mL, or in the rare case of patients taking biotin at ≥10 mg daily doses, it is necessary to delay sample collection for a longer period (up to 3 days) after the last dose of biotin in order to avoid the risk of false assay results.
- Biotin is renally excreted; therefore it is likely that in AKI/CKD, plasma/serum biotin concentrations will be higher than expected.

Additional information provided by the manusfacturer of the iSYS immunoassay analyser is provided in Table 3.

Analyte	Analyser	Type of assay	Will biotin interference increase or decrease the analyte result?	Washout period (hours)
25-OH Vitamin D	IDS iSYS	Competitive	↑	48
IGF-I	IDS iSYS	Sandwich	↓ The lowest Biotin level that does not significantly lower the results (<10% bias) is 300 nmol/L with IDS IGF-I assay	24
Growth Hormone	IDS iSYS	Sandwich	↓ The lowest Biotin level that does not significantly lower the results (<10% bias) is 300nmol/L with IDS hGH.	24

Table 3: Manufacturer-reported washout period for assays run on the iSYS analyser. Reference: Customer Advisory Notification; N-2019-003.

Demand Management

The laboratory has a number of automated rules to demand-manage tumour marker requests, including CA125, CA19-9, CEA (no repeat within 14 days) SFLC and serum electrophoresis (no repeat within 21 days) and serum 5HIAA (no repeat within 11 weeks of previous result). However, if more frequent monitoring of these tests is required, to guide clinical management of the patient or for clinical trial purposes, then please make it clear on the request form that an override of the demand management rule if required (e.g. write 'CA125 override' on the request form), or contact the lab for advice.

Time limits for requesting additional examinations

For most biochemistry requests it may be possible to add on additional tests, details on time limits which apply to various analytes can be found in the Biochemistry Test Directory.

Names and addresses of referral laboratories

Some specialised or low volume assays are referred to external laboratories for analysis. In line with UKAS requirements we endeavour to use accredited laboratories whenever possible. A full list of the tests referred out and the

laboratories that are used is available from the department; however the more common ones can be found in the list of referral laboratories.

Comments/Complaints Procedure

Any complaints or concerns about any aspect of the service should be raised initially with the Blood Sciences Service Manager/Deputy General Manager, Mrs Sylvia Blake, telephone 0161 446 3316.

We are keen to know about any problems arising from the laboratory service. Feedback from our users will help in our constant efforts to improve our service.

Data Protection

All staff comply with The Trust Information Governance Policy for handling of patient confidential information.

Quality assurance and Accreditation

The department participates in internal quality control (IQC) and external quality assurance (EQA) for all the tests undertaken within the laboratory. Performance is monitored and subject to rigorous control, to ensure that analyses are accurate, precise and results are comparable with other laboratories.
Details of the Biochemistry laboratory UKAS accreditation status can be found at the link below by searching our customer number **8697:**
https://www.ukas.com/search-accredited-organisations/

The lab also regularly monitors the accreditation status of the referral laboratories used for specialist testing.

Biochemistry Test Directory (listed alphabetically)

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
17-OH Progesterone	Serum 1mL	0-6 nmol/L	Sent to referral lab for analysis	5 days	2-4 weeks
5-HIAA	Serum 0.5mL	0-140 nmol/L	Sent to referral lab for analysis	5 days	1-2 weeks
5-HIAA	24 hour Urine	<45 µmol/24 hours	24 hour urine bottle containing acid (available from lab). Sent to referral laboratory for analysis	2 days	1-2 weeks
ACE	CSF 0.5mL	<1.2 IU/L	Sent to referral lab for analysis	Not applicable	<21 days
ACE	Serum 0.5 mL	20-70 IU/L	Sent to referral lab for analysis	5 days	7 days
ACTH	Plasma (EDTA) 1mL	0-46 ng/L at 09:00hrs	Take to lab on ice immediately after collection.	Not applicable	7 days
ACTH precursors	Plasma (EDTA) 2mL	<100 pmol/L	Take to lab on ice immediately after collection. Sent to referral laboratory for analysis.	Not applicable	2 weeks
AFP	Serum 0.5mL	0-7 IU/mL		5 days	24 hours (Mon-Fri)
Albumin	Serum 0.5mL	35 – 50 g/L		5 days	60 mins
Aldosterone	Plasma (EDTA) 1mL	0-630 pmol/L	Take to lab immediately. Sent to referral lab for analysis.	Not applicable	2 weeks
Alkaline Phosphatase	Serum 0.5mL	Adult: 30 - 130 IU/L Infant-16 Years: 60 - 425 IU/L		5 days	60 mins
ALP Isoenzymes	Serum 1mL	Qualitative interpretation	Sent to referral lab for analysis	5 days	2 weeks
Alpha subunit (TSH)	Serum 1mL	Reference range dependant on gender and menopausal status. Refer to result report.	Sent to referral lab for analysis	2 days	2-4 weeks
Alpha-1-antitrypsin	Serum 2mL	1.10-2.10 g/L	Sent to referral lab for analysis	5 days	1-2 weeks

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
ALT	Serum 0.5mL	10 – 49 IU/L		5 days	60 mins
Amikacin	Serum 1mL	For all patients on multiple daily dosing target levels pre dose are <10mg/L and target levels 1 hour post dose are <30mg/L. all patients on once daily (extended interval) dosing target levels pre dose <5mg/L	Include time and amount of last dose on request form. Sent to referral laboratory for analysis.	Not applicable	Within 4 hours of receipt at referral laboratory
Ammonia	Plasma (EDTA) 1mL	Adult: 11 - 35 µmol/L Infant-16 Years: <50 µmol/L	Contact laboratory prior to taking sample for non-trial patients. Take to lab on ice immediately after collection.	Not applicable	60 mins
Amylase	Fluid 1mL	Interpret with reference to serum levels	Collect into 60 mL screw top container	1 day	60mins
Amylase	Serum 0.5mL	30 – 118 IU/L		5 days	60 mins
Androstenedione	Serum 1.5mL	Male: 0.9-7.2 nmol/L, Female: 0-6.0 nmol/L	Sent to referral lab for analysis	4 days	2-4 weeks
Apo-E genotyping	Whole blood (EDTA) 1mL	E2/E2 homozygosity associated with Type III Hyperlidiaemia	EDTA sample Sent to referral lab for analysis	5 days	2-4 weeks
Asialotransferrin/ Tau-protein	CSF 0.5mL	DETECTED, NOT DETECTED or EQUIVOCAL	Sent to referral lab for analysis		If sample reaches referral lab before 12:00 it will be analysed same day. Otherwise next day analysis (Mon-Fri).
AST	Serum 0.5mL	0-33 IU/L		5 days	60 mins
B12	Serum 0.75mL	211 – 911 ng/L		Day of request	24 hours (Mon-Fri)

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
Bence Jones Protein	Urine (random) 2mL	Normal: negative	Qualitative test - no quantification carried out. 60 mL screw top container.	5 days	1-2 weeks
Beta-2-microglobulin	Serum 2mL	1.0-2.4 mg/L		3 days	60 mins
Bicarbonate	Serum 0.5mL	22 – 29 mmol/L		Day of request	4 Hours
Blood Gases	Arterial Blood Gas 0.5mL	pH 7.35-7.45 pCO_2 4.6-6.0 kPa pO2 9.98-13.3 kPa Base Excess –2.0 to +3.0	Collect in ABG syringe, ensure no air spaces, mix thoroughly and analyse immediately. Do not use POD	Not Applicable	20 mins
CA125	Serum 0.5mL	0-30 U/mL	For monitoring only, inappropriate for diagnosis	5 days	24 hours (Mon-Fri)
CA15-3	Serum 0.5mL	0-32 U/mL	For monitoring only, inappropriate for diagnosis	5 days	7 days
CA19-9	Serum 0.5mL	0-37 U/mL	For monitoring only, inappropriate for diagnosis	5 days	24 hours (Mon-Fri)
Caeruloplasmin	Serum 1mL	200-600 mg/L	Sent to referral lab for analysis	5 days	2-4 weeks
Calcitonin	Serum 2mL	Male: 0-8.4 ng/L Female: 0-5.0 ng/L	Take to lab on ice immediately after collection.	Up to 60 minutes	7 days
Calcium	Serum 0.5mL	2.20 - 2.60 mmol/L		5 days	60 mins
Calcium	Urine (24 hour)	2.5 - 7.5 mmol/24 hours	Collect into plain 24 hour urine bottle if sample to be anlaysed same day.	Day of request	60 mins
Calcium (ionised)	Venous or arterial sample (Blood Gas Syringe)	1.09-1.3 mmol/L		5 days	60 mins
Calcium:Creatinine Ratio	Urine (random/ 2 hour) 1mL	0.3 - 0.7 mmol/mmol (assuming normal renal function)	Collect into 60 mL screw top container.	Day of request	60 mins
Carbamazepine	Serum 0.5mL	4-12 mg/L	Pre-dose sample. Sent to referral laboratory for analysis.	5 days	Within 2 hrs of receipt at referral lab

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
Carbohydrate Deficient Transferrin (CDT)	Serum 2mL	To be interpreted with clinical history	Sent to referral lab for analysis	Not applicable	7 days
CEA.	Serum 0.5mL	0-5 µg/L (non-smokers) <11 µg/L (smokers)	For monitoring only, inappropriate for diagnosis	5 days	24 hours (Mon-Fri)
Chloride	Serum 0.5mL	95-108 mmol/L		5 days	60 mins
Chloride	Urine (random) 0.5mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	Day of request	60 mins
Chloride	Urine (24 hour)	110 – 250 mmol/24 hours	Collect into plain 24 hour urine bottle if sample to be anlaysed same day.	Day of request	60 mins
Cholesterol	Fluid 0.5mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	Day of request	4 Hours
Cholesterol	Serum 0.5mL	<5.0. Primary prevention treatment decisions should be based on overall cardiovascular risk. Secondary prevention optimal treatment target is total Cholesterol <4 mmol/L and LDL-Cholesterol <2 mmol/L. Audit treatment target is TC <5 mmol/L & LDL-C <3 mmol/L).	Total cholesterol can be measured on non-fasting sample	5 days	4 Hours
Chromogranin A	Serum 0.5mL	Normal: 0-91 ng/mL Borderline: 92-218 ng/mL Abnormal >218 ng/mL	Take to lab immediately after collection. Elevated CgA seen with proton-pump inhibitors.	3 days	1 weeks
Citrate	24 hour Urine	1680-6450 µmol/24hr	24 hour urine bottle containing acid (available from lab). Sent to referral laboratory for analysis	Not applicable	1-2 weeks

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
CK	Serum 0.5mL	Male: 40–320 IU/L Female: 25–200 IU/L.		4 days	4 Hours
CK MB	Serum 0.5mL	0-5 ng/mL Female 0-6 ng/mL Male	Sent to referral lab for analysis	4 days	Within 2 hrs of receipt at referral lab
Copper	Serum 1mL	13.0-26.0 µmol/L	Sent to referral lab for analysis	5 days	2-4 weeks
Cortisol	Saliva 1 salivette	9am: 5-46 nmol/L Midnight: <2.6 nmol/L Adequate response to synacthen: an increment >10 nmol/L from 0-30min >22 nmol/L from 0-60min	Collect into Cortisol Salivette. Patient removes synthetic swab from tube, chews it for approx 45 seconds then returns it to tube and replaces stopper.	Not applicable	1-2 weeks
Cortisol	Serum 0.5mL	119 – 618 nmol/L at 09:00hrs	Used in dynamic function tests and day curves.	5 days	24 hours (Mon-Fri)
Cortisol	Urine (24 hour)	<165 nmol/24 hours	24 hour urine bottle plain (available from lab). Sent to referral lab for analysis	5 days	2-4 weeks
Cortisone	Saliva 1 salivette	9am: 18-47 nmol/L Late night: <18 nmol/L Adequate response to synacthen: an increment >14 nmol/L from 0-30min >22 nmol/L from 0-60min	Collect into Cortisol Salivette. Patient removes synthetic swab from tube, chews it for approx 45 seconds then returns it to tube and replaces stopper.	Not applicable	1-2 weeks

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
COVID-19 rapid test (swab test). RSV/Flu A/B/COVID rapid panel test (swab test)	Nose & throat swab	Detected. Not detected. Equivocal Invalid	Samples must be delivered to the lab within 7 hours of being taken.	Not applicable	4 hours
C-Peptide	Serum 2mL	Interpret with reference to glucose and insulin result.	Take to lab on ice immediately after collection. Sent to referral laboratory for analysis.	5 days	2-4 weeks
Creatinine	Fluid 1mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	Day of request	60 mins
Creatinine	Serum 0.5mL	Male: 62 – 115 µmol/L Female 44 – 97 µmol/L Paediatrics:	Enzymatic method is used to measure creatinine for all patients <18yrs. Paediatric reference ranges are aligned to those proposed by the Paediatric Laboratory Medicine Network (PaLMnet). Please refer to results report.	5 days	60 mins
Creatinine	Urine (24 hour)	Male: 7.1 - 17.7 mmol/24hours Female: 5.3 - 15.9 mmol/24hours	Plain 24 hour urine bottle (available from lab)	5 days	60 mins
Creatinine Clearance	Urine (24 hour)	80-120mL/min	Plain 24 hour urine bottle (available from lab) Must have a serum sample for serum creatinine measurement.	5 days	60 mins
CRP	Serum 0.5mL	0 - 5 mg/L		5 days	60 mins
Cryoglobulins	Serum & plasma (Fill tubes provided by lab fully)	Normal - not detected	Collect thermos flask and warmed tubes from Biochemistry before collection. Return samples to pathology immediately in thermos flask	Not applicable	1-2 weeks
CSF Oligoclonal banding	CSF 0.5mL & 2ml serum	Normal - not detected	Sent to referral lab for analysis	Not applicable	2-4 weeks

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
CSF Xanthochromia	CSF 1mL	Absence of bilirubin excludes sub arachnoid haemorrhage. Presence of haemoglobin and CSF total protein contact affects result. False negative results if sample taken too early. See interpretative comments on report.	Contact laboratory prior to collection. Must not be collected <12 hours after onset of headache. To reduce blood contamination, collect CSF for xanthochromia in the last tube in a series. It should be protected from light by placing in a brown envelope. A simultaneous blood sample is required for LFT to help interpretation of the bilirubin level in CSF. A fluoride oxalate blood sample is also required for glucose for general examination. Sent to referral laboratory for analysis. Lab to provide referral laboratory with serum bilirubin and CSF Total Protein results to aid interpretation.	Not applicable	Same day if received at referral laboratory before 17:00
CTx	Plasma (EDTA) 3mL	0.1-0.5µg/L No reference range for under 16 years of age.	Fasting morning sample preferred. Sent to referral lab for analysis	3 days	2-4 weeks
Cyclosporin	Whole blood (EDTA) 2mL	see local protocol	Pre dose sample will be analysed the same day if it reaches the lab before 2pm	5 days	Daily batch analysis
DHEA Sulphate	Serum 1.5mL	Male: 2.2-15.2 µmol/L Female: 1.0-12.0 µmol/L	Sent to referral lab for analysis	5 days	2-4 weeks
Digoxin	Serum 0.5mL	1.0-2.0 µg/L	Samples for digoxin should be collected as trough levels just prior to the next drug dose or at least 12 hours post last dose	5 days	Within 2 hrs of receipt at referral lab
Direct Bilirubin	Serum 0.5mL	0-5 µmol/L		5 days	4 Hours

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
DPD - 5FU toxicity	Whole blood (EDTA) 3mL	See report for comment	Sent to referral lab for analysis	3 days	1 week
eGFR	Serum 0.5mL	eGFR >90 Normal (if no other evidence of kidney disease) eGFR 60-89 Stage 2 CKD eGFR 45-59 Stage 3a CKD eGFR 30-44 Stage 3b CKD eGFR 15-29 Stage 4 CKD eGFR <15 Stage 5 CKD	Patient's height (cm) and weight (Kg) must be written on request form. The Wright formula is used.	5 days	60 mins
Erythropoietin	Serum 1mL	5.0-25.0 IU/L	Sent to referral lab for analysis	5 days	2-4 weeks
Ethanol	Plasma (Fluoride Oxalate) 2mL	No reference range	Sent to referral lab for analysis. (Serum sample may be acceptable if analysed immediately after collection)	Not applicable	Within 2 hrs of receipt at referral lab
Faecal Elastase	Faecal 2g	>200µg/g	Fresh sample must arrive at referral laboratory on day of collection. Collect into faecal pot	Not applicable	1-2 weeks
Ferritin	Serum 0.5mL	Males 22 – 322 µg/L Females 10 – 291 µg/L		5 days	24 hours
Folate	Serum 0.75mL	>5.4 µg/L		Day of request	24 hours (Mon-Fri)
Free T3	Serum 1.5mL	3.5-6.5 pmol/L		5 days	24 hours (Mon-Fri)
Free T4	Serum 1.5mL	10-22 pmol/L		3 days (as for TSH for first-line TFT)	24 hours (Mon-Fri)
Fructosamine	Serum 1mL	1.70-2.80 mmol/L	Sent to referral lab for analysis	Not applicable	7 days

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
FSH	Serum 0.5mL	Male: 1.4-18.1 IU/L, Female: Early Follicular phase 2.5-10.2 IU/L, Ovulation peak 3.4-33.4 Luteal phase 1.5-9.1 IU/L Post menopausal 23-116		5 days	24 hours (Mon-Fri)
Gamma-GT	Serum 0.5mL	Male: < 73 IU/L Female: < 38 IU/L		5 days	60 mins
Gentamicin	Serum 0.5mL	Trough target level <1 mg/L. Contact ward pharmacist for further information about result interpretation.	Samples should be taken in the two hour pre-dose period.	Not applicable	60 mins
Gilberts genotyping	Whole blood (EDTA) 2mL	See report for comment	Sent to referral lab for analysis	5 days	2-3 weeks
Glucose	CSF 5 drops	2.2 – 3.9 mmol/L	5 drops suffice. Collect into Fluoride Oxalate tube	Not applicable	60 mins
Glucose	Fluid 0.5mL	Interpret with serum results and clinical history	Collect into Fluoride Oxalate tube	Not applicable	60 mins
Glucose	Plasma (Fluoride Oxalate) 0.5mL	Fasting 4.1-6.0 mmol/L. Non-fasting 4.1 - 7.7 mmol/L Please see laboratory handbook for interpretation of elevated glucose results diagnosis of diabetes	Collect into Fluoride Oxalate tube	Not applicable	60 mins
Growth Hormone	Serum 0.5mL	Adult Normal basal GH 0-9.9 ug/L	Basal values not suitable for diagnosis of acromegaly/GH deficiency; dynamic function tests required. Please contact lab on 3298 to discuss.	5 days	1 week

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
GUT Hormones	Plasma (EDTAx3) 12mL	VIP 0-30 pmol/L, PP 0-300 pmol/L, Gastrin 0-40 pmol/L, Glucagon 0-50 pmol/L, Somatostatin 0-150 pmol/L	Patient must be fasted. 3x EDTA tubes must be taken to the laboratory immediately after collection. Sent to referral laboratory for analysis.	Not applicable	4-6 weeks
Haptoglobin & Haemopexin	Serum 2mL	Male Haptoglobin 0.5-2.0 g/L, Haemopexin 0.5-1.1 g/L Female Haptoglobin 0.4-1.6 g/L, Haemopexin 0.6-1.3 g/L	Sent to referral lab for analysis	5 days	1-2 weeks
HbA1c	Whole blood (EDTA) 2mL	Diagnostic cut-off ≥48mmol/mol	Results are IFCC aligned.	5 days	3 days
HCG	Serum 0.5mL	0-9 IU/L		5 days	24 hours (Mon-Fri)
HCG Rapid test (rapid pregnancy test)	Serum 0.5mL	NEGATIVE or POSITIVE	Contact lab prior to sending if result required urgently	2 days	20 mins
HCG Rapid test (rapid pregnancy test)	Urine 0.5mL	NEGATIVE or POSITIVE	Contact lab prior to sending if result required urgently	2 days	20 mins
HDL-Cholesterol	Serum 0.5mL	>1.0 mmol/L	Fasting sample preferred	5 days	4 Hours
HFE genotyping	Whole blood (EDTA) 4mL	Not applicable: DNA test	Sent to referral lab for analysis	Not applicable	3 Weeks
Homocysteine	Plasma (EDTA) 1mL	< 18 µmol/L	Ideally fasting sample. Sent to referral lab for analysis	Not applicable	3 Weeks
IgA	Serum 0.5mL	0.40 – 3.50 g/L		5 days	4 Hours
IGF-1	Serum 0.5mL	Age dependent. Contact lab (ext 3298)		3 days	1 week
IgG	Serum 0.5mL	6.50 –16.00 g/L		5 days	4 Hours

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
IgM	Serum 0.5mL	0.50 – 3.00 g/L		5 days	4 hours
Igs & electrophoresis	Serum 1mL	See interpretative comments for electrophoresis		5 days	4 Hrs for Igs, 1 week for EPS
Inhibin A	Serum 0.5mL	Post menopausal female 0-3.6 pg/mL. Values in the pre-menopausal female vary with the stage of the cycle 5-160 pg/mL	Sent to referral lab for analysis	5 days	2-3 weeks
Inhibin B	Serum 0.5mL	Post menopausal female 0-5 pg/mL. Values in the pre-menopausal female vary with the stage of the cycle 5-200 pg/mL	Sent to referral lab for analysis	5 days	2-3 weeks
Insulin	Serum 2mL	Interpret with reference to glucose and c-peptide result	Sample must be taken to laboratory on ice immediately after collection. Sent to referral laboratory for analysis.	Not applicable	2-4 weeks
Insulin antibodies	Serum 2mL	NEGATIVE or POSITIVE	Sent to referral lab for analysis	Not applicable	2-4 weeks
Iron	Serum 0.5mL	Male:12 – 31 µmol/L Female:9 – 30 µmol/L		5 days	4 Hours
Itraconazole	Non-gel separated serum 1mL	Trough target level 5.0-17.1 mg/L	Steady state reached after 1-2 weeks on oral therapy with little variation throughout the day. Sent to referral lab for analysis	Not applicable	Within 24 hrs of receipt at referral lab
Lactate	Venous or arterial sample (Blood Gas Syringe)	0.5-1.6 mmol/L	Collect in ABG syringe, ensure no air spaces, mix thoroughly and analyse immediately. Do not use POD.	Not applicable	20 mins
Lamotrigine	Serum 2mL	3.0-15.0 mg/L	Pre-dose sample. Sent to referral laboratory for analysis.	Not applicable	1 week
LDH	CSF 5 drops	Interpret with serum results and clinical history	5 drops suffice	Not applicable	60 mins

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
LDH	Fluid 0.5mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	5 days	60 mins
LDH	Serum 0.5mL	120 - 246 IU/L		5 days	60 mins
LDL-Cholesterol	Serum 1mL	< 3.0mmol/L	Fasting sample preferred	5 days	60 mins
Lead	Whole blood (EDTA) 2mL	< 0.5 µmol/L	Sent to referral lab for analysis	5 days	2-4 weeks
LH	Serum 0.5mL	Adult males - 20 - 70yrs 1.5 - 9.3 IU/L >70 yrs 3.1 - 34.6 IU/L Female adults - Follicular phase 1.9 - 12.5 IU/L Mid cycle peak 8.7 - 76.3 IU/L Luteal phase 0.5 - 16.9 IU/L Pregnant <0.1 - 1.5 IU/L Post menopausal 15.9 - 54.0 IU/L Contraceptives 0.7 -5.6 IU/L Children <0. 1- 6.0 IU/L.		5 days	24 hours (Mon-Fri)
Lipase	Serum 0.5mL	12 - 53 U/L		5 days	4 Hours
Lithium	Serum 0.5mL	0.4-1.0 mmol/L	12 hours post dose. Sent to referral laboratory for analysis.	5 days	Within 12hrs of receipt at referral lab
Macroprolactin	Serum 0.5mL	Macroprolactin: Detected / Not-detected. Recovery (given as a %). Post-PEG prolactin: Male: 61-196 mU/L, Female: 66-278 mU/L		5 days	14 days

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
Magnesium	Serum 0.5mL	0.7 - 1.0 mmol/L		5 days	60 mins
Magnesium	Urine (24 hour)	2.4 - 6.5 mmol/24 hours	24 hour urine bottle containing acid (available from lab)	3 days	60 mins
Magnesium	Urine (random) 0.5mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	5 days	60 mins
Metanephrines	Urine (24 hour)	Urine Metadrenaline excretion: Male & Female: 0.0-2.0 µmol/24hr, Urine Normetadrenaline Male: 0.0-5.3 µmol/24hr, Female: 0.0-4.3 µmol/24hr, Urine Noradrenaline: 0.0-1.0 µmol/24 hr, Urine Adrenaline: 0.0- 0.2 µmol/24 hr	24 hour urine bottle containing acid (available from lab). Sent to referral laboratory for analysis	4 days	2-4 weeks
Metanephrines	Plasma (EDTA) 1mL	Plasma Metanephrine: 0-510 pmol/L, Plasma Normetanephrine: 0-1180 pmol/L 3MT: 0-180 pmol/L	Take to lab immediately. Initial screening test can be taken non-fasting and sitting. If elevated confirm with a fasting sample taken after 30 minutes lying down	Not applicable	2-4 weeks
Methotrexate	Serum 1mL	Refer to local protocol	State dose timing on request form. Sample will be analysed on the same day if it reaches the laboratory before 8pm	3 days	Samples will be analysed on the same day if received in the laboratory between 08:30-20:00. Samples received after 8pm will be analysed next day.

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
Microalbumin (Urine ACR)	Urine (random) 1mL	<3mg/mmol (NICE NG203)	Sent to referral lab for analysis	5 days	Within 24 hrs of receipt at referral lab
Mitotane	Plasma (2x EDTA) 4mL	14-20 mg/L	Contact lab for specific request form. Analysis available for patients on lysodren. Sent to specialist laboratory for analysis.	Not applicable	2-4 weeks
Neuron Specific Enolase	Serum 2mL	0-12.5 µg/L	Sent to referral lab for analysis	3 days	7 days
NT-proBNP	Serum 1mL	<400 ng/L	If screening for carcinoid heart disease, patients with NTproBNP >260 ng/L should be referred for echo (NETs guidelines, Gut 2012). If NTproBNP is <400 ng/L in untreated patients with a normal ECG then heart failure (HF) is unlikely. If result is between 400-2000 ng/L HF cannot be excluded and a routine referral for echo is required. If result is >2000 ng/L HF is very likely and urgent referral (within 2 weeks) is required. N.B. Some drugs e.g. diuretics, ACE inhibitors, ARBs and beta-blockers can decrease NTproBNP levels. (Nice Clinical Guideline 108, Aug 2010) Sent to referral lab for analysis	Day of request	3 days

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
Oestradiol	Serum 0.5mL	Males: <146pmol/L Follicular phase: 72 – 529 pmol/L Ovulation/midcycle peak: 234 – 1309 pmol/L Luteal phase: 205 – 786 pmol/L Post-menopausal females: <118 pmol/L		3 days	24 hours (Mon-Fri)
High sensitivity oestradiol	Serum 1mL	Oestradiol (MS) reference range: Pre-menopausal adult female: 11-969 pmol/L Post-menopausal adult female: 7-77 pmol/L Oestrone (MS) reference range: Pre-menopausal adult female: 15-418 pmol/L Post-menopausal adult female:11-118 pmol/L	Sent to referral lab for analysis	3 days	2 weeks
Orosomucoid	Serum 1mL	Male 0-50yrs: 0.6 – 1.2 g/L >50 yrs: 0.8 – 2.0 g/L Female 0-50yrs: 0.4 – 1.0 g/L >50yrs: 0.8 – 2.0 g/L	Sent to referral lab for analysis	3 days	2-4 weeks
Osmolality	Serum 0.5mL	275-295 mOsm/kg		24 hours	24 hours

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
Osmolality	Urine (random) 1mL	100-1200 mOsm/kg	Result dependent on hydration status. Early morning urines most helpful	5 days	24 hours
Oxalate	Urine (24 hour)	Male: 80-490 µmol/24hr, Female: 40-32 µmol/24hr	24 hour urine bottle containing acid (available from lab). Sent to referral laboratory for analysis	4 hours	1-2 weeks
P1NP	Plasma (EDTA) 2mL	Pre-menopausal female 30-78 µg/L, Post-menopausal female 26-110 µg/L, Males 20-76 µg/L No reference range for under 16 years of age.	Sent to referral lab for analysis	3 days	1-2 weeks
Paracetamol	Serum 2mL	in overdose refer to BNF nomogram	Sent to referral laboratory for analysis. At least 4 hours after overdose.	5 days	Within 2 hrs of receipt at referral lab
pH	Pleural Fluid 1mL	Normal: approx pH 7.6 Inflammatory state: <7.3	Collect into ABG syringe with all air expelled. Send to laboratory immediately. Do no use POD	Not applicable	60 mins
Phenobarbitone	Serum 1mL	10-30 mg/L	Pre-dose sample. Sent to referral laboratory for analysis.	5 days	1 week
Phenytoin	Serum 2mL	5-20 mg/L	Pre-dose sample. Sent to referral laboratory for analysis.	5 days	1 week
Phosphate	Serum 0.5mL	Adult: 0.80 - 1.50 mmol/L 1-16 Years: 0.90 - 1.80 mmol/L		5 days	60 mins
Phosphate	Urine (24 hour)	15-50 mmol/24 hours	24 hour urine bottle containing acid (available from lab)	2 days	60 mins
Phosphate	Urine (random) 1mL	Results dependent on hydration status	Collect into 60 mL screw top container	2 days	60 mins
Potassium	Fluid 1mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	5 days	60 mins
Potassium	Serum 0.5mL	3.5-5.3 mmol/L		5 days	60 mins

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
Potassium	Urine (24 hour)	25 – 125 mmol/24hr Interpret with serum results and clinical history	Plain 24 hour urine bottle (available from lab)	5 days	60 mins
Potassium	Urine (random) 1mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	5 days	60 mins
Progesterone	Serum 0.5mL	Adult Males 0.9 - 3.9 nmol/L Adult females - Follicular phase <4.6 nmol/L Luteal phase 10.6 - 81.3 nmol/L Mid Luteal 14.1 - 89.1 nmol/L Post menopausal <2.4 nmol/L		5 days	24 hours (Mon-Fri)
Proinsulin	Serum 2mL	0-10 pmol/L	Sample must be taken to laboratory on ice immediately after collection. Sent to referral laboratory for analysis	Not applicable	2-4 weeks
Prolactin	Serum 0.5mL	Males 45 - 375 mU/L Females - Non-pregnant 59 - 619 mU/L Pregnant 206 - 4420 mU/L Post-menopausal 38 - 430 mU/L		5 days	24 hours (Mon-Fri)
Protein (Total)	CSF 5 drops	0.15 – 0.45 g/L	5 drops suffice	Not applicable	60 mins
Protein (Total)	Fluid 1mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	5 days	60 mins
Protein (Total)	Serum 0.5mL	60-80 g/L		5 days	60 mins
Protein (Total)	Urine (24 hour)	0.05 – 0.08 g/24 hours	Plain 24 hour urine bottle (available from lab)	5 days	60 mins
Protein:creatinine ratio	Urine (random) 1mL	0-45 mg/mmol	Collect into 60 mL screw top container.	5 days	60 mins
PSA	Serum 0.5mL	0.00 – 4.00 ug/L		5 days	24 hours (Mon-Fri)

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
PTH	Plasma (EDTA) 2mL	1.5-7.6 pmol/L	PTH result must be interpreted in relation to calcium level.	2 days	1 week
PTHrP	Plasma (EDTA) 2mL	< 1.8 pmol/L	Sample must be taken to laboratory immediately after collection. Sent to referral lab for analysis.	Not applicable	4 weeks
Renin	Plasma (EDTA) 1mL	Random: 0.3-2.2 nmol/L/hr	Sample must be taken to laboratory immediately after collection. Sample should NOT be transported on ice. Sent to referral laboratory for analysis.	Not applicable	2 weeks
Selenium	Serum 5mL	0.6-1.5 µmol/L	Sent to referral lab for analysis	5 days	1 week
Serum Free Light Chains	Serum 2mL	Kappa: 3.30-19.40 mg/L Lambda: 5.71-26.30 mg/L K:L ratio 0.26-1.65		5 days	7 days
Serum immunofixation	Serum 2mL	See report for interpretative comments		5 days	1-2 weeks
SHBG	Serum 1mL	Male: 13-71 nmol/L, Female: 18-114 nmol/L	Sent to referral lab for analysis	5 days	1 week
Sirolimus	Whole blood (EDTA) 0.5 mL	4-12 µg/L	Pre dose sample required. Sent to referral lab for analysis.	Not applicable	Within 24 hrs of receipt at referral lab
Sodium	Fluid 1mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	5 days	60 mins
Sodium	Serum 0.5mL	133 - 146 mmol/L		5 days	60 mins
Sodium	Urine (24 hour)	40 – 220 mmol/24hr To be interpreted with serum results and clinical history	Plain 24 hour urine bottle (available from lab)	5 days	60 mins
Sodium	Urine (random) 1mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	5 days	60 mins
Tacrolimus	Whole blood (EDTA) 0.5mL	3.0-8.0µg/L	Pre-dose sample. Sent to referral laboratory for analysis.	Not applicable	Within 24 hrs of receipt at referral lab

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
Tau protein	CSF 0.5mL	NEGATIVE or POSITIVE	Samples with microbial contamination can give false positives. Sent to referral laboratory for analysis.	Not applicable	7 days
Teicoplanin	Whole Blood (EDTA) 0.5mL		Sent to referral lab for analysis Sent to referral lab for analysis.	Not applicable	7 days
Testosterone	Serum 0.5mL	Males: 8.4 – 28.7 nmol/L Females: 0.5 – 2.6 nmol/L		3 days	24 hours (Mon-Fri)
Testosterone (extracted/ LC-MS)	Serum 1mL	Female: 0-1.5 nmol/L	Sent to referral lab for analysis	3 days	1-2 weeks
Theophylline	Serum 0.5mL	10-20 mg/L	Pre-dose sample. Sent to referral laboratory for analysis.	5 days	Within 2 hrs of receipt at referral lab
Thyroglobulin +Tg autoabs	Serum 1mL	Thyroglobulin 0-55 ng/mL Tg antibodies 0-40 IU/mL	Presence of Tg antibodies will lead to a falsely low TG result. Storage: 7 days at 2–8°C	5 days	7 days
TIBC	Serum 0.5mL	45-70 µmol/L		5 days	4 Hours
Total Bilirubin	Serum 0.5mL	0-20 µmol/L		5 days	60 mins
TPO Abs	Serum 0.5mL	0-59 IU/L	Sent to referral lab for analysis	5 days	5 days
Transferrin	Serum 0.5mL	Male: 2.2 – 3.7 g/L Female: 2.5 - 3.8 g/L		5 days	4 Hours
Triglyceride	Fluid 1mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	5 days	4 Hours
Triglyceride	Serum 0.5mL	0.0 - 2.3 mmol/L	Fasting sample preferred	5 days	4 Hours
Troponin I	Serum 0.5mL	0-45 ng/L	Serial samples may help distinguish chronic mild elevations (such as in kidney disease) from acute MI.	8 hours	60 mins
Troponin T	Serum 0.5mL	0-14 ng/L	Trial samples only. Sent to referral lab for analysis	24 hours	Within 24 hrs of receipt at referral lab

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
TSH	Serum 1.5mL	Infants (1-23 months) = 0.87-6.15, Children (2-12 years) = 0.67-4.16, Adolescents (13-20 years) = 0.48-4.17, > 20years (Adults) 0.55 - 4.78 mU/L		3 days	24 hours (Mon-Fri)
TSH rec Ab	Serum 0.5mL	0-0.9 U/mL	Sent to referral lab for analysis	Not applicable	2-3 weeks
Urea	Fluid 1mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	Not applicable	60 mins
Urea	Serum 0.5mL	Adult: 2.5 - 7.8 1-16 Years: 2.5 - 6.5mmol/L		5 days	60 mins
Urea	Urine (24 hour)	430 – 710 mmol/24hours	Plain 24 hour urine bottle (available from lab)	5 days	60 mins
Urea	Urine (random) 1mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	5 days	60 mins
Uric acid	Serum 0.5mL	Male 200 - 430 µmol/L Female 140 – 360 µmol/L		5 days	60 mins
Uric acid	Urine (24 hour)	1.5 - 4.5 mmol/24 hr	Plain 24 hour urine bottle (available from lab)	4 days	60 mins
Uric acid	Urine (random) 1mL	Interpret with serum results and clinical history	Collect into 60 mL screw top container	4 days	60 mins
Urine Densitometry	Urine (24 hour)	Normal: no Bence Jones protein detected	Plain 24 hour urine bottle (available from lab).	5 days	1-2 weeks
Urine Electrophoresis	Urine (random) 2mL	Normal: no Bence Jones protein detected	Collect into 60 mL screw top container	5 days	1-2 weeks
Urine Immunofixation	Urine (random or 24 hour)	Normal: no Bence Jones protein detected	Plain 24 hour urine bottle (available from lab)	5 days	1-2 weeks

Test Name	Sample Type and min volume	Reference Range and units	Special requirements/comments	Time limit for add-on test	Turnaround time
Valproate	Serum 0.5mL	50-100 mg/L	Pre-dose sample. Sent to referral laboratory for analysis.	5 days	1 week
Vancomycin	Serum 0.5mL	Trough target level 15 – 20 mg/L. Contact ward pharmacist for further information about result interpretation.	Samples should be taken in the two hour pre-dose period and sent with a biochemistry form.	2 days	60 mins
Vitamin A	Serum 1mL	See table below	Sent to referral lab for analysis	5 days	2-3 weeks
Vitamin D	Serum 1mL	50-250 nmol/L	See interpretative comments.	3 days	1 week
Vitamin E	Serum 1mL	See table below	Sent to referral lab for analysis	5 days	2-3 weeks
Vitamin E:Cholesterol ratio	Serum 1mL	3.50-9.50	Sent to referral lab for analysis	5 days	2-3 weeks
Voriconazole	Non-gel separated serum 0.5mL	1.3-5.7 mg/L (pre-dose level)	Include time and amount of last dose on request form. Sent to referral laboratory for analysis.	Not applicable	Within 4 day of receipt at referral lab
Zinc	Serum 4mL	12-22 µmol/L	Reference range only applies if patient has a normal serum albumin. Sent to referral laboratory for analysis.	5 days	1-2 weeks

This table covers the most frequently requested tests; please contact the duty biochemist (ext 3298) regarding any test not listed

Vitamin A			
Lower age limit (years)	**Upper age limit (years)**	**Lower limit (µmol/L)**	**Upper limit (µmol/L)**
0	≤1	0.50	1.50
>1	≤7	0.70	1.40
>7	≤13	0.91	1.71
>13	≤20	0.91	2.51
>20	≤120	1.05	2.80

Vitamin E			
Lower age limit	**Upper age limit**	**Lower limit (µmol/L)**	**Upper limit (µmol/L)**
0 weeks	≤4 weeks	2.3	11.6
>4 weeks	≤13 years	7.0	21.0
>13 years	≤20 years	14.0	23.0
>20 years	≤120 years	12.0	42.0

Vitamin E:cholesterol ratio			
Lower age limit (years)	**Upper age limit (years)**	**Lower limit (µmol/mmol)**	**Upper limit (µmol/mmol)**
0	120	3.5	9.5

Names and addresses of referral laboratories

Referral laboratory	Analyte referred	Sample
Dept of Clinical Biochemistry, City Hospital Birmingham, Dudley Road, Birmingham, B18 7QH Tel: 0121 507 5162	**Gilbert's (UGT1A1*28) TPMT**	**EDTA Blood EDTA Blood**
Sandwell and West Birmingham Hospital NHS FT Haematology City Hospital Dudley Road Birmingham West Midlands B18 7QH	**Erythropoietin**	**Serum**
Endocrinology lab, Division of Investigative Sciences Imperial College London Charing Cross Hospital London W6 8RF Tel: 020 3313 3949	**Fasting Gut Hormones Cortisol-BG**	**EDTA x3 Serum**
Biochemistry Department Manchester Royal Infirmary Oxford Road Manchester M13 9WH Tel: 0161 276 5180	**Caeruloplasmin Copper Carbamazepine Digoxin Paracetamol Phenobarbitone Phenytoin Pro-calcitonin Salicylate Selenium Theophylline Troponin T Drug screen Valproate Zinc TPO HFE Genotyping**	**Serum Serum Serum Serum Serum Serum Serum Serum or LiHep Serum Serum Serum Serum Urine Serum Serum Serum EDTA whole blood**

Walton Centre NHS Foundation Trust **Lower Lans** **Fazakerley** **Liverpool** **L9 7LJ** **0151 556 3262**		
SYNLAB MVZ Leinfelden-Echterdingen GmbH **SYNLAB International Services** **Nikolaus-Otto-Str. 6** **70771 Leinfelden-Echterdingen**	**PTHrp**	**EDTA plasma**
Clinical lab services **Queen Elizabeth Hospital Birmingham** **Mindlesohn Way** **Edgebaston** **Birmingham** **B15 2WB** **Tel: 0121 371 6544**	**Alpha subunit (TSH)**	**Serum**
Liverpool Clinical Laboratories **Department of Clinical Biochemistry & Metabolic Medicine** **4th Floor** **Duncan Building** **Royal Liverpool University Hospital** **Liverpool** **L7 8XP** **Tel: 0151 706 4230**	**CTX** **P1NP** **CKMB** **Manganese** **Lead** **NTpro-BNP**	**EDTA plasma** **EDTA plasma** **Serum** **EDTA blood** **EDTA blood** **Serum**
Paediatric Specimen Reception **Ground Floor CSB III** **Royal Manchester Children's Hospital** **Oxford Road** **Manchester** **M13 9WL** **Tel: 0161 901 2233/ 0161 276 8766**	**17-OH Progesterone** **Amikacin** **Lamotrigine**	**Serum** **Serum** **Serum**

SAS Peptide Hormones Section **Clinical Laboratory** **Royal Surrey County Hospital** **Egerton Road** **Guildford** **Surrey** **GU2 7XX** **Tel: 01483 406 715**	**Insulin & C-peptide** **Insulin autoantibodies** **Proinsulin** **IGF binding protein 3**	**Serum** **Serum** **Serum** **Serum**
Biochemistry Dept **Salford Royal Hospital** **Stott Lane** **Salford** **M6 8HD** **Tel: 0161 206 4958**	**SHBG** **Androstenedione** **DHEAS** **Extracted Testosterone** **Urine Metanephrines** **Porphyrins** **Catecholamines** **CSF Tau-protein/asialotransferrin** **Oligoclonal bands** **CSF Xanthochromia**	**Serum** **Serum** **Serum** **Serum** **Urine** **Urine** **Serum** **Urine** **CSF** **Paired CSF/Serum** **CSF**
Protein Reference Unit **Supraregional Protein Reference Unit** **Department of Immunology** **Sheffield Teaching Hospitals NHSFT** **Northern General Hospital** **Herries Road** **Sheffield** **S5 7YT** **Tel: 0114 271 5552**	**TSH receptor antibody** **Orosomucoid** **Haptoglobin/Haemopexin** **Alpha 1 Antitrypsin** **CDT** **Inhibin A & B** **Neurone specific enolase** **Urine myoglobin**	**Serum** **Serum** **Serum** **Serum** **Serum** **Serum** **Serum** **Urine**
Dept of Chemical pathology **St George's Healthcare NHST** **Blackshaw Road** **Tooting** **London** **SW17 0QT** **Tel: 020 8725 5843**	**Apo-E genotyping**	**EDTA blood**

Biochemical Genetics **Block 46** **St James' University Hospital** **Leeds** **LS9 7TF** **Tel: 0113 206 4256**	**Homocysteine**	**EDTA plasma**
Department of Biochemistry **Stepping Hill Hospital** **Poplar Grove** **Stockport** **SK2 7JE** **Tel: 0161 419 4919**	**Ethanol**	**EDTA plasma** **Fluoride Ox. Plasma**
University of Manchester **Department of Medicine** **Dept. Medicine (ESRG)** **University of Manchester** **Room 3.825 Stopford Building** **Oxford Road** **Manchester** **M13 9PT** **Tel: 0161 275 5178 or** **0161 306 0641**	**ACTH precursors**	**EDTA plasma**
Clinical Biochemistry Department **Clinical Sciences Building** **Wythenshawe Hospital** **Southmoor Road** **Wythenshawe** **Manchester** **M23 9LT** **Tel 0161 291 2136**	**Vitamin A & E** **HS Oestradiol** **Serum 5HIAA** **Urine 5HIAA** **Metanephrines** **ACE** **Aldosterone** **Faecal Elastase** **Microalbumin** **Renin** **Salivary Testosterone** **Salivary Cortisol** **Serolimus** **Tacrolimus** **Tobramycin** **U. Citrate** **U. Free Cortisol** **U. Oxalate**	**Serum** **Serum** **Serum** **Urine** **EDTA plasma** **Serum** **EDTA plasma** **Faecal** **Urine** **EDTA plasma** **Saliva** **Saliva** **EDTA blood** **EDTA blood** **Serum** **Urine** **Urine** **Urine**

Regional Mycology Lab Wythenshawe Hospital Southmoor Road Wythenshawe Manchester M23 9LT Tel: 0161-291-2142	**Fluconazole Itraconazole Posaconazole Voriconazole Beta-glucan Galactomannan**	**Non-gel separated serum Non-gel separated serum Non-gel separated serum Non-gel separated serum *Serum *Serum Please send additional serum sample for beta-glucan and galactomannan requests.**
Addenbrookes - UKAS 9814 Clinical Biochemistry and Immunology Hills Road Cambridge CB2 0QQ Tel: 01223 217 781 (3781)	**Thyroxine Binding Globulin**	**Serum**
Neurometabolic Unit Box 105 National Hospital Queen Square London WC1N 3BG Tel: 02034483818	**CSF ACE**	**CSF**

Useful Links

Lab Tests Online: Lab Tests Online.org.uk

11. Document Locations

Hard copies are issued to the following locations:	1. Biochemistry
Electronic Version	1. Biochemistry Intranet Site
Any other printed copies of this document are unauthorised.	

12. Procedure Amendments

1) eGFR – removed broken web link on p27.

2) Tacrolimus reference range updated to 3.0-8.0µg/L (from 4.0-12.0).
3) Update to align with CPP Specimen acceptance policy:
4) Removed broken HIVE link on Page 7.
5) Updated NTproBNP Turnaround time to reflect improved turnaround time of approx. 3 days (based on average NTproBNP turnaround time from 01/04/2023-29/03/2024)