OSPIDÉAL NÁISIÚNTA ORTAIPÉIDEACH CHEAPAÍ NATIONAL ORTHOPAEDIC HOSPITAL CAPPAGH	**Document Number:**	PP-LAB-7
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National Orthopaedic Hospital Cappagh, Finglas, Dublin 11.	**PATHOLOGY LABORATORY USER MANUAL**	

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INTRODUCTION

The Laboratory in National Orthopaedic Hospital Cappagh (NOHC) consists of 4 disciplines: Biochemistry/Near Patient Testing, Blood Transfusion/(Haemovigilance), Haematology and Microbiology/Molecular. The Pathology Laboratory:

- Ensures patient confidentiality is maintained at all times *
- Ensures that the rights of patients to care, is free from discrimination.
- Maintains impartiality

* The laboratory will inform the user in advance of the information it intends to place in the public domain. Please note that the laboratory, as per legislative requirements, is required to notify the Medical Officer of Health (MOH)/Director of Public Health (DPH/Health Protection Surveillance Centre) of certain diseases. The list of diseases (and their respective causative pathogens) that are notifiable is contained in the Infectious Diseases Regulations 1981 and subsequent amendments. The most recent amendment to the Regulations is the Infectious Diseases (Amendment) (No.2) Regulations 2024 (S.I. No. 528 of 2024)."

Refer to: List of Notifiable Diseases - Health Protection Surveillance Centre (hpsc.ie)

The laboratory is accredited to ISO 15189:2012 standards (Registration Number 318MT). Refer to National Orthopaedic Hospital Cappagh - INAB for a list of accredited tests. Please note that laboratory reports will indicate when a test is outside the scope of accreditation.

POSITION	PHONE
Laboratory Manager	(01) 814 0386
Pathology and Tissue Establishment Quality Manager	(01) 814 0456
Chief /Senior Medical Scientist (Haematology/Blood Transfusion)	(01) 814 0413 (01) 814 0377
Chief/Senior Medical Scientist (Biochemistry)	(01) 814 0472
Chief/Senior Medical Scientists (Microbiology)	(01) 814 0305
Haemovigilance Officer	(01) 814 0330
Senior Phlebotomist	(01) 814 0365

Location:

The Laboratory is located beside the Professorial Unit opposite the Out- Patient's entrance.

Address:

Pathology Department,
National Orthopaedic Hospital Cappagh,
Finglas, Dublin 11
D11 EV29

Hours of service:

Monday – Friday 8.00am to -7.00pm, 6.00 pm to 8.00 pm for urgent specimens including COVID- 19
Monday – Friday 7.00am to 8.00am the on call medical scientist is on site to process pre-op bloods for Same Day Admission (SDA) Patients
There is a limited emergency on call service available for Biochemistry, Blood Transfusion, Haematology and Microbiology outside of these hours.

Consent:

Consent to take samples for testing in the laboratory is obtained from the patient prior to the procedure taking place. The procedure and reasons for the samples are explained to the patient. In most situations, consent is provided when the patient presents for specimen collection. For specific tests (eg genetic screening) written consent may be required by the referral laboratory.
RF-OCH-1 Consent for Participation in Serological Blood testing, available on Q-Pulse, should be completed by the clinical team and retained in the patient chart.

Sample requirements:

For Microbiology samples e.g. urine/stool, an adequate amount is required – do not over or underfill sample container. Ensuring samples and form have been labelled correctly, place samples into the plastic biohazard bag attached to the green Microbiology Request Form (RF-MIC-158) and seal.
All blood sample tubes must be filled to the marker on the bottle. These samples are placed into the plastic biohazard bag attached to the blue Blood Sciences Request Form (RF-LAB-50) for

Haematology/Biochemistry requests or a red NOHC request form specifically for Blood Transfusion (RF-BT-78).

Requirements for Samples		
Discipline	**Essential**	**Desirable**
Blood Sciences (Biochemistry & Haematology)	Patient's Full Name	Patient's consultant
	Date of Birth	Patient location/destination for report
	Hospital Number (MRN)	Signature of venepuncturist
		Date and, where relevant, time of primary specimen collection
Blood Transfusion	Refer to Blood Sciences essential requirements. **Only Handwritten or BloodTrack PDA labels are accepted. There is zero tolerance on any discrepancies in patient demographics.** Additionally: Signature of venepuncturist or BloodTrack PDA label. Date and time of Specimen Collection.	Patient's consultant Patient location/destination for report
Microbiology & Histology	Refer to Blood Sciences essential requirements.	Refer to Blood Sciences desirable requirements.
	Site of Sample	
	Specimen Description If more than 1 Microbiology	

	sample is taken then label the individual samples 1. 2, 3 etc. (with full details on each). If more than 1 Histology sample is taken then label the individual samples A. B, C etc. (with full details on each).	

Request Form Requirements:

Addressographs are accepted on all NOHC request forms. Please affix addressograph labels to ALL copies. The request form should contain the following information

Requirements for Request Form		
Discipline	**Essential**	**Desirable**
RF-LAB-50 Blood Sciences Request Form (Biochemistry and Haematology); RF-LAB-63 Rheumatology Request Form	Patient's Full Name	Clinically relevant information
	Date of Birth	Patient's address
	Hospital Number (MRN)	Mobile Number
	Gender	
	Patient's consultant	
	Patient location/destination for report	
	Signature of venepuncturist or BloodTrack PDA label.	
	Date and, where relevant, time of primary specimen collection	
	Required tests	
RF-MIC-158	Refer to Blood Sciences essential	Refer to Blood

Microbiology Request Form, RF-LAB-54 Histology Request Form	requirements.	Sciences desirable requirements.
	Specimen taker	
	Specimen Type	
	Specimen Site	
	Specimen Description If more than 1 Microbiology sample is taken then label the individual samples 1. 2, 3 etc. (with full details on each). If more than 1 Histology sample is taken then label the individual samples A. B, C etc. (with full details on each).	
RF-BT-78 Blood Transfusion Request Form	Refer to Blood Sciences essential requirements. **There is zero tolerance on any discrepancies in patient demographics.**	Refer to Blood Sciences desirable requirements.
	Requesting doctor	
	CMV/IRR requirements	
RF-LAB-108 External User Request Form	Refer to Blood Sciences essential requirements.	Refer to Blood Sciences desirable requirements.
	NOHC Employee Number or MRN	

** If additional requests are required for Biochemistry, Haematology or Microbiology/Molecular, the requesting clinician MUST complete the **appropriate** Pathology Laboratory Request Form (RF-LAB-50 for Haematology/Biochemistry or RF-MIC-158 for Microbiology/Molecular) and forward to the laboratory.*

Please note that the laboratory will accept an emailed copy of this completed request form to labrequests@nohc.ie

*** If Blood/blood products are required, the requesting clinician MUST complete the Blood Transfusion Request form (RF-BT-78) and forward to the Blood Transfusion laboratory. An accompanying telephone request for ordering blood is preferrable to ensure timely issuing of blood and blood products. Blood/blood products will be prepared but not issued, until receipt of this form. Please note that the blood transfusion laboratory will accept an emailed copy of this completed request form to labrequests@nohc.ie*

Requirements for samples referred to the Mater Misericordiae University Hospital (MMUH), St James Hospital, IBTS and NVRL are listed from page 50.

Specimen Acceptance/Rejection Criteria

It is the policy of the Pathology Laboratory within the NOHC to only accept hospital specimens if both the specimen and the request form match and have the following minimum three key identifiers:

- *Patient's name*
- *Patients' Date of Birth*
- *Patient's Hospital number*

While every effort is made to minimise rejection of samples, some samples will be deemed unsuitable for analysis or will yield inaccurate results. These include:

- Grossly haemolysed samples
- Clotted Samples
- Underfilled samples
- Contaminated Samples due to incorrect order of draw. If an EDTA sample is taken before the biochemistry lithium heparin the potassium and calcium measurement can be affected.
- Samples taken from an arm with an infusion or a line may yield falsely elevated or decreased results.
- Sample/Analyte that may have deteriorated due to prolong transit time e.g. APTT >4 HRS.
- Leaking Specimens
- Aged samples

Samples received into the laboratory, which are rejected for analysis due to sample quality, etc must be recorded in the LIS and then credited with the appropriate comment and requestor notified.

In the case of samples that cannot be easily repeated, the sample and request form are amended by the originator in the laboratory. A laboratory Disclaimer (AP-LAB-5) is completed and these samples are processed as per normal. The nature of the disclaimer is indicated on the laboratory report.

Additional/Spare Samples

Any additional/spare samples received with no apparent test request, are also given a unique laboratory number. The requester, if known, is informed. The sample type will be indicated on the final laboratory report. Samples are stored for up to 7 days if viable. This is not related to spare Blood Transfusion samples.

Within Hours Sample Storage

All samples are stored at Ward level in the specimen Transport Box provided by the Laboratory.
All SSC samples are prepared by SSC staff for transport to NOHC in line with ADR Regulations

Out of Hours Sample Storage

All NOHC out of hours microbiology/molecular samples (with the exception of blood cultures and bone harvest samples) are to be stored at 4ºC in the out of hours hospital specimen fridge (which is located in theatre) for up to 48h.

NOHC Blood cultures must immediately go to the NOHC Microbiology Laboratory and be placed onto the Bact/ALERT Blood Culture analyser. **DO NOT REFRIGERATE.**

Bone Bank samples must immediately go to the NOHC Microbiology Laboratory and be placed into the designated incubators. If this is not possible, store at room temperature but **DO NOT REFRIGERATE.**

For any out of hours NOHC Biochemistry, Haematology and Blood Transfusion samples contact the **on call medical scientist ASAP as per table below. DO NOT REFRIGERATE.**

Contacting the On Call Medical Scientist:

On Call Medical Scientists for Biochemistry, Blood Transfusion and Haematology can be contacted through the Laboratory mobile phones on:

Laboratory On call	Telephone Numbers
Weekday (7pm-7am)	Mobile: 087 2301505
Weekend (8am-8am)	Mobile: 087 6607955
Bank Holidays (8am-8am)	Mobile: 087 2301505

In the event that the rostered medical scientist cannot be contacted **please contact NOHC** switchboard **on (01) 834 1211.**

Specimen collection times:

Porters collect and deliver NOHC samples to the lab at intervals throughout the day during routine working hours. Phlebotomists will also deliver NOHC samples if not collected by the porter.

Porters will collect and deliver NOHC samples to the lab on Saturday morning. The on call Medical Scientist will collect samples as required, outside this time.

SSC will have a twice daily specimen collection from NOHC Ambulance service. SSC will arrange transport of SSC specimens outside the set collections. All request forms are date stamped at specimen reception.

Routine samples must arrive at the lab before **5pm** to be analysed on the same day. Please see Microbiology Department Section for exceptions to these cut off times. Samples to be referred to other hospitals must arrive in the lab before **2:30pm** to be sent on the same day.

Report delivery times:

Reports are placed into sealed envelopes (to maintain confidentiality) and placed into specific pigeonholes in the laboratory and collected by porters throughout the day. The reports are delivered to their source location as indicated on the request form.

SSC reports will be delivered twice daily by NOHC Ambulance service, Monday to Friday. SSC reports will be delivered throughout the weekend/bank holiday by taxi.**The reports are also available on ward enquiry**.

Turnaround Times

Turnaround times are calculated from the time the sample is RECEIVED by the laboratory until the report is available on Ward lookup

Additional Examinations:

In compliance with PP-NOHC-22 (Effective Clinical Communication), verbal requests for additional examinations (add-on requests for tests) for all disciplines will require a completed request form for the relevant department to be sent via email (labrequests@nohc.ie) or hard copy to the laboratory. Viability of additional tests will be confirmed prior to testing by the Laboratory staff.

Repeat examination:

Repeat examination due to analytical failure, further examination of primary specimen or delayed processing is recorded on the LIS by way of a report comment. Discarded specimens and additional examinations are captured on the LIS.

Discrimination:

The laboratory does not discriminate when processing patient samples.

Charges:

NOHC Public / private patients are not charged.

For all other queries, please contact the Laboratory Manager on (01) 814 0386.

Freedom of Information:

The Freedom of Information Act 2014 allows for members of the public to make applications for their own personal records, the records of others and the corporate documents of an organisation.

The Freedom of Information office can be contacted by writing to:
The Freedom of Information Officer, National Orthopaedic Hospital Cappagh, Finglas, Dublin 11.

Open Disclosure:

It is the policy of The National Orthopaedic Hospital Cappagh that incidents are identified, managed, disclosed and reported and that learning is derived from them. The patient must be informed in a timely manner of the facts relating to the incident and an apology provided, where appropriate. (PP-COR-23 NOHC Open Disclosure Policy)

Specimen Transport: *P650 Packaging Instructions (AP-LAB-2)*

P650 **PACKAGING INSTRUCTION** **P650**

This packing instruction applies to UN 3373 (Diagnostic Specimens).

General Requirements

(1) The packaging shall be of good quality, strong enough to withstand the shocks and loadings normally encountered during carriage, including transhipment between vehicles or containers and between vehicles or containers and warehouses as well as any removal from a pallet or overpack for subsequent manual or mechanical handling. Packaging shall be constructed and closed to prevent any loss of contents that might be caused under normal conditions of carriage by vibration or by changes in temperature, humidity or pressure.

(2) **The packaging shall consist of at least three components:**

i) a leak-proof primary receptacle(s)

ii) a leak-proof secondary packaging

iii) an outer packaging of adequate strength for its capacity, mass and intended use, and with at least one surface

having minimum dimensions of 100 mm × 100 mm;

- Either the secondary or outer packaging should be rigid.

(3) Primary receptacles shall be packed in secondary packaging in such a way that, under normal conditions of carriage, they cannot break, be punctured or leak their contents into the secondary packaging. Secondary packagings shall be secured in outer packagings with suitable cushioning material. Any leakage of the contents shall not compromise the integrity of the cushioning material or of the outer packaging. Enough absorbent material is placed between layers so that in the case of leakage there is enough absorbent material to absorb all fluid.

(4) For carriage, the mark illustrated below shall be displayed on the external surface of the outer packaging on a background of a contrasting colour and shall be clearly visible and legible. The

mark shall be in the form of a square set at an angle of 45° (diamond shaped) with minimum dimensions of 50 mm by 50 mm; the width of the line shall be at least 2 mm and the letters and numbers shall be at least 6 mm high. The proper shipping name “Biological Substance, Category B” in letters at least 6 mm high shall be marked on the outer package adjacent to the diamond-shaped mark.



(5) At least one surface of the outer packaging shall have a minimum dimension of 100mm x 100mm.

(6) The completed package shall be capable of successfully passing the drop test in 6.3.5.3 as specified in 6.3.5.2 at a height of 1.2 m. Following the appropriate drop sequence, there shall be no leakage from the primary receptacle(s) which shall remain protected by absorbent material, when required, in the secondary packaging.

(7) **For liquid substances:**

(a) The primary receptacle(s) shall be leakproof;
(b) The secondary packaging shall be leakproof;
(c) If multiple fragile primary receptacles are placed in a single secondary packaging, they shall be either individually wrapped or separated to prevent contact between them;
(d) Absorbent material shall be placed between the primary receptacle(s) and the secondary packaging. The absorbent material shall be in quantity sufficient to absorb the entire contents of the primary receptacle(s) so that any release of the liquid substance will not compromise the integrity of the cushioning material or of the outer packaging;

(e) The primary receptacle or the secondary packaging shall be capable of withstanding, without leakage, an internal pressure of 95 kPa (0.95 bar).

(8) **For solid substances**:

(a) The primary receptacle(s) shall be sift proof;
(b) The secondary packaging shall be sift proof;
(c) If multiple fragile primary receptacles are placed in a single secondary packaging, they shall be either individually wrapped or separated to prevent contact between them.
(d) If there is any doubt as to whether or not residual liquids may be present in the primary receptacle during carriage, then a packaging suitable for liquids, including absorbent materials, shall be used.

(9) Refrigerated or frozen specimens: Ice:

(a) Ice shall be placed outside the secondary packagings or in the outer packaging or an overpack. Interior supports shall be provided to secure the secondary packagings in the original position. If ice is used, the outside packaging or overpack shall be leakproof.
(b) The primary receptacle and the secondary packaging shall maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

(10) When packages are placed in an overpack, the package markings required by this packing instruction shall be clearly visible or reproduced on the outside of the overpack.

(11) Infectious substances assigned to UN No. 3373 which are packed and packages which are marked in accordance with this packing instruction are not subject to any other requirement in ADR.

(12) Clear instructions on filling and closing such packages shall be provided by packaging manufacturers and subsequent distributors to the consignor or to the person who prepares the package (e.g. patient) to enable the package to be correctly prepared for carriage.

(13) Other diagnostic goods shall not be packed in the same packaging as Class 6.2 infectious substances unless they are necessary for maintaining the viability, stabilizing or preventing degradation or neutralization the hazards of the infectious substances. A quantity of 30 mls or less of dangerous goods included in Classes 3,8 or 9 may be packed in each primary receptacle containing infectious substances. When these small quantities of dangerous goods are packed with infectious substances in accordance with this packing instruction no other requirements of ADR need be met.

(14) If any substance has leaked and has been spilled in a vehicle or container, it may not be reused until after it has been thoroughly cleaned and, if necessary, disinfected or decontaminated. Any other goods and articles carried in the same vehicle or container shall be examined for possible contamination.

For packaging of limbs see “Procedure for Specimen and Amputated Limb Collection and Processing” (PP-THE-1).

PHLEBOTOMY SERVICE

Phlebotomy provides a service for NOHC In-Patients, Out-Patients and staff members (GP referral letters, hospital referrals, occupational referrals and inoculation screening) SSC will maintain an onsite Phlebotomy service.

Location:

NOHC Phlebotomy is located on the ground floor opposite the Day Ward. Bloods are taken outside of the area on the wards or in the Out-Patient Department.

Hours of service:

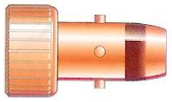
Monday – Friday	07.00am – 16.00pm
Saturday	08.00am – 10.00am

Staff:

The phlebotomists can be reached on DECT numbers: 8867, 8868,8869 and 8969.

Order of Draw: (*AP-PHL-3*)

Please note: If Blood Cultures are to be taken (adult or paediatric) these must be taken first before any other blood samples.

COLOUR CODE	ORDER	INVESTIGATION
	1 **Do Not Refrigerate**	Blood culture analysis (Adult Blue & Purple bottles as a set, Paediatric Yellow bottle only) Bring straight to the laboratory
 2 WHITE	SERUM 4.9ml **1** **STAND UPRIGHT ONCE DRAWN**	Serology, Testosterone, Viral Screens, ACE, Vitamin D **(always do Bone Profile with Vitamin D).** IGF-1 Allergen Screening **(4.9 ml x2) (Specify each allergen)**
3  GREEN	Sodium Citrate (COAG) 2.7/10ml	PT/INR, APTT, Fibrinogen and D-Dimers Factor V Leiden **(2.7ml x 2 plus 2.7ml x 1 EDTA grey top)** Thrombophilia Screen **(2.7ml x 6 plus 2.7ml x 1 EDTA grey top)** Von Willebrand's Screen **(2.7ml x 4)** **UNDER FILLED SAMPLES WILL BE REJECTED**
4  BROWN	SERUM GEL 4.9ml **STAND UPRIGHT ONCE DRAWN**	LDH, Therapeutic Drug levels, **Lithium (4.9 ml x1) for Biochemistry only** All **Immunology:** Electrophorosis, RH Factors, CCP, Ds DNA, C3, C4, ANA, ENA, ANCA, Coeliac/TTG **(4.9 ml x1)**
5  ORANGE	METAL FREE LITHIUM HEPARIN 7.5 ml	Metal Ions including ASR's – **Chromium/Cobalt** Use special Metal Free Lithium Heparin tube and special metal free needle. **Extra metal free tube required for TITANIUM**
6  ORANGE	LITHIUM HEPARIN GEL 4.9ml	**Tests done by NOHC require (4.9ml x1)** Renal, Liver, Bone Profiles (**Calcium & Phosphate**), Magnesium, CRP, Vancomycin, Haematinics (**Iron, Transferrin, B12, Folate, Ferritin, TSAT**) **Troponin I (Extra sample bottle to be taken for Troponin I)** **Tests referred to MMUH Lab require separate tube (4.9ml x1)** Lipid Profile, Urate (Uric Acid), CK (CPK), Amylase, PSA, TFT, TPO Ab, FSH/LH, Progesterone, Prolactin, Oestradiol, Gentamicin, Osmolality, Cortisol. Homocysteine (contact Lab) **Tumour markers (CEA, CA 125, CA 19.9)**
 7 RED	BLOOD TRANSFUSION 7.5ml or 4.5ml (Paediatric G&H)	Group, Crossmatch HLA B27 **(full tube x1)**
8  RED **Wide 2.7ml tube only**	EDTA 2.7ml	**HBA1c (separate 2.7ml tube)** **PTH (Always do Bone Profile with PTH),** **NT-Pro BNP**

 **9** GREY	EDTA 2.7ml	**FBC,** IM Screen, *SICKLEDEX*®/HPLC, Haemochromatosis Lymphocyte Subsets.
 **10** DARK PINK	**ThromboExact** 2.7ml	Pseudothrombocytopenia
 **11** YELLOW	SODIUM FLUORIDE 2.7ml	Glucose, Glucose Tolerance Test (GTT)
 **12** PURPLE	Citrate,4NC 2ml	**ESR** UNDER FILLED SAMPLES WILL BE REJECTED

Disposal of Materials used in the Collection of Samples

If gloves, tourniquet, swabs, and any packaging used during the phlebotomy procedure are free from bodily fluid/blood, they can be disposed of in general waste bin (Black). If there are any traces of blood on these items, they must be disposed into a Clinical waste bag (Yellow). Staff are responsible for the safe use and disposal of every sharp they generate. Sharps must be disposed in the sharps bins provided.

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Recommendations for blood culture collection

a summary of good practice

Using winged blood collection set

1> Prepare blood collection kit

Gather all materials before beginning the procedure. **Ensure the blood culture bottles are within date. Do not use bottles which show any signs of damage, deterioration or contamination.**





2> Prepare bottles for inoculation

Wash hands with soap and water then dry, or apply an alcohol hand rub. Remove the plastic "flip-cap" from the blood culture bottles and disinfect the septum using an appropriate disinfectant, such as 2% chlorhexidine in 70% isopropyl alcohol, 70% isopropyl alcohol, or iodine in swab or applicator form. Use a fresh swab/applicator for each bottle. **Allow bottle tops to dry in order to fully disinfect.**




BIOMÉRIEUX

3> Prepare venipuncture site

Confirm the patient's identity. If skin is visibly soiled, clean with soap and water. Apply a disposable tourniquet. Palpate to identify the vein and cleanse using an appropriate disinfectant, such as 2% chlorhexidine in 70% isopropyl alcohol, 70% isopropyl alcohol, or iodine in swab or applicator form.
The venipuncture site is not fully clean until the disinfectant has fully evaporated.





4> Wash hands. Wear gloves.

Wash hands again or use an alcohol hand-rub and apply clean examination gloves.
Sterile gloves are not necessary.




5> Venipuncture

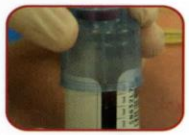
Attach a winged blood collection set to a collection adapter cap.
To prevent contaminating the puncture site, do not re-palpate the prepared vein before inserting the needle.
Insert the needle into the prepared site.




For full instructions on using BacT/ALERT® culture bottles, refer to the manufacturer's Instructions for Use.

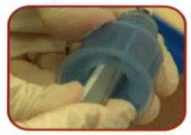
6> Culture bottle inoculation

Place the adapter cap over the aerobic bottle and press down to pierce the septum. Hold the bottle below the patient's arm with the bottle in an upright position, and use the graduation lines to accurately gauge sample volume.
Do not allow the culture bottle contents to touch the stopper or the end of the needle during the collection. Monitor the process closely to ensure proper flow is obtained and that there is no backflow of bottle contents in the adapter tubing.
Add up to 10 ml of blood per adult bottle and up to 4 ml per pediatric bottle. Once the aerobic bottle has been inoculated, remove the adapter cap and repeat the procedure for the anaerobic bottle. Release the tourniquet as soon as the blood starts to flow into the bottle, or within 2 minutes of application.
The use of blood collection adapters without blood collection sets is not recommended.

7> Other blood tests

If blood is being collected for other tests, place an insert into the adapter cap. The insert is used to guide blood collection tubes onto the needle. **If other blood tests are required, always collect the blood culture first.**



8> Finish the procedure

Discard the winged collection set into a sharps container and cover the puncture site with an appropriate dressing. Remove gloves and wash hands before recording the procedure, including indication for culture, time, site of venipuncture, and any complications. **Ensure additional labels do not cover the bottle barcodes and that the tear-off barcode labels are not removed.**




Recommendations for blood culture collection

a summary of good practice

Using needle and syringe

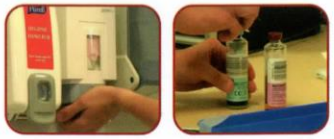
1> Prepare blood collection kit

Gather all materials before beginning the procedure. **Ensure the blood culture bottles are within date. Do not use bottles which show any signs of damage, deterioration or contamination.**



2> Prepare bottles for inoculation

Wash hands with soap and water then dry, or apply an alcohol hand rub. Remove the plastic "flip-cap" from the blood culture bottles and disinfect the septum using an appropriate disinfectant, such as 2% chlorhexidine in 70% isopropyl alcohol, 70% isopropyl alcohol, or iodine in swab or applicator form. Use a fresh swab/applicator for each bottle. **Allow bottle tops to dry in order to fully disinfect.**



BIOMÉRIEUX

3> Prepare venipuncture site

Confirm the patient's identity. If skin is visibly soiled, clean with soap and water. Apply a disposable tourniquet. Palpate to identify the vein and cleanse using an appropriate disinfectant, such as 2% chlorhexidine in 70% isopropyl alcohol, 70% isopropyl alcohol, or iodine in swab or applicator form. **The venipuncture site is not fully clean until the disinfectant has fully evaporated.**



4> Wash hands. Wear gloves.

Wash hands again or use an alcohol hand-rub and apply clean examination gloves. Sterile gloves are not necessary.



5> Venipuncture

Attach the needle to a syringe. **To prevent contaminating the puncture site, do not re-palpate the prepared vein before inserting the needle.** Carefully insert the needle into the vein.



6> Culture bottle inoculation

Collect the sample. Transfer the blood into the culture bottles, starting with the anaerobic bottle. Hold the bottle upright and use the graduation lines to accurately gauge sample volume. Add up to 10 ml of blood per adult bottle and up to 4 ml per pediatric bottle.



7> Finish the procedure

Discard the needle and syringe into a sharps container and cover the puncture site with an appropriate dressing. Remove gloves and wash hands before recording the procedure, including indication for culture, time, site of venipuncture, and any complications. **Ensure additional labels do not cover the bottle barcodes and that the tear-off barcode labels are not removed.**



bioMérieux S.A.
69280 Marcy l'Etoile
France
Tel. : 33 (0)4 78 87 20 00
Fax : 33 (0)4 78 87 20 90
www.biomerieux.com

BIOMÉRIEUX

BIOCHEMISTRY

Clinical Biochemistry deals with the biochemical basis of disease and the use of biochemical tests for its diagnosis, prognosis, and management. Renal profile (sodium, potassium, Chloride, urea, creatinine, calculated eGFR), Liver profile (total protein, albumin, calculated globulins, bilirubin, alkaline phosphatase, ALT and Gamma GT), bone profile (albumin, calcium, phosphate, calcium adjusted for albumin and alkaline phosphatase) and Iron profile (Iron, Transferrin, calculated Transferrin Saturation, Ferritin, Folate and Vitamin B12) are carried out daily as requested. Blood Gases, which includes: pH, pCO2, pO2 std bicarbonate and Lactate are measured shortly after collection due to the rapid rate of change of the values in both the specimen and patient. Other tests include High Sensitivity Troponin I, Glucose, C- Reactive Protein (CRP), HbA1c and Magnesium. There are two Blood Gas Analysers located in HDU and in Recovery, which measures Blood Gases, Electrolytes (Sodium, Chloride and Potassium ion concentration), Total Haemoglobin and Metabolites (Lactate and Glucose concentration). There are 12 glucometers located on each ward on the hospital for Near patient testing along with two ketone meters, one in HDU and one in Theatre. Some low volume tests are referred to other hospitals and these are listed from page 50. Routine chemistry samples are processed on the Beckman Coulter AU480 chemistry platform and/or the Beckman Coulter Access 2 Immunoassay analyser, depending on the test required. HbA1c tests are processed on the Arkray HA-8190V analyser.

Note: One lithium heparin 4.9ml is sufficient to measure renal, liver, bone profiles, magnesium, and CRP.

Turn Around Times

Urgent specimens: 1 hour (Clinically urgent specimens should be phoned and delivered promptly)
HDU/Fast track specimens: 2 hours (priority)
Routine specimens: 8 hours (same day)
Iron studies 24 hours (Weekdays)
HbA1c 48 Hours (Weekdays)

Hours of service:

Monday – Friday 8.00am to 7.00pm

Monday – Friday 7.00am to 8.00am, the on call medical scientist is on site to process pre-op bloods for Same Day Admission (SDA) Patients.

A limited off site on call emergency service is available outside these hours.

All Biochemistry tests as listed in the below tables, are available on call, except for iron, transferrin, Ferritin, Folate, Vitamin B12 and HbA1c.

	Test	Specimen Bottle	Units	Reference Range	Whole Blood Sample Viability at Room Temp **	Stability after separation (Fridge)	Method/ Analyser
RENAL	Sodium	Li Hep 4.9 ml	mmol/l	135-145	24 Hours	6 days	Indirect ISE/ AU480
	Potassium	Li Hep 4.9 ml	mmol/l	3.3.-5.0	4 Hours	1 day	Indirect ISE/ AU480
	Chloride	Li Hep 4.9 ml	mmol/l	95-108	24 Hours	6 days	Indirect ISE/ AU480
	Urea	Li Hep 4.9 ml	mmol/l	2.6-6.8 (F) P<17yrs 2.6-7.5 (M) P<17yrs 2.5-7.8 Adult	24 Hours	6 days	Urease/A U480
	Creatinine	Li Hep 4.9 ml	umol/l	22-41 P<5yrs 30-57 P<12yrs 43-75 P<15yrs 46-77(F)P<18yrs 58-99(M)P<18yrs 49-90 (F) Adult 64-104(M) Adult	24 Hours	6 days	Enzymatic /AU480
	eGFR	Calculated	mL/min	See below	N/A	N/A	N/A
LIVER	Total Protein	Li Hep 4.9 ml	g/l	59-72 P<6yrs 62-74 P<9yrs 63-77 P<18yrs 60-80 Adult	24 Hours	6 days	Biuret/ AU480

	Albumin	Li Hep 4.9 ml	g/l	38-47 P<8yrs 39-49 P<15yrs 38-51(F) P<18yrs 40-52(M)P<18yrs 35-50 Adult	24 Hours	7 days	BCG/ AU480
	Total Bilirubin	Li Hep 4.9 ml	µmol/l	2.0-8.0 P<9yrs 2.0-10 P<12yrs 3.0-13 P<15yrs 3-15 P<18yrs <21 Adult	24 Hours	1 day	DPD/ AU480
	Globulin	Calculated (TP-ALB)	g/l	18-36	N/A	N/A	N/A
	ALP	Li Hep 4.9 ml	IU/l	160-381 P<10yrs 144-475 P<13yrs 62-288(F) P<15yrs 130-534(M) P<15yrs 54-131 (F) P<17yrs 90-377 (M) P<17yrs 48-96(F) P<18yrs 59-168(M) P<18yrs 30-130 Adult	24 Hours	3 days	AMP(IFCC) / AU480
	ALT	Li Hep 4.9 ml	IU/l	9-23 P<13yrs 8-22 P<18yrs <50 (M) Adult <35 (F) Adult	24 Hours	6 days	IFCC/ AU480
	Gamma GT	Li Hep 4.9 ml	IU/l	5-13 P<11yrs 6-17 P<18yrs 3-38 (F) Adult 3-55 (M) Adult	24 Hours	6 days	IFCC/ AU480
BONE	Albumin	Li Hep 4.9 ml		38-47 P<8yrs 39-49 P<15yrs 38-51(F) P<18yrs 40-52(M)P<18yrs 35-50 Adult	24 Hours	7 days	BCG/ AU480
	Calcium	Li Hep 4.9 ml	mmol/l	2.20-2.70 P<13yrs 2.20-2.65 Adult	24 Hours	6 days	Arsenazo/ AU480
	Adjusted Calcium	Calculated (corrected for Albumin)	mmol/l	2.20-2.60	N/A	N/A	N/A
	Inorganic Phosphate	Li Hep 4.9 ml	mmol/l	1.4-2.33 P<5yrs 1.28-1.98 P<13yrs 0.93-1.87(F) P<16yrs 1.05-2.10(M) P<16yrs 0.93-1.63 P<18yrs	4 Hours	1 day	Phosphomolybdate UV/AU480

				0.8-1.5 Adult			
Iron Profile	Iron	Li Hep 4.9 ml	µmol/l	3.0-23 P<14yrs 4.0-29(F) P<18yrs 6.0-30(M) P<18yrs 10.7-32 (F) Adult 12.5-32(M) Adult	4 Hours	5 days	TPTZ/ AU480
	Transferrin	Li Hep 4.9 ml	g/l	2.14-3.30 P<18yrs 2.0-3.6 Adult	24 Hours	7 days	Turbimetric / AU480
	Transferrin Saturation	Calculated	%	10-50% (F) 17-55% (M)	N/A	N/A	N/A
	Ferritin	Li Hep 4.9 ml	ug/l	11-306.8 (F) 23.9-336.2 (M)	4 Hours	1 Day	Immunoassay/ Access 2
	Folate	Li Hep 4.9 ml	ug/l	5.9-22.3	4 Hours	1 Day	Immunoassay/ Access 2
	Vitamin B12	Li Hep 4.9 ml	ng/l	122-626	4 Hours	1 Day	Immunoassay/ Access 2
Other	Magnesium	Li Hep 4.9 ml	mmol/l	0.83-1.13 P<18yrs 0.7-1.0 Adult	4 Hours	7 days	Xylidl blue/ AU480
	Glucose	Fluoride Oxalate 2.7ml	mmol/l	3.9-5.5 (Fasting) WHO	4 Hours	7 days	Hexokinase / AU480
	CRP	Li Hep 4.9 ml	mg/l	<5	24 Hours	7 days	Latex/ AU480
	High Sensitivity Troponin I	Li Hep 4.9 ml	ng/L	M <20, F <12 Refer-to algorithm ED-BIO-50	8 Hours	8 Hours	Immunoassay/ Access 2
	^HbA1c	EDTA 2.7 ml	mmol/ mol	20-42 (IFCC)	3 Days	8 Days	HPLC HA-8190V
Anti-biotic	Vancomycin	Li Hep 4.9 ml	mg/l	Once daily/BD dosing- desirable level (Predose/Trough) 10-20 mg/l Complicated Infection- desirable level (predose/trough) 15-20 mg/l	24 Hours	7 days	PETINIA/ AU480

				Continuous Infusion-desirable level (random) 20-25 mg/l For children aged 1 month to 17 years: (predose/trough) 10-15 mg/l (15-20 mg/L for less sensitive strains of MRSA			

The laboratory must be notified prior to ABG specimens being taken.

NPT	Test	Specimen Bottle	Units	Reference Range	Whole Blood Sample Viability at Room Temp	Stability after separation (Room temp)	Analyser
^Blood Gas	pH	Heparinised Syringe safe Pico self-fill with needle		7.35-7.45	30 minutes RT	N/A	Room Temp ABL90 Flex plus
	PCO2		kPa	4.5-6.0		N/A	
	PO2		kPa	11-14.0		N/A	
	Base Excess		mmol/l	-2.0 - +3.0		N/A	
	STD Bicarbonate		mmol/l	22.4-25.8		N/A	
	Oxygen Saturation		percentage	95-98%		N/A	
	cLactate		mmol/l	0.5 – 2.0		N/A	
	cGlucose		mmol/l	3.5 – 6.0		N/A	
	ctHb		g/dL	M 13.0-18.0 F 11.5-16.5		N/A	
^Glucometers	Glucose	Finger prick	mmol/l	3.0-6.0	N/A	N/A	Roche Inform II
^Ketone meter	Ketones	Finger prick	mmol/l	<0.6	N/A	N/A	Ketosure POC

**** Stability references reviewed in accordance with Consultant Clinical Biochemist:**

"Stability study of 81 analytes in human whole blood, in serum and in plasma

Christiane Oddoze , Elise Lombard, Henri Portugal"
https://www.sciencedirect.com/science/article/abs/pii/S0009912012000197?via%3Dihub

Information is taken from the manufacturer's kit insert and an inhouse stability study (AP-BIO-15).
Reference ranges are for non-pregnant Adults unless otherwise stated.
Paediatric reference ranges taken from Adeli K,Higgins V, Trajcevski K, Al Habeed (2017). "The Canadian Laboratory initiative on paediatric reference intervals: A Caliper white paper".
Adult reference ranges taken from the Pathology Harmony Project, where available, and the Kit inserts.
Blood gas reference ranges taken from MMUH in-house study.

Add on requests

Samples are stored in the lab for 7 days. Additional testing can be requested on samples if within the test stability stated above. If requesting an add on request, send a form with add on request and the test(s) required to the lab.

Stratification of Chronic Kidney Disease by eGFR

	Stage Description	***GFR (ml/min/1.73m^2)***
1.	Kidney damage with normal	GFR >90 with other evidence of chronic kidney damage*
2.	Mild reduction in GFR	GFR 60-89 with other evidence of chronic kidney damage*
3.	Moderate reduction in GFR	GFR 30-59
4.	Severe reduction in GFR	GFR 15-29
5.	Kidney Failure	GFR <15 or RRT

-
- Estimates of GFR are unreliable in acute renal failure due to the kinetics of creatinine accumulation.
- GFR estimates between 60 and 89 mL/min/1.73m^2 do not indicate CKD unless there is other laboratory/clinical evidence of disease.
- The formula is applicable to adult patients (i.e. patients 18 years or older).
- Values will not be given for results of eGFR >/=90ml/min/1.73m^2
- The formula is not adjusted for ethnicity

Interfering Substances

Many tests are subject to interference. This may be biological, where the offending substance alters the true concentration within the body, or analytical, where the method is not specific. The report will outline the more common interfering substances such as haemolysis, Icteria (bilirubin interference) and Lipaemia (lipoprotein interference). Depending on the degree of interference, some assays may not be reportable.

Abbreviations:

AU480- Beckman Coulter AU480 Clinical chemistry analyser

Access 2- Beckman coulter Access 2 immunoassay analyser

Arkray HA-8190V- High Performance Liquid chromatography (HPLC) analyser for HbA1c

M – Male

F – Female

P < Paediatric range less than

A - Adult

Li Hep – Lithium Heparin

ALP – Alkaline Phosphatase

ALT – Alanine Aminotransferase

ACa2+ - Adjusted calcium

eGFR Estimated Glomerular Filtration Rate

TSat Transferrin Saturation

CRP – C-reactive protein

ctHb – Total Haemoglobin (concentration)

HbA1c – Glycosylated haemoglobin

ABG- Arterial Blood Gas

^ non-accredited test

NOTE: * Reference Ranges quoted are both adult and paediatric unless otherwise indicated by letter P

HAEMATOLOGY

The Haematology Laboratory deals with investigations into general haematological diseases including anaemia, and monitoring the blood coagulation status of the patients.

The following tests are carried out in Haematology:

- Full blood counts which include red cell counts, white cell counts and differential, haemoglobin, haematocrit, red cell indices such as mean cell volume (MCV), me an cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC), and platelet counts** ***To note FBC testing is currently outside scope of accreditation.***
- Coagulation studies which include prothrombin time, activated partial thromboplastin time and fibrinogen
- Erythrocyte sedimentation rate
- Blood Films
- Sickle Screening

Some low volume tests are referred to other hospitals and these are listed from Page 50. Samples may be processed on the Sysmexes XN2000, ACL TOP 550

Please note that the examination method, if required, is available on request from the laboratory.

Turn Around Times

Urgent specimens: 1 hour

HDU/Fast track specimens: 2 hours (priority)

Routine specimens: 8 hours (same day)

Blood Films: 24 hours

Hours of service:

Monday – Friday 8.00 am to 7.00pm,

Monday – Friday 7.00 am to 8.00am, the on call medical scientist is on site to process pre-op bloods for Same Day Admission (SDA) Patients.

A limited off site on call emergency service is available outside these hours.

All Haematology tests as listed in the below tables, are available on call with the exception of blood films AND Sickle Cell Screen.

Sample Requirements for Haematology – refer to AP-HAEM-2

	Test	Specimen Bottle	Units	Reference Range	Specimen Viability	Storage Requirements
^FBC	**^WBC**	2.7ml EDTA	x10^9 /L	6.0-18.0 (≤1 yr) 5.0-15 (≤8 yrs) 4.5-13.5 (9-13 yrs) 4.0-11.0 Adult (≥14yrs)	8 Hours	Room Temperature
	^RBC	2.7ml EDTA	x10^12 /L	3.1 - 4.5 (91 days) 3.7-5.3 (2 yrs) 3.9-5.3 (3-6 yrs) 4.0-5.2 (7-12 yrs) 4.5-5.3 M (13-18yrs) 4.5-6.5 M(≥19yrs) 4.1-5.1 F(13-18yrs) 3.8-5.8 F (≥19yrs)		
	^HB	2.7ml EDTA	g/dl	9.0- 14.0 (63 days) 10.5-13.5(18mths-3yrs) 11.5- 14.5 (4 to 7 yrs) 11.5-15.5 (8 to 13yrs) 13.0-18.0 M (≥14yrs) 11.5-16.5 F (≥14yrs)		
	^HCT	2.7ml EDTA	%	29.0- 41.0 (98 days) 33.0-39.0 (98 days) 35.0-45.0 (4 to13 yrs) 40.0-54.0 M (≥14yrs) 37.0-47.0 F (≥14yrs)		

	^MCV	2.7ml EDTA	fl	74-118 (98 days) 70-86 (≥3yrs) 75-87 (5 to 6 yrs) 77-96 (7 to 13 yrs) 80-95 Adult (≥14yrs)		
	^MCH	2.7ml EDTA	pg	25-35 (95 days) 23-31 (≥3yrs) 24-30 (4 to 7yrs) 25-33 (8 to 13 yrs) 28-32 Adult (≥14yrs)		
	^MCHC	2.7ml EDTA	g/dl	32.1-36.5 (1yrs) 31-37 (≥6yrs) 32-36 Adult (≥7yrs)	8 Hours	Room Temperature
	^RDW	2.7ml EDTA	**%**	11.0-16.0 M/F/P		
	^PLATELET	2.7ml EDTA	x10^9/L	150-400 M/F/P		
	^MPV	2.7ml EDTA	fl	7.5-10.5 M/F/P		
	^Neutrophils	2.7ml EDTA	x10^9/L	1.5 – 7.0 (≤3 days) 1.0 – 8.5 (≤2 yrs) 1.5-8.5 (3 to 6 yrs) 1.5-8.0 (7 to 12 yrs) 1.8-8.0 (13 to 16 yrs) 2.0-7.5 Adult (≥17yrs)		
	^Lymphocytes	2.7ml EDTA	x10^9/L	2.0 – 5.0 (≤3 days) 3.0 – 13.5 (≤2 yrs) 2.0-9.5 (3 to 6 yrs) 1.5-7.0 (7 to 12 yrs) 1.2-5.2 (13 to 16 yrs) 1.5-4.0 Adult (≥17yrs)		

	^Monocytes	2.7ml EDTA	x10^9/L	0.3– 1.1(≤3 days) 0.3 – 1.5 (≤2 yrs) 0.3-1.5 (3 to 6 yrs) 0.1-1.8 (7 to 12 yrs) 0.1-0.8 (13 to 16 yrs) 0.2-0.8 Adult (≥17yrs)		
	^Eosinophils	2.7ml EDTA	x10^9/L	0.2 – 2.0 (≤3 days) 0.1- 0.3 (≤2 yrs) 0.3-0.8 (3 to 6 yrs) 0.1-0.8(7 to 16 yrs) 0-0.4 Adult (≥17yrs)		
	^Basophils	2.7ml EDTA	x10^9/L	0.02 – 0.1(≤3 days) 0.02 – 0.1(≤2 yrs) 0.02-0.1(3 to 6 yrs) 0.0-0.2 (7 to 16 yrs) 0-0.1 Adult (≥17yrs)		
Coag	**PT**	3.0ml Citrate	Seconds	9.9-13.4 (1 to 5 yrs) 10.0-14.6 (6 to 10 yrs) 10.0-14.1 (11 to 16 yrs) 10.8-13.4 (≥17yrs)	12 Hours	Room Temperature
	APTT	3.0ml Citrate	Seconds	24.0-39.2 (1 to 5 yrs) 26.9-38.7 (6 to 10 yrs) 24.6-38.4 (11 to 16 yrs) 25 – 36.5 (≥17yrs)	4 hours	
	Fibrinogen	3.0ml Citrate	g/l	1 1.64-4.97 (1 to 5 yrs) 1.71-5.37 (6 to 10 yrs) 1.68-5.29 (11 to 16 yrs) 1.5-4.0 (≥17yrs)	12 hours	
	ESR	Sedivette	mm/hr	3-13 (Neo to Puberty)	24 Hours	Refrigerate

		ESR/Citrate Buffer 3.5ml		0-10 M (≥14yrs) 0-20 F (≥14yrs)		
	Blood Film	2.7ml EDTA			8 Hours	Room Temperature
	Sickle Screening	2.7ml EDTA		F	8 hours 7 days (as per retention of samples in house)	Room Temperature 2– 8°C

For reference:

- Source of Reference Range for adults – Practical Haematology 12th Edition in combination with Consultant Haematologist (ED-HAEM-15, ED-HAEM-90)
- BSH guideline: Identification and management of preoperative anaemia in adults: A British Society for Haematology Guidelines (ED-HAEM-96) and Significant-haemoglobinopathies-a-guideline-for-screening-and-diagnosis. (ED-HAEM-94)
- Paediatrics reference ranges are in accordance with Temple Street Hospital and Crumlin Hospital and Great Ormond Street together with Consultant Haematologist (ED-HAEM-69, ED-HAEM-70, ED-HAEM- 88, ED-HAEM-90)

Abbreviations:

WBC – White Blood Cell
RBC – Red Blood Cell
HB – Haemoglobin
HCT – Haematocrit
MCV – Mean Cell Volume
MCH − Mean Cell Haemoglobin
MCHC – Mean Cell Haemoglobin Concentration
Paeds - Paediatrics
SCD – Sickle Cell Disease
PT – Prothrombin Time
APTT – Activated Partial Thromboplastin Time
ESR – Erythrocyte Sedimentation Rate
EDTA − Ethylenediaminetetraacetic acid
MPV − Mean Platelet Volume
RDW – Red Cell Distribution Width
^- Unaccreditated Test

LABORATORY CRITICAL VALUES *(AP-LAB-4)*

Primary Critical Results are Telephoned ASAP to the Clinical Team

BIOCHEMISTRY					
Test	**Sex**	**Age(Yrs)**	**Code**	**Less than or equal to (≤)**	**Greater than or equal to (≥)**
Urea (plasma)	M/F	0-120	URE		30 mmol/L
Sodium (plasma)	M/F	0-120	NA	125 mmol/L	155 mmol/L
Potassium (plasma)	M/F	0-120	K	2.8 mmol/L	5.8 mmol/L
Creatinine (plasma)	M/F	0-120	CREA		354 µmmol/L and/or 3x baseline if known as per KDIGO
Calcium (adjusted) (plasma)	M/F	0-120	CA	1.8 mmol/L	2.90 mmol/L
Glucose (Fasting/Random) (plasma)	M/F	0-120	GLU	2.5 mmol/L	25 mmol/L
C-Reactive Protein (plasma)	M/F	0-120	CRP		300 mg/L
hsTroponin I (plasma)	M F	0-120	hsTrop I		(M) 100 ng/L (F) 60 ng/L
ALT (plasma)	M/F	18-120 0-17	ALT		600 IU/l 300 IU/l
Phosphate (plasma)	M/F	0-120	PO4	0.30 mmol/L	2.50 mmol/L
Magnesium (plasma)	M/F	0-120	Mg	0.40 mmol/L	1.50 mmol/L
Lactate (whole blood)	M/F	0-120	LAC		2.0 mmol/L
Vancomycin (plasma)	M/F	0-120	VANC		25.0 mg/L

Primary Critical Results are Telephoned ASAP to the Clinical Team

HAEMATOLOGY					
Test	**Sex**	**Age(Yrs)**	**Code**		
	Pre-Operatively				
White Blood Cell	M/F/U	0-12	WBC	<3.0 x 10^9 /L	>20.0 x 10^9 /L
	M/F/U	13-121		<3.0 x 10^9 /L	>20.0 x 10^9 /L
Neutrophils	M/F/U	13-121	NEUT	<1.0 x 10^9 /L	>20.0 x 10^9 /L
Lymphocytes	M/F/U	13-121	LYMP	-	>6.0 x 10^9 /L
Haemoglobin	M/F/U	0-12	HB	<9.5 g/dl	>16.0 g/dl
	M/F/U	13-121		≤6.0 g/dl	>20.0 g/dl
				≤8.0g/dl-phone for transfusion purposes	
				≤7.0g/dl-phone to request repeat Or unexpected drop in Hb	
Platelets	M/F/U	0-12	PLT	≤50 x 10^9 /L	>800 x 10^9 /L
	M/F/U	13-121		≤80 x 10^9 /L	>800 x 10^9 /L
				<100 Phone result following film check	
				≤80 phone to request repeat	
	Post Operatively				
White Blood Cell	M/F/U	0-12	WBC	<3.0 x 10^9 /L	>20.0 x 10^9 /L
	M/F/U	13-121		<3.0 x 10^9 /L	>20.0 x 10^9 /L
Haemoglobin	M/F/U	0-12	HB	<9.5 g/dl	<16.0 g/dl
	M/F/U	13-121		≤6.0 g/dl	>20.0 g/dl
				≤8.0g/dl-phone for transfusion purposes	
				≤7.0g/dl-phone to request repeat Or unexpected drop in Hb	
Platelets	M/F/U		PLT	≤50 x 10^9 /L	≥800 x 10^9 /L
				<100 Phone result following film check	
				≤80 phone to request repeat	
Preoperative/Post Operative					
PT (INR)	M/F		PT		>4.5 phone to request repeat
					6.0
APTT	M/F		APTT		>40 phone to request repeat
					120 Sec
Fibrinogen	M/F		FIBR	<1.5g/l	
Sickle Screening	M/F/U		SDEX	POSITIVE	PHONE RESULT

BLOOD TRANSFUSION

The Blood Transfusion Laboratory performs a range of tests including blood grouping, antibody screening and compatibility testing. This testing is to ensure the right blood gets to the right patient in a timely manner. A range of blood products are available from the blood transfusion laboratory- red cells, plasma, platelets, prothrombin complex and fibrinogen. Please note that the examination method, if required, is available on request from the laboratory.

Turn Around Times:

Routine specimens: Same Day

Urgent group and screen: 1 hr (antibody screen negative)

Crossmatch: 60 minutes*

*In the case of crossmatching for UPMC Sports Surgery Clinic, additional logistics (transfer by taxi) may result in increased turnaround times.

Hours of service:

Monday – Friday 8.00am to 7.00pm

Monday – Friday 7.00am to 8.00am, the on call medical scientist is on site to process pre-op bloods for Same Day Admission (SDA) Patients.

A limited off site on call emergency service is available outside these hours.

The following tests are available on call:

Group and hold, crossmatching and issuing of blood products (Red Cell, Platelets, Plasma, Prothrombin Complex Concentrate (**PCC)** and Fibrinogen)

Samples may be processed manually (using tube technology or gel technology) or automatically (using gel technology on the IH-500).

Samples for HLAB27 are referred to the IBTS. Refer to page 72.

In line with the BSH Guidelines, Appendix 7, two (2) Group and Hold Specimens are required prior to the issue of blood group specific red cell units. This requires two (2) separate Group and Hold specimens to be taken on two separate episodes.

Guide to pre-transfusion collection of samples:

- If the patient **has not been pregnant or transfused in the previous three (3) months**, the patient's sample is valid for **seven (7) days**.
- If the patient **has been pregnant or transfused in the previous three (3) months** the patient's sample is valid for **three days (72 hours)**.
- This testing frequency is essential because of the possibility of antibody development in patients exposed to red cell antigens from transfusion or pregnancy during the referred intervals. This will ensure compatible blood is available for patients.

If 72 hours have elapsed since the patient was transfused and further transfusion is contemplated, then a new sample must be sent for group and antibody screen and crossmatching. This is required for the confirmation of antibody status, ensuring the correct blood is issued at all times. EDTA samples are retained in the laboratory for 7 days after being processed and are then discarded. Samples that have been used for crossmatch are retained in the laboratory for 14 days after the crossmatch.

Crossmatched units for NOHC patients are stored in the Issue Fridge located in Theatre Recovery, unless otherwise stated (Please check Blood Track or phone the Blood Transfusion laboratory to confirm the availability of blood products). Crossmatched units for SSC patients are stored in the Blood Transfusion laboratory until they are required for transfusion. Crossmatched units and blood products are issued to the patient for 48 hours before being returned to stock in the laboratory.

Four emergency O Rhesus D Negative, Kell Negative, CMV Negative and group confirmed blood units are held on standby in the Blood Transfusion Department and Two Emergency O Rhesus D Negative, Kell Negative, CMV Negative are kept in the Issue Fridge in Recovery at all times. This is to cater for emergency situations.

A notice period is required for specific requests regarding ordering of blood products:

- CMV negative and irradiated blood units Routine (at least 24 hours for SSC)
- Antibodies or multiple antibodies At least 48hrs Notice

Sample Requirements for Blood Transfusion

Test Profile	Specimen Bottle	Profile Includes	Results available/Comments	Sample viability	Storage
Group and Hold	7.5ml/4.5ml EDTA (Red Writing)	Blood Group Antibody Screen	Specimens are analysed on the Biorad IH-500 analyser and reported same day. Automated blood group and antibody screen – 60 minutes. If an urgent blood group and antibody screen is required, the group and screen may be carried out manually and a result may be available within 35 – 40 minutes, (if antibody screen is negative). If negative, the results will be available on the same day. Positive results will necessitate further investigation.	24 hours 7 Days (72 hours if patient has been transfused /pregnant in last 3 months)	Room Temp 4°C
Issuing of Blood Products:	7.5ml/4.5ml EDTA (Red Writing)	Red cells Octaplas, PCC & Fibrinogen Platelets	For an urgent Immediate spin cross match -**20 minutes**. FULL crossmatch – **60 minutes** Octaplas (Frozen Plasma) are defrosted and issued in **30- 35 minutes.** Fibrinogen and PCC are stored on site and issued in **10 minutes.** Platelets are not stored on site, so will have to be ordered in from the IBTS, which may take between **1.5–2 hours** to be delivered and issued from ordering	24 hours 7 Days (72 hours if patient has been transfused /pregnant in last 3 months)	Room Temp 4°C
Antibody Panels	7.5ml/4.5ml EDTA (Red Writing) by 2		If a positive antibody screen is detected, extensive panels are carried out to ascertain antibody identification. This assists in provision of antigen negative blood. Turnaround dependant on the complexity of the antibodies present. If the antibody cannot be identified in-	24 hours 7 Days (72 hours if patient has been	Room Temp 4°C

			house; the sample is referred to the IBTS. (Turnaround time (TAT) usually 10 working days)	transfused /pregnant in last 3 months)	
Direct Coombs Test (DAT/DCT)	7.5ml/4.5ml/2.7ml EDTA		The DAT/DCT is a test used to determine if red cells have been coated in vivo with immunoglobulin, complement or both. A positive DAT may or may not be associated with immune-mediated haemolysis. The DAT is used primarily for the investigation of haemolytic transfusion reactions (HTR's), auto-immune haemolytic anaemia (AIHA), drug-induced haemolysis and haemolytic disease of the newborn. Occasionally a DAT is performed on a donor unit if the crossmatch is unexpectedly positive due to the donor having a positive DAT.	24 hours 7 Days	Room Temp 4°C
Red Cell Phenotyping	7.5ml/4.5ml EDTA (Red Writing)		Red cell Units are occasionally typed for antigen specificity. This is carried out in house rather than at the IBTS. Patient samples are also phenotyped to assist in antibody identification. TAT One day.	24 hours 7 Days (72 hours if patient has been transfused /pregnant in last 3 months)	Room Temp 4°C
Transfusion Reaction	7.5ml EDTA/4.5ml **(Red Writing) x2,** 2.7ml EDTA sample **(red lid),** Lith. Heparin **(orange lid),** Coag sample **(green**	Various tests FBC (Blood Film) Coagulation DAT (DCT) Full Screen Biochemistry. Microbiology **IgA levels**	A thorough investigation of a transfusion reaction may take some time. If blood units are required before the investigation is complete, either the haematology consultant is contacted and the case is discussed, or the requesting physician takes full responsibility for the issue and administration of the unit(s)	Until a Medical Scientist who works routinely in Blood Transfusion is able to process the Transfusion reactions	4°C

	lid), First MSU**,** Blood Cultures Residue from any units transfused **(including all units crossmatched and the giving set of the suspected unit.)**				

Maximum Surgical Blood Ordering Schedules at NOHC: *(AP-HVO-8)*

UPPER LIMB SURGERY	
Shoulder Replacement	Group & Hold
Revision Shoulder Replacement	Group & Hold
Elbow Replacement	Group & Hold
Revision Elbow Replacement	Group & Hold
SPINAL SURGERY	
Removal of Spinal Instrumentation	Group & Hold
Spinal Decompression	Group & Hold
Adolescent Posterior Spinal Fusion (For Scoliosis)	Group & Hold
All other spinal fusions	Group & Hold
LOWER LIMB SURGERY	
THR	Group & Hold
Hip Resurfacing	Group & Hold
Conversion THR	Group & Hold
Revision THR	Group & Hold
Infected Revision THR/1st Stage and 2nd Stage	Group & Hold
Hip Osteotomy (including Salters)	Group & Hold
Hip Arthrodesis	Group & Hold
Disarticulation	**Cross-Match 4 Units**
Removal of Femoral Plate	Group & Hold
Amputation	Group & Hold
Enbloc Resection	Group & Hold
TKR	Group & Hold
Revision TKR	Group & Hold
Knee Arthrodesis	Group & Hold
Patellar Resurfacing	Group & Hold
Total Ankle Replacement	Group & Hold
Revision Total Ankle Replacement	Group & Hold
Ankle Arthrodesis	Group & Hold

1 unit of blood will be crossmatched for all surgical patients with red cell antibodies.
Crossmatching will be carried out for any patient, as requested by a Surgeon or Anaesthetist.

Patient Consent and Patient Information Leaflet

Patient consent for blood transfusion must be documented within the surgical consent form via the Pre-Assessment Clinic. The prescribing doctor must also ensure verbal consent prior to transfusion and document in the patient's Healthcare records.

To assist in informed consent, a Blood Transfusion patient information leaflet is given to each patient undergoing major surgery in Pre-Assessment Clinic. For patients that haven't been through Pre-Assessment Clinic a patient information leaflet should be provided prior to transfusion.

Tick box should be completed on the front of the Blood/Blood Product Prescription/Transfusion Record for documenting the provision of the Patient Information Leaflet.

MICROBIOLOGY

The Microbiology Department provides a range of diagnostic services in routine microbiology. Referral for mycobacteriology, parasitology and virology serology (including bone bank and post Hepatitis B vaccination levels) and any specialised microbiology can be arranged through the Department.

Some low volume tests are referred to other hospitals and these are listed from Page 50.

Please note that SSC Microbiology samples excluding MRSA screens, CPE screens & Urine samples (which are processed in-house) are referred to the Mater Private Hospital directly by SSC. The Microbiology Department supports the National and NOHC infection control policies. Theatre air sampling and environmental monitoring is carried out when sanctioned by the Consultant Microbiologist.

It is necessary to discuss processing of urgent samples including direct Gram staining of fluid samples and tissue samples with a member of staff in Microbiology when taking the samples. Please provide as much information as possible on the request form including site of sample, clinical details and antibiotic therapy, to assist with the interpretation of the results.

The blood culture analyser is monitored during routine hours, Monday – Friday (8.00 am to 6.00 pm) and weekends/Bank Holidays (9.00 am to 12:30pm only). The Medical Scientist in Microbiology will process the blood culture and will liaise with the Consultant Microbiologist/ Microbiology Registrar during these hours.

Hours of service:

Monday – Friday 8.00am to 6.00pm,

Saturday - 9.00 am to 12.30pm;

Sunday/Bank Holiday - 9.00 am to 12.30pm on standby for positive blood culture processing only.

An urgent SARS CoV-2/Influenza service for **symptomatic patients only** is provided by the Medical Scientist on-call until midnight. Samples must reach the lab by 10pm. Please contact the On-call Medical Scientist using the numbers listed in the Introduction.

Any other requests have to be sanctioned by the Consultant Microbiologist.

Tests performed in NOHC Microbiology Department:

Microscopy, Culture and Antimicrobial Susceptibility testing of isolates from specimens including Blood Cultures, Aspirates, Tissue, Bone, Intraoperative swabs, Intravascular Cannulae, Urines, ENT and Superficial swabs.

Screening swabs for HCAI - MRSA, CPE and VRE.

SARS-CoV-2, Influenza & RSV testing.

Bone Bank Sterility Testing.

Please refer to AP-MIC-61 for swab types available for Microbiology testing

Please note that the examination method, if required, is available on request from the laboratory.

Tests referred to other hospital laboratories:

CSF for analysis - cell count, culture and susceptibility testing.

Fluids for Crystal Determination.

Faeces for enteric pathogen analysis, C *difficile,* Norovirus and ova, cysts and parasites. (Please send individual samples for each test).

Sputum for culture and susceptibility testing.

Miscellaneous samples from sites not covered above e.g. HVS, urinary hCG

Sputum, Fluids and Tissues for Mycobacterium microscopy, culture and susceptibility testing.

Blood for Quantiferon testing.

Blood for virology testing and Bone Bank serology.

Sample Requirements for Microbiology:

Test	*Container/ Swab*	*Results Available[1, 2]*	*Comments*	*Sample viability[3]*	*Storage*
Aspirates: **1. Gram Stain** **2. C/S** **3. Crystal Determination** **4. Cell count and ^differential**	1, 2 and 3. Sterile double wrapped 30mL clear PS Universal Tube 2B. Blood Culture Bottles 4.EDTA Sample bottle	1 & 4. Urgent 30-60 mins, Routine – 24hrs. 2. 7-9 days interim report released after 48hrs. 2B. 5 days 3. Referred to MMUH	If Gram stain is urgent, please contact the Microbiology laboratory prior to sending the sample. ***Do not use wide MSU containers*** Please transport to the laboratory ASAP	Up to 48 hrs if stored at 4°C **Note:** Do not place aspirates in Blood Cultures bottles into the fridge.	Processed ASAP if not refrigerate (except BC bottles)
Tissue/Bone: **1. Gram Stain** **2. C/S**	Sterile Double wrapped 30mL clear PS Universal Tube	1. Urgent 30-60 mins, Routine – 24hrs. 2. 7-9 days interim report released after 48hrs.	If Gram stain is urgent, contact the Microbiology laboratory in advance of taking the specimen. Large tissue/Bone samples should be divided into **Marble sized representative samples in the clean air environment**. These should then be submitted in individual containers to the Microbiology Laboratory Do **NOT** add any fluid to tissue samples Please transport to the laboratory ASAP	Up to 48 hrs if stored at 4°C	Processed ASAP if not Refrigerate
Intraoperative swabs	Sterile Double wrapped	5-7 days	N/A	Up to 48 hrs if stored at	Processed ASAP if not Refrigerate

	Transport Swab with Amies medium – no charcoal			4°C	
^Blood cultures	BacT/ALERT Blood culture bottles – Aerobic (blue top) and Anaerobic (purple top) 2 bottle set for adults Universal bottle (yellow top) for paediatrics – one bottle only	2-6 days	Bottles kept on each ward, replenish stocks from microbiology. Please note expiry date. Immediately bring bottles to the Microbiology Laboratory for loading onto the BacT/ALERT blood culture instrument	24 hrs store at room temp	Processed **ASAP.** If not store at Room Temp **Do NOT** Refrigerate
Intravascular Cannulae - Central /PICC	Place in Sterile Urine or Universal Container	2-3 days	**N.B.** Cannulae specimens will only be cultured if a blood culture sample is received simultaneously	Up to 48 hrs if stored at 4°C	Processed ASAP if not Refrigerate
MSU	Sterile Urine Container	Microscopy - same day, urgent 60 minutes. Culture: 1-2 days	Mid-stream clean catch. Please close container lid tightly, leaking specimens will not be processed. Urine samples that are retained at room temperature for > 2 hrs may not be processed	Up to 48 hrs if stored at 4°C	Processed ASAP if not Refrigerate
CSU	Sterile Urine Container	Microscopy - same day, urgent 60 minutes. Culture: 1-2 days	Urine should be collected from tube leading into catheter. Urine samples that are retained at room temperature for > 2 hrs may not be processed.	Up to 48 hrs if stored at 4°C	Processed ASAP if not Refrigerate
Superficial Swabs	Transport Swab with Amies medium – no charcoal	2-3 days	Please record site of swab on request form and any relevant clinical details and antimicrobial therapy	Up to 48 hrs if stored at 4°C	Processed ASAP if not Refrigerate

MRSA Screens	**<u>Culture:</u>** Transport Swab with Amies medium – no charcoal	1-3 days	Minimum screening swabs of Nasal and Groin.	Up to 48 hrs if stored at 4°C	Processed ASAP if not Refrigerate
	<u>Molecular MRSA</u> For samples requiring same day MRSA results **<u>only.</u>** Stuart Dual Swab (900-0370) Available from the Microbiology Department	3-3.5 hours	To be used for urgent MRSA requests only. Nasal and Groin swabs only Not suitable for patients <2years old.	24hrs at room temp. Up to 7 days if stored at 4°C	Processed ASAP if not Refrigerate
VRE Screens	Rectal swab taken in a Transport Swab with Amies medium – no charcoal	2-3 days	Taking of VRE screens is carried out in accordance with Infection Prevention and Control Guidelines. Screening to identify VRE colonised patients is recommended during outbreaks only and on the instructions of the Clinical Microbiologist	Up to 48 hrs if stored at 4°C	Processed ASAP if not Refrigerate
CPE Screens	**<u>Culture:</u>** Rectal swab taken in a Transport Swab with Amies medium – no charcoal. Additional samples from other sites (e.g. urine,	1-3 days	Taking of CPE screens is carried out in accordance with Infection Prevention and Control Guidelines. Other CPE Screening is recommended only on the instructions of the Clinical Microbiologist	Up to 48 hrs if stored at 4°C	Processed ASAP if not Refrigerate

	swabs from skin breaks may also be suitable for surveillance purposes				
	Molecular: LQ Stuart Dual Rectal Swab (900-0370) Available from the Microbiology Laboratory.	2 hours	Transport to the laboratory as soon as possible Swabs overly soiled with stool may not be suitable for analysis. Same day testing available if the sample is received into the laboratory by 4pm Monday to Friday	Up to 5 days if stored at 15-28°C	Processed ASAP, do not refrigerate
^Influenza/RSV	Nasopharyngeal Sample Collection Kit for Viruses Available from the Microbiology Laboratory.	2 hours	Transport to the laboratory as soon as possible Same day testing of urgent samples available if the sample is received into the lab by 22:00	Up to 7 days if stored at 2-8°C	Processed ASAP if not Refrigerate
^SARS-CoV-2 (Covid-19)	Nasopharyngeal Sample Collection Kit for Viruses. Available from the Microbiology Laboratory.	2 hours	Transport to the laboratory as soon as possible Same day testing of urgent samples available if the sample is received into the lab by 22:00	Up to 7 days if stored at 2-8°C	Processed ASAP if not Refrigerate
Bone Bank Sterility Testing	Direct inoculation into 20ml Tryptone Soy Broth & Thioglycolate broth	16-18 days	Transport immediately to laboratory for incubation	48hrs	Incubated ASAP, if not do NOT Refrigerate

^ Non-accredited tests

[1]These times are a typical guide and due to the nature of microbiological testing they may vary.

[2] The TAT times outlined above are bound by the hours of service and may be delayed accordingly due to limited microbiology weekend service or increased workloads at busy periods

[3] Additional examinations requests may be made within the sample viability timeframe where appropriate and if necessary, on the advice from the Consultant Microbiologist.

Please note that samples which do not meet the requirements specified in the above table, will be rejected.
Faeces for culture and sensitivity will only be processed if the patient has been hospitalised for < 3 days.

CYTOLOGY/HISTOLOGY

NOHC Pathology Specimen Reception provides the transport service for NOHC Cytology/ Histology specimens to the Histology Laboratory at the MMUH. Prof Molloy, Prof O'Toole, and Mr Lee histology specimens are transported to SVUH Histology Laboratory.

The majority of surgical specimens should be sent to the NOHC Laboratory in the appropriate preservative (10% Neutral Buffered formalin).
Avoid squeezing specimens into small jars.

The body of the container must be labelled with the patients' details (Name, DOB and hospital number) and the specimen details. If more than 1 sample is taken then label the individual samples A. B, C etc. (with full details on each).

For NOHC Cytology/ Histology specimens complete the NOHC Histology Request form (RF-LAB-54) and provide a contact name and number.

For NOHC Cytology/ Histology specimens the appropriate specimen Log (RF-LAB-17 & RF-LAB-18) should be completed at source (Theatre / X-ray). Signed for specimens are to be transported by porters and signed into the Laboratory by a member of the laboratory staff.

SPECIMEN REQUIREMENTS FOR CYTOLOGY:

- Fluid samples such as joint fluids for query crystal analysis should always to be sent **fresh,** as well as fluids for query mucin, ground substance, colloid, collagen etc. These fluid samples MUST NOT BE PLACED INTO FORMALIN. Please notify the NOHC laboratory prior to taking these samples.
- For cytology fluid samples **which do not require the former**, Cytolyt ® fixative should be used (1: 1 ratio) instead of 10% buffered formalin.
- Ganglion cysts for aspiration: if no crystal analysis is required, aspirated fluid must be placed directly into Cytolyt ® fixative. See Histology below for Ganglion cyst samples.

SPECIMEN REQUIREMENTS FOR HISTOLOGY

- Ganglion cyst samples: if no crystal analysis is required, the cyst must be placed directly into 10% Buffered Formalin. Any fluid aspirated from the Ganglion cyst must treated as for Ganglion cysts for aspiration (see Cytology section above) prior to placing sample in Formalin.
- Frozen Section Analysis A frozen section service is provided in MMUH from 9.00 – 17.30, Monday to Friday. Frozen sections must be booked at least 24 hours in advance of elective surgery by phoning the MMUH Histology Laboratory at 01 803 2116.
- Specimen: Fresh tissue in an appropriately labelled sealed container. Delivered immediately to MMUH Histology laboratory.

  Turnaround time: Same day

  Special precautions: Specimens from patients who have/ suspected to have TB are NOT appropriate for frozen section. These specimens must be placed into appropriate fixative immediately. If a patient is suspected of having such an infection, the clinical staff must inform MMUH Histology laboratory

- Please refer to
  - PP-THE-1 (Procedure for Specimen and Amputated Limb Collection and Processing) on the Q-Pulse system.
  - PP-RAD-21 (Management of Biological Specimen Taken During an Interventional Radiological Procedure)
  - WI-LAB-18 MMUH Cytology/Histology Specimen Requirements

- WI-LAB-22 SVUH Histology Specimen Requirements

MMUH: If in doubt about how to treat a Cytology or Histology specimen, please contact a member of the MMUH Histology staff before putting the specimen into a fixative on (01) 803 2116

SVUH: If in doubt about how to treat a Histology specimen, please contact a member of the SVUH Histology staff before putting the specimen into a fixative: Histology Main Laboratory (01) 2214613.

MMUH: Cytology/ Histology reports are received by NOHC Pathology Specimen Reception and forwarded to the NOHC Medical Consultant/Specialist Registrar. Copies are not stored in the laboratory or on the LIS.

SVUH: Histology reports are received by NOHC Pathology Specimen Reception by post/email and forwarded to the NOHC Radiology Dept. for Prof. O'Toole, Prof. Molloy and Mr. Lee patients. Copies are not stored in the laboratory or on the LIS.

REFERRAL LABORATORIES

It may be necessary to refer specimens to referral /external laboratories, where:

- the referral laboratory provides a unique or unusual service
- the test requested is not routinely processed in the Biochemistry, Haematology or Microbiology/Molecular laboratories in NOHC (low volume test). Only clinically significant tests will be referred out of hours e.g. D-Dimer and Gentamycin. Needle stick serology is referred to NVRL by the medical scientist on call if the source is deemed as high risk by the doctor in charge or Infection Control Nurse.
- Confirmation of initial or unusual findings or address uncertainty of measurement.
- Backup service in the event of an unplanned interruption of the service at NOHC

For packaging instructions of laboratory specimens in compliance with ADR regulations Ref to AP-LAB-2

TURNAROUND TIMES (TATs)-Important note

TATs stated for tests referred to MMUH, indicate the Total Testing Process, from **time of receipt by MMUH laboratory**. Please allow additional time to refer the sample from the NOHC Laboratory. Routine times should be interpreted as minimum of 8 hours for all Mater referrals (same working day).

MATER MISERICORDIAE UNIVERSITY HOSPITAL (MMUH) UNIVERSITY HOSPITAL *(REFER TO ED-LAB-7)*

Clinical Chemistry and Diagnostic Endocrinology Tests

ACR (Albumin to Creatinine Ratio)	
Specimen:	Urine (Spot sample) analysed for “Microalbumin” and Creatinine.
Turnaround time:	3 Hours
Reference range:	0 – 2.5 mg/mmol Creatinine (Microalbuminuria: 2.5 – 25.0 mg/mmol Creatinine)
AFP (Alpha Feto Protein)	
Specimen:	4.9ml blood in WHITE tube (no anticoagulant).
Turnaround time:	1 working day
Reference range:	0 – 9 µg/L
Amylase	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube. Urine (spot sample) may also be tested.
Turnaround time:	Routine: 3 hours. Emergency: 1 hour
Reference range:	28 – 97 IU/L (Plasma); 0 – 470 IU/L (Urine)
Angiotensin converting enzyme(ACE)	
Specimen:	4.9ml blood in WHITE tube (no anticoagulant).
Turnaround time:	1 week
Reference range:	0 – 9 µg/L
Anti-TPO	

Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube.
Turnaround time:	1 – 3 days
Reference range:	<5.6 IU/ml
AST	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube.
Turnaround time:	3 Hours
Reference range:	19-42 IU/L
CA125	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube.
Turnaround time:	1 – 3 days
Reference range:	0 – 35 kU/L
CA15.3	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube.
Turnaround time:	1 – 3 days
Reference range:	0 – 31.3 kU/L
CA19.9	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube.
Turnaround time:	1 – 3 days
Reference range:	2 – 23 U/ml
Catecholamines	
Specimen:	24-hour urine collection. (Acid container; pH <3) Referred to Beaumont Hospital. Catecholamines plus Metanephrines afford the optimal sensitivity in diagnosis of Phaeochromocytoma.
Turnaround time:	2 weeks
Therapeutic range:	See Report form
Carbamazapine	
Specimen:	4.9ml blood in BROWN SERUM GEL tube for clotted blood. Trough sample should be taken immediately next dose.

Turnaround time:	Routine: 3 hours. Emergency: 45 mins.
Therapeutic range:	4 – 12 mg/L
Carcinembryonic Antigen (CEA)	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube.
Turnaround time:	1 – 3 days
Reference range:	0 - 52 µg/L
Cholesterol	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube.
Randon or fasting sample. Reported as part of Lipid Screen (min 12 hour fast)	
Turnaround time:	3 hours
Reference range:	Desirable level: 3.1 – 5.0 mmol/L
CK (Creatine Kinase)	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube. Add-on allowed up to 8 hours if to establish baseline level, but if for query – MI a fresh (later) sample is preferred
Turnaround time:	Routine: 3 hours. Emergency: 1 hour
Reference range:	33 – 208 IU/L (Female), 44 – 272 (Male) Reference range for Caucasians: for Afro-Caribbean's twice these
Cortisol	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube. Note time and date of collection on tube to facilitate appropriate interpretation of result. Morning sample preferred.
Turnaround time:	Routine: 3 hours.
Reference range:	Morning: 150 – 455 nmol/L
Creatinine Clearance	
Specimen:	24-hour urine collection plus 4.9ml blood in LITHIUM HEPARIN GEL tube, the blood collected during the 24 hour collection period. Urine and plasma must be received by the laboratory together. NB: ensure only

one early	
	morning void included in 24-hour urine collection.
	Calculation = (UCr [µmol/L]/PCr[µmol/L]) x (Vol[mL/24hr]/1440)
Turnaround time:	3 hours
Reference range:	100 – 130 mL/min (Female), 110 – 150 mL/min (Male)
Digoxin	
Specimen:	4.9ml blood in BROWN SERUM GEL tube.
	Sample must be taken before dose or at least 6 hours post-dose.
Turnaround time:	Routine: 1 working day. Emergency: 45 minutes.
Therapeutic range:	0.5 – 1.0 µg/L
Epanutin	**See Phenytoin**
Epilim	**See Valproate**
Free T4	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube. Included as part of Thyroid Function Test (TFT)
Turnaround time:	1 – 3 days
Reference range:	8-20 pmol/l
Free T3	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube. Included as part of Thyroid Function Test (TFT)
Turnaround time:	1 – 3 days
Reference range:	2.6-6.0 pmol/l
FSH	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube for clotted blood.
Turnaround time:	1 – 3 days
Reference range:	1.4 – 10.8 mIU/ml (Males)
	Female: Follicular phase: 3.0 – 8.1 IU/L. Mid-cycle peak: 4.9 – 16.7 IU/l, Luteal phase: 1.4 – 5.5 IU/l
Growth Hormone (GH)	
Specimen:	4.9ml blood in WHITE tube. (no anticoagulant)
Turnaround time:	2 weeks

Reference range:	Not applicable. Please evaluate GH response in relation to the relevant Dynamic Function Test protocol. As a guide to the initial investigation of hypoglycaemia, a rise to >5 ug/L, may be considered adequate.
HbA1c (Glycosylated Haemoglobin)	
Specimen:	2.7 ml=L PINKISH EDTA tube.
Turnaround time:	1 – 2 days
Reference range:	IFCC: 20 – 42 mmol/mol; DCCT: 4.0 – 6.0%
HDL (HDL – Cholesterol)	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube. Included as part of lipid profile. Fasting 12 hours + is required
Turnaround time:	3 hours
Reference range:	> 1.5 mmol/L
Homocysteine	
Specimen:	2.7ml PINKISH EDTA tube. (Contact lab; must be spun and separated within 10 minutes of taking blood) Referred to Temple Street Hospital for Metabolic investigations, all other Homocysteine's for to St Vincents Hospital.
Turnaround time:	6 weeks
Reference range:	See report form
LDH (Lactate Dehydrogenase)	
Specimen:	4.9ml blood in BROWN SERUM GEL tube for clotted blood.
Turnaround time:	Routine: 3 hours, Emergency: 45 minutes
Reference range:	120 – 220IU/L
LDL (LDL – Cholesterol)	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube. Fasting for 12 hours or more is required. LDL is a calculated parameter. LDL = Chol – HDL – C – [TG/2.2] Tested as part of lipid profile/lipid screen.
Turnaround time:	2 hours
Reference range:	Desirable range: < 4.9 mmol/L (lower levels are recommended for secondary prevention)
LH	

Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube.
Turnaround time:	1 – 3 days
Reference range:	1.4 – 6.5 mIU/ml (Male) Female: Follicular phase: 1.8 – 11.8 IU/l, Mid-cycle peak: 7.6 – 89.1 IU/l, Luteal phase: 0.6 – 14.0 IU/l
Lipid Screen / Lipid Profile	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube. Lipid profile comprises Total Cholesterol, Triglycerides, LDL-Cholesterol and HDL – Cholesterol. Fasting for 12 hours or more is required.
Turnaround time:	3 hours
Reference range:	See individual test
Lithium	
Specimen:	4.9ml blood in BROWN SERUM GEL tube for clotted blood. Trough sample should be taken immediately before next dose.
Turnaround time:	Routine: 3 days, Emergency: 3 hours
Therapeutic range:	0.6 – 1.2 mmol/L
Macroprolactin	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube. Automatically added to first time prolactin's >550 mIU/L (Males), >700 mIU/L (Females)
Turnaround time:	14 days
Reference range:	Males: 72 – 229 Miu/L, Females: 79 – 347 mIU/l
Osmolality	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube or urine (spot)
Turnaround time:	3 hours
Reference range:	Plasma: 285 – 295 mmol/Kg Assess urine osmolality relative to plasma osmolality and electrolytes and in the context of disease investigation.

	Calculated Osmolality = (1.87 x [Na]) + Glu + Urea + 9 (all in mmol/L)
Phenytoin	
Specimen:	4.9ml blood in BROWN SERUM GEL tube for clotted blood. Trough samples should be taken immediately before next dose
Turnaround time:	Routine: 3 hours, Emergency: 45 minutes
Therapeutic range:	10 – 20 mg/L
Prolactin	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube.
Turnaround time:	1 – 3 days
Reference range:	Males: 103 – 460 mIU/l; Females: 116 – 585 ml/l. Macroprolactin screening is added if prolactin is >550 Miu/l in males, >700 Miu/l in females.
Progesterone	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube. Day 21 sample required (or 7 days before onset of menses if not a 28-day cycle)
Turnaround time:	1 – 3 days
Reference range:	Assuming correctly timed sample: <10nmol/l: ovulation unlikely, 10 – 30 nmol/l: equivocal, >60 nmol/l: ovulation likely
PSA (Prostate Specific Antigen)	
Specimen:	4.9ml blood in LITHIUM HEPARIN GEL tube. PSA test is available for diagnostic and monitoring purposes only, not for screening.
Turnaround time:	1 working day
Reference range:	0 – 4.0 µg/L
PTH (Parathyroid Hormone)	
Specimen:	2.7 ml blood in PINKISH EDTA tube.
Turnaround time:	1 – 3 days
Reference range:	1.89 – 7.61 pmol/l
Red Cell Folate	
Specimen:	2.7 ml blood in PINKISH EDTA FBC tube.
Turnaround time:	4 days

Reference range:	126 – 651 µg/l
Tegretol	**See Carbamazepine**
Testosterone	
Specimen:	4.9ml blood in WHITE tube. (no anticoagulant)
Turnaround time:	10 days
Reference range:	Males: 6.3 – 24.7 nmol/l, Females: 0.7 – 1.9 nmol/l
Note:	SHBG is added to male testosterones >0.7, <10.0 nmol/l, and females if testosterone is >1.5 nmol/l. The free testosterone is also calculated in these cases. Refer to reports for reference ranges.
Theophylline	
Specimen:	4.9 mL blood in BROWN SERUM GEL tube for clotted blood. Dry tube (no anticoagulant) may be used. Trough sample should be taken immediately before next dose
Turnaround time:	Routine: 3 hours. Emergency: 1 hr.
Therapeutic range:	10 – 20 mg/L
TSH (Thyroid Stimulating Hormone)	
Specimen:	4.9 mL blood in LITHIUM HEPARIN GEL tube. Included as part of Thyroid Function Test (TFT)
Turnaround time:	1 to 3 days
Reference range:	0.35-4.94 mIU/l
Thyroid Function Test	
Specimen:	4.9 mL blood in LITHIUM HEPARIN GEL tube. Includes fT4 and TSH
Turnaround time:	1 to 3 days
Reference range:	See individual tests
Troponin I	
Specimen:	4.9mL LITHIUM HEPARIN tube.
Turnaround time:	Routine: 3 hours. Emergency: 1 hour
Reference range:	16 ng/L (F), 34 ng/L (M)

	MI should not be ruled out on the basis of a single negative early Troponin I value post onset of pain.
Urate (Uric Acid)	
Specimen:	4.9 mL blood in LITHIUM HEPARIN GEL tube. Urine may also be tested; 24hour urine collected in plain container if delivered fresh to lab.
Turnaround time:	Routine: 3 hours. Emergency: 1 hour
Reference range:	Plasma: 177-465 µmol/L. Urine: 1.2 – 4.0 mmol/L /24hrs
Valproate (Epilim)	
Specimen:	4.9 mL blood in BROWN SERUM GEL tube for clotted blood. Dry tube (no anticoagulant) may be used. Trough sample should be taken immediately before next dose
Turnaround time:	Routine: 3 hours. Emergency 1 hour
Vitamin D	
Specimen:	4.9 mL blood in WHITE tube (no anticoagulant). Must be a separate specimen
Turnaround time:	2 weeks
Reference range:	Desirable range greater than 50 nmol/L
VMA	**VMA is now correctly called HMMA. See Catecholamines. HMMA (VMA) only measured if Catecholamines are abnormal**

Haematology

Blood Film	
Specimen:	2.7 ml blood in EDTA tube (Pink Cap FBC tube). Blood film will be examined, if requested, with relevant clinical information or if indicated by the F.B.C. In the presence of a normal F.B.C., there are few indications for routine film examination, e.g. possible infectious mononucleosis, malaria. Film must be made within 12 hrs. of venipuncture
Turnaround time:	96 hours
Reference range:	See report form
*** Note min 96 hrs (4 working days and max 7 days for referred Blood films as Consultant Haematologist will review on site at weekly meetings)	

D-Dimers (DD)	
Specimen:	3ml Coagulation tube (green cap) Blood exactly aspirated to the mark and gently mixed. Specimen must be assayed within 4 hours of venipuncture
Turnaround time:	3 hours
Reference range:	0 - 0.5mg/L
Flow Cytometry	
Specimen:	2.7 ml blood in EDTA PINK FBC tube or RPMI Heparinized sample for bone marrow available in laboratory. Must be arranged in advance with Haematology Medical "team" and Haematology Laboratory.
Turnaround time:	7 Days
Reference range:	See Report Form
Haemoglobin Electrophoresis	
Specimen:	2.7 ml blood in EDTA tube (Pink CapFBC tube). Analysis carried out using alkaline electrophoresis and HPCL to quantify HbA2 and HbF and to identify/quantify haemoglobin variants. Acid electrophoresis is used to confirm/identify rarer variant haemoglobins
Turnaround time:	10 days
Reference range:	Adult HbA2 1.5 - 3.4 % HbF < 1.0%
****Ensure copy of FBC and Haematinics Report attached to Haemoglobin Electrophoresis Requests****	
Lupus Anticoagulant	
Specimen:	Three x 3ml Coagulation tubes (green cap). Blood exactly aspirated to the mark and gently mixed. Tests performed include PT, APTT, PTTLA, DVV, and Lupus confirmatory tests.
Turnaround time:	14 days
Reference range:	**PTTLA** Please refer to reference range stated with result **DVV** Please refer to reference range stated with result
Sickle Cell Screen Performed in house (Referral to MMUH for Adults for Positive Sickle Screen Result for HPLC/HBE) (Referral to CHI Crumlin for Paediatrics for Postive Sickle Screen results)	
Specimen:	2.7 ml blood in EDTA tube (Pink Cap FBC tube).

Turnaround time:	24 hours
Reference range:	Positive or negative result BUT all results must be verified on Haemoglobin electrophoresis
Thrombophilia Screen	**Please Contact Laboratory for further advise (RESTRICTED TESTING)**

Sample received for Heritable Thrombophilia testing must meet the guideline as detailed on MMUH website – see attached link.
http://www.mater.ie/healthcare-professionals/gp-referrals/Guideline_for_heritable_thrombophilia_testing.pdf

Requests not meeting the guideline will generate one of the following comments:
“No clinical details are provided, /Incomplete clinical details are provided/The request falls outside MMUH guideline for testing.

These samples will not be processed but will be held in storage in the Haematology laboratory until additional clinical information had been received. In the event of no communication the samples will discarded after eight weeks.

Specimen:	6 x 3ml Coagulation tube (green cap) or 2 x 10ml coagulation tube (green cap) and 1 x 2.7 ml blood in EDTA tube (Pink cap FBC tube). Tests performed include PT, APTT, Fibrinogen, Lupus Anticoagulant, Protein C, Free Protein S, Antithrombin, Activated Protein C Resistance, Factor V Leiden. Patients should be 2-3 weeks post thrombotic event before testing, samples should be sent to the lab as soon as possible after phlebotomy. The following tests will not be performed if the patient is on VKA: PC, PS, LA. The following tests will not be performed if the patient is on heparin: LA, APCRV (and also FVL), Antithrombin.
I.M.S (Infectious Mononucleosis) Screen	
Specimen:	2.7ml blood in EDTA tube (Pink Cap FBC tube)
Turnaround time:	3 hours
Reference range:	Positive or negative result

Immunology

ANCA antibodies (Immuno fluorescence test for ANCA Pattern)	
Specimen:	4.9 ml in BROWN Serum Gel tube for clotted blood
Turnaround time:	3 days routine samples, same day for phoned urgent samples if received before 12 pm.
Reference range:	Negative is normal.
Antibody Screen	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood
Turnaround time:	7 days
Reference range:	Negative is normal The antibody screen includes parietal cell antibody (PCA), mitochondrial antibody (AMA), smooth muscle antibody (SMA), which are tested on rat tissue. If the PCA is positive, the sample will automatically be tested for thyroid peroxidase antibody. If the AMA is positive, the sample will automatically be tested for M2 (PBC) and LKM antibodies.
Additional Information:	Positive samples will not be repeated within 3 months
CCP (cyclic citrullinated peptide) antibody	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood
Turnaround time:	4 days
Reference range:	Less than 11 U/mL
Complement (C3 & C4)	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood
Turnaround time:	2 days
Reference range:	Adult C3: 0.75 – 1.88 g/L. C4: 0.14 – 0.61 g/L
dsDNA antibody (Immunoassay)	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood
Turnaround time:	21 days
Reference range:	Less than 15 IU/mL If the result is greater than 10 IU/mL, DNA CL will automatically be requested (unless it was previously DNACL+)
ENA antibodies (Ro, La, RNP, Sm, Scl-70 & Jo-1)	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood

Turnaround time:	21 days
Reference range:	If the antinuclear antibody was ANA +, it is automatically tested for ENA antibodies. The sample is initially screened for ENA antibodies, if this is positive, the sample is automatically tested for the individual antibodies (ENAC). ENA Screen ratio <0.7 is negative. Samples with levels >0.7 will be tested for specific ENA antibodies
Additional Information:	Positive samples will not be repeated within 3 months
Endomysial (IgA) antibody	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood
Turnaround time:	14 days
Reference range:	Negative is normal.
Additional Information:	EMA is only used to confirm TTG positive samples. Previously positive samples are not repeated for EMA. The tTG antibody assay is used to monitor patients.
IgE	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood
Turnaround time:	8 days
Reference range:	0 - 3 years old: less than 56 kU/L 3 - 7 years old: 56-110 kU/L 8 - 10 years old: 124-148 kU/L Greater than 10 years old: Less than 114 kU/L
Immunoglobulins IgG, IgA & IgM	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood Requests for Immunoglobulins are also assayed for Protein Electrophoresis and vice versa.
Turnaround time:	3 days
Reference range:	Adults IgG: 7.00 –16.00 g/L IgA: 0.70 – 4.00 g/L IgM: 0.4 – 2.30 g/L The results are not released until compared with Protein Electrophoresis results. If there is a band present, sample is immunofixed.
Nuclear Antibody (ANA)	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood
Turnaround time:	7 days
Additional information:	Negative is normal

	ANA is tested on Hep2 cells to detect and identify anti nuclear antibody (centromere, homogeneous, nucleolar and Speckled patterns). If the ANA is greater than a weak positive, it will automatically be tested for dsDNA and ENA (extractable nuclear antigen, which includes anti Ro, La, RNP, Sm, Jo-1 & Scl-70) antibodies. Positive samples will not be repeated within 3 months
Paraprotein identification/Protein Electrophoresis	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood Requests for Protein Electrophoresis (SPEP) are also automatically assayed for serum Immunoglobins. If a possible Paraprotein band is detected then, the sample is automatically reflexed for immunofixation, unless a paraprotein previously typed and identified.
Turnaround time:	3 days
Reference range:	No paraprotein detected is normal. Report comments added on an individual case basis
Parietal Cell Antibody	
Specimen:	See antibody screen
Rheumatoid Factor	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood Fluids cannot be tested.
Turnaround time:	2 days
Reference range:	Less than 20 IU/mL (nephelometry)
Smooth Muscle Antibody	
Specimen:	See antibody screen
Thyroid Antibodies	**Please refer to Clinical Chemistry and Diagnostic Endocrinology**
Tissue Transglutaminase antibody	
Specimen:	4.9 ml in BROWN SERUM GEL tube for clotted blood
Turnaround time:	2 days
Reference range:	Less than 3 U/mL
Additional information:	The IgA level is automatically checked, as IgA deficiency causes false negative results for tTG IgA

	antibody. If the patient is IgA deficient; the tTG IgG antibody assay is completed instead of the tTG IgA antibody. The endomysial IgA antibody assay is used to confirm positive tTG IgA samples, if they were not previously positive.
Cardiolipin IgG & IgM antibody	
Specimen	4.9 ml in BROWN SERUM GEL tube for clotted blood
Turnaround Time:	8 days
Reference Range:	Less than 10 U/ml

Other Possible Referral Immunology Tests include

Acetyl choline esterase antibody John Radcliffe Hospital Headington Oxford UK	
Specimen:	4.9ml in Brown Serum Gel tube for clotted sample
Turnaround Time:	**14 days**
Referral Laboratory	
Tryptase Beaumont Hospital	
Specimen Type:	4.9ml serum sample x 3 (timed at 0,4-6 hrs and >24 hours post event)
	35 days
Angiotensin converting enzyme(ACE) Beaumont Hospital	
Specimen:	4.9ml blood in WHITE tube (no anticoagulant).
Turnaround time:	1 week

Microbiology

Routine Bacteriology

CSF (Cerebrospinal Fluid)	
Specimen	CSF is normally collected sequentially into 3 or more separate disposable sterile screw-capped containers, which should be numbered sequentially 1, 2, 3 etc. A minimum volume of 1 ml in each container is required. Please prioritise tests and ensure there is sufficient sample if a large number of tests are ordered.

Turnaround time	Processed on receipt. Microscopy report: <2hours Final negative report: 48hours Final culture positive report: 48-72hours **All positive results are telephoned to a member of attending team by Microbiology medical staff.**
Special precautions	Samples of CSF **must** be brought to the laboratory and handed directly to a member of staff.
Additional information	Oligoclonal bands: When oligoclonal bands are requested, a clotted blood sample (white cap or brown cap) must also be taken. These are referred to a laboratory in Sheffield. CSF samples **not** accompanied by serum will **not** be referred.
Sputum	
Specimen	a) Sputum-expectorated b) endotracheal tube specimen (induced sputum) A minimum volume of 1 ml sample in a sterile screwcap container e.g. MSU container
Turnaround Times:	Routine final report: 2-4 days. Transplant patients: 5-7 days
Special Precautions:	Salivary or mucosalivary specimens are unsuitable for culture and will not be processed. Exceptions are samples from ITU/HDU/CTHDU and HLTW Where the patient has difficulty producing a specimen, postural drainage and physiotherapy may be required Samples should reach the laboratory within 4 hours of collection to avoid overgrowth with Gram-negative bacilli. Also *H. influenzae and S. pneumoniae* may not survive beyond this time Results from specimens not received in the laboratory on the same day, as collection should be interpreted with care. **Clinical information e.g. cystic fibrosis is essential**
Storage	Specimens are stored at 4oC until they are processed.
Additional information	Early morning fresh expectorated sputum is recommended for *Mycobacterium tuberculosis.* See section- Mycobacteriology. If required, a separate sample should be taken for cytology and sent to the Histology laboratory.

Mycobacteriology

Tuberculosis	
Specimen	Early morning freshly expectorated sputum is recommended for *Mycobacterium tuberculosis* • Sputum (3 consecutive mornings): 5ml per sample • EMU- not appropriate for the diagnosis of respiratory TB. Please contact a Clinical Microbiologist (4634) before ordering this test. Early morning urine on 3 consecutive days; minimum of 50ml of each collection. Note: appropriate containers are available from biochemistry • Aspirate brushing • Bronchoalveolar Lavage (BAL) Bronchial washing - 5 ml • CSF: minimum volume 1ml • Body fluids, aspirates, pus: minimum 1ml • Gastric Lavage: collected early morning before breakfast. Used for children where a sputum cannot be obtained, preferably 5ml per sample • Skin or Tissue biopsies. Note: do not add formalin • Blood/bone marrow: (specific culture bottles available from Microbiology laboratory) Add 3mls aseptically into the culture bottle and return promptly to the microbiology laboratory in the transport container provided. • Post mortem specimens Samples must be taken into a sterile screwcap container e.g. MSU container and sealed in a plastic biohazard bag
Turnaround time	<u>Auramine Stains</u>: Routine: Same day if received by 8am Monday to Friday Urgent: Direct stains can be carried out on samples received before 22.00 using special requisition form available in laboratory. <u>Culture:</u> 7 weeks (most cultures become positive within the first four weeks of incubation, however if the strain is slow-growing or if there are scanty numbers of organisms present in the specimen prolonged incubation may be required) Note: Positive microscopy and positive cultures are phoned immediately to the requesting source

	Sensitivity Testing: The first isolate from each positive patent is identified and the culture is sent to a reference laboratory for susceptibility testing. Results are normally available within three weeks of the date on which the culture is dispatched. Molecular Tests: Direct detection of Mycobacterium tuberculosis complex in a clinical sample: available on request, 7day turnaround time Identification of Mycobacterial cultures to species level: Routinely carried out on the first isolate from each patient, results within 7 working days Molecular detection of resistance to rifampicin and isoniazid: Routinely carried out on all first isolates of *Mycobacterium tuberculosis* complex, results available within 7 working days.
Storage:	Specimens are stored at 4oC until they are processed.

Parasitology

Faeces: Ova, Cysts and Parasites – only by request of Consultant Microbiologist	
Specimen:	Approximately 5 – 6 grams collected into a sterile leakprooof container (MSU)
Turnaround Time:	3-5 days
Special Precautions	Three examinations spaced 2-3 days apart are recommended for optiomal recovery, as shedding of ova and cysts tends to be intermittent. Full clinical details are **Essential** eg foreign travel, immunocompromised patients. Samples received without appropriate clinical information will not be processed.
Stoage:	Specimens are stored at 4oC until they are processed

Quantiferon Testing – By prior arrangement only	
Specimen:	4 blood samples collected into 4 Quantiferon TB Gold collection Tubes These must be ordered in advance and collected from the Microbiology Laboratory. Date and time of

	specimen collection must be recorded on each tube. Inoculated tubes must **not** be refrigerated.
Turnaround time:	7-10 days
Special precautions/ Additional Information:	Specimens are accepted Monday to Thursday up to 4pm only – specimens will not be accepted on Fridays or after hours. Specimen tubes must be filled to the black line on each tube – DO NOT OVERFILL Tubes must be thoroughly mixed and delivered promptly to the Microbiology Laboratory – do NOT refrigerate

Therapeutic Drug Monitoring

Antibiotic Assays	**Amikacin, Gentamycin,**
Specimen:	4.9 ml in ORANGE LITHIUM HEPARIN GEL tube.
<u>When to monitor</u>	• In serious sepsis within the first 72 hours of commencing therapy to ensure adequate peak blood levels and to ensure that accumulation of the dose does not occur. Thereafter at three day, intervals if renal function is normal • Daily in patients with impaired renal function in order to ensure that accumulation of the drug is not taking place • Daily in patients on renal dialysis, on prolonged treatment (>10 days) and in patients with changes in renal function during aminoglycoside therapy. • If an expected therapeutic response does not occur • In patients with gross obesity, in whom levels tend to be high when dosed according to total body weight
Therapeutic ranges	

ANTIBIOTIC	TROUGH	
Amikacin	**<5.0mg/L**	
Gentamycin (once daily dose)	**<1.0 mg/L**	

Additional Information:	Peak levels are no longer indicated

NATIONAL CENTRE FOR HEREDITARY COAGULATION DISPORDERS - ST JAMES' HOSPITAL

Factor V Leiden (FVL)	
Specimen:	1 x 3ml Purple EDTA and 2 x 3ml Light Blue Tri-Sodium Citrate. Samples must be received by Coag Lab, NCHCD by 4pm Mon-Fri. Requests for Factor V Leiden must be accompanied by either sample for APCR analysis or an APCR result from an external source.
Turnaround time:	1 month
Extrinsic Factor Assay (Factor II, Factor V, Factor VII, Factor X, Factor 2, Factor 5, Factor 7, Factor 10)	
Specimen:	6 x 3 ml LIGHT BLUE tri—sodium Citrate
Turnaround time:	7 days
Reference range:	Adult (>18 years) Factor II = 0.72 – 1.31 IU/mL Factor V = 0.63 – 1.33 IU/mL Factor VII = 0.51 – 1.54 IU/mL Factor X = 0.64 – 1.50 IU/mL
Intrinsic Factor Assay (Factor VII, Factor IX, Factor XI, Factor XII, Factor 8, Factor 9, Factor 11, Factor 12)	
Specimen:	6 x 3 ml LIGHT BLUE tri—sodium Citrate
Turnaround time:	7 days
Reference range:	Adult (>18 years) Factor VIII = 0.60 – 1.36 IU/mL Factor IX = 0.80 – 1.47 IU/mL Factor XI = 0.72 – 1.52 IU/mL Factor XII = 0.52 – 1.64 IU/mL
VWD Screen (Von Willebrand Screen)	
Specimen:	4 x 3 ml LIGHT BLUE tri—sodium Citrate
Turnaround time:	3 weeks (including multimers 6 weeks)
Reference range:	Adult (>18 years) Factor VIII = 0.60 - 1.36 IU/mL VW Antigen = 0.49 - 1.73 IU/mL VW Ristocetin Co-Factor = 0.55 - 1.56 IU/mL

	VW Collagen Binding = 0.50 - 1.50 IU/mL VW Multimers = Qualitative result

BIOCHEMISTRY DEPARTMENT- ST JAMES' HOSPITAL

Hemochromatosis (HFE) testing	
Specimen:	3ml Whole blood EDTA sample
Turnaround time:	6 weeks
Consent form (ED-BIO-108) and Request form (ED-BIO-107) required for testing.	

NATIONAL VIRUS REFERENCE LABORATORY

Bone Bank Serology	
Specimen:	5.5 ml in WHITE SERUM tube. Stand upright once drawn
Turnaround time:	14 working days

NATIONAL VIRUS REFERENCE LABORATORY – SEROLOGY

Needle Stick Serology	
Specimen:	5.5 ml in WHITE SERUM tube. Stand upright once drawn
Turnaround time:	Routine: 3 working days, Urgent: 1 hour
Other Virology Requests including Post Vaccination Titre (Hep B Titre), MMR, HIV, HTLV, HSV Hepatitis Screen etc.	
Specimen:	5.5 ml in WHITE SERUM tube. Stand upright once drawn
Turnaround time:	Serology 8 working days Measles PCR (Oral fluid swab) same day TAT if received by 9.30am Mon-Sat
Reference range:	>10 mIU/mL

PUBLIC HEALTH LABORATORY SERVICES – CHERRY ORCHARD

***Clostridium difficile* toxin (Faeces**	
Specimen	Approximately 5-6 grams faeces are sufficient for *C. difficile* toxin testing. This should be collected into a Sterile leak proof container (MSU). Transport to laboratory as soon as possible. Turnaround time Positive Same day of receipt Monday-Friday
Storage	Specimens are stored at 4oC until they are processed.
Additional information	*C. difficile* toxin testing will only be performed on diarrhoeal samples. Repeat testing will not be performed for 28 days on patients who are *C. difficile* toxin positive. Sample must be received in Cherry Orchard laboratory for processing by 9am, & must be delivered directly to the NOHC Microbiology Laboratory by 08.00 for same day results
Enteric Pathogens/VTEC/Norovirus PCR	
Specimen.	Stool sample in a sterile universal container. 3 day hospital admission rule applies to routine enteric pathogens
Turnaround time:	1 working day for positive samples

NATIONAL MRSA REFERENCE LABORATORY

Susceptibility Testing, Resistance/Virulence Mechanisms, WGS and Typing	
Specimen	Sloped isolates may be sent to these reference laboratories for further testing as deemed appropriate by the Consultant Microbiologist.
Storage	Culture plates may be held at room temperature until sloping.
Turnaround Times	According to test request and workup.

GALWAY REFERENCE LABORATORY INCORPORATING NSSLRL AND NCPERL

ID/Susceptibility Testing, Resistance/Virulence Mechanisms Confirmation, WGS and RT-PCR	
Specimen	Sloped isolates may be sent to these reference laboratories for further testing as deemed appropriate by the Consultant Microbiologist.

Storage	Culture plates may be held at room temperature until sloping.
Turnaround Times	28 days

PUBLIC HEALTH LABORATORIES ENGLAND – UK HEALTH SECURITY AGENCY

Bacteriology, Mycology and Anaerobe Reference Laboratories	
Specimen	Isolates in broths or slopes; culture plates or neat sample may be sent to these reference laboratories for further testing as deemed appropriate by the Consultant Microbiologist.
Storage	Specimens are stored at 4ºC until they are referred, plates may be held at room temperature.
Turnaround Times	According to test request and workup.

IRISH BLOOD TRANSFUSION SERVICES

Antibody Investigations	
Specimen:	2 x 7.5ml EDTA RED transfusion tube.
Turnaround time:	5-10 working days
HLAB27	
Specimen:	7.5 ml EDTA tube. (FULL)
Turnaround time:	10 working days
D Variant Typing	
Specimen:	7.5ml EDTA RED transfusion tube.
Turnaround time:	10 working days

SOUTHAMPTON GENERAL HOSPITAL

Blood/Fluid Samples for ASR and Titanium	
Specimen.:	7.5ml METAL FREE LITHIUM HEPARIN ORANGE tube. Use metal free needle. Samples kept frozen and delivered at ambient temperature through Eurofins
Address:	SAS trace element unit, University Hospital Southampton, NHS Foundation trust, Southampton General Hospital, Tremona road, Southampton, S0166YD, UK.
Turnaround time:	4 weeks
Reference range:	Titanium 0 - 40 nmol/L **Chromium 0 – 20 nmol/L** **Cobalt 0 - 17 nmol/L**

QUALITY POLICY

The Pathology Department of the National Orthopaedic Hospita
l Cappagh is committed to providing the highest quality diagnostic and consultative services for all its patient's and users. In order to achieve this objective, it is the policy of the Department to implement and maintain an effective Quality Management System, which will include:

- The setting of quality objectives and plans at its Annual Management Review
- Implementation of measurable objectives consistent with policies at all levels throughout the laboratory organisation.
- Implementation, and maintenance of processes for identifying risks of harm to patients and opportunities for improved patient care associated with its examinations and activities, and developing actions to address both risks and opportunities for improvement
- Integration of the Department's procedures, processes and resources.
- Commitment to the health, safety and welfare of patients, staff, students and visitors.
- Maintenance of professional practice including the safeguarding of patient information.
- Maintenance of the integrity of the management system when changes are implemented in a planned manner.
- The establishment of quality indicators to evaluate performance through key aspects of pre-examination, examination and post examination processor.
- Familiarising personnel with the content of this Quality Manual, Quality Policy and all procedures relevant to their work to ensure user satisfaction.

The Quality Management System will comply with the standards set by ISO 15189, AML-BB, and S.I. No. 360 of 2005 European Communities (Quality and Safety of Human Blood and Blood Components) Regulations. The Pathology Department is committed to:

- Staff recruitment, training and development at all levels to provide an effective and efficient service to its users.
- Impartiality of staff.
- Providing and managing resources to ensure that all examinations are processed to produce the highest quality results possible.

- Reporting results in ways, which are timely, confidential, accurate and are supported by clinical advice and interpretation when required,
- Ensuring that the rights of patients to care is free from discrimination
- Ensuring that laboratory examinations are fit for intended use
- Ensuring that due care and respect is taken when treating patients, samples or remains.
- Implementation of Internal Quality Control, External Quality Assessment, Audit and Assessment of User Satisfaction to continuously improve the quality of the service
- Compliance with relevant environmental legislation.
- Adherence to appropriate technical and professional standards.

Management and staff are committed to creating a quality culture within the Department by continuously improving our services based on the results of performance through data review, internal quality audits, equipment maintenance, Quality Control programmes and the assessment of patient and user needs.

PROBLEMS, COMPLAINTS & SERVICE IMPROVEMENTS

All problems/complaints should be directed to either the Laboratory Manager (marese.mullins@nohc.ie) or the Pathology Quality Manager (beverley.kristiansen@nohc.ie) via email. Whenever possible, the laboratory will acknowledge receipt of the complaint, either verbally, or via email, within 24 hours of receipt. Investigation and resolution of complaints will not result in any discriminatory actions. Resolution of the complaint will be made by, or reviewed and approved by, persons not involved in the subject of the complaint in question. Where resources do not permit this, any alternative approach will not compromise impartiality. Following resolution of the complaint, the laboratory will provide the complainant with the outcome and, if applicable, progress reports within 30 working days of acknowledgement of the complaint.

In addition, suggestions for improvement of the service are always welcome. Feedback from the NOHC website is managed by the Pathology & Tissue Establishment Quality Manager.

CLINICAL INTERPRETATION

During Routine hours (9am – 5pm) please contact:

Biochemistry:	Dr. Graham Lee	01 8034983
Haematology/Blood Transfusion:	Prof. Peter O'Gorman	01 803 2438
NOHC Microbiology:	Dr. Deirdre Brady	01 8545067
Microbiology Registrars	01 803 2032	
UPMC-SSC Microbiology:	Consultant Microbiologist on duty available through UPMC-SSC switch 01 5262001/2	

Out of hours:

The on-duty consultants are available through the MMUH switchboard for medical advice outside office hours of 5pm and 9am (Mon-Fri) and weekends/Bank Holiday. Refer to RF-PMG-33 Department of Pathology Emergency Contact Numbers.