Mayo University Hospital

Pathology Laboratory User Manual

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1 GENERAL INFORMATION

1.1 INTRODUCTION

This User Reference Manual provides information to facilitate your use of the Pathology and Laboratory Medicine Services at Mayo University Hospital (MUH). Included within are details of the Laboratory Quality Policy and accredited Quality Management System, the location and opening times of the Pathology Laboratory and contact numbers of key laboratory personnel.

Also available is a Directory of Tests (A-Z) which gives an alphabetical listing of the MUH referral test repertoire along with the type of tube/container required, expected turnaround times, and relevant notes. *Note:* this information may be subject to change by the referral laboratory.

We recognise that it not possible to cover every eventuality so please do not hesitate to contact the relevant laboratory for help and advice when necessary.

The purpose of this manual is to act as a reference guide for all users. Every effort has been made to ensure that the information provided herein is current and accurate. The manual will be subject to regular review and revision.

The manual should be used as a guide only, any queries arising or required in relation to laboratory services should be addressed by directly contacting the relevant laboratory department. The Pathology Laboratory shall not be liable to users of the manual for any consequential action by the user other than to request the user to utilise the manual strictly as a guide reference only.

1.2 PATHOLOGY QUALITY POLICY STATEMENT

The Pathology Laboratory is **committed** to promoting and providing the highest quality diagnostic and consultative services for all its users.

In order to ensure that the needs and requirements of users are met, the Pathology Laboratory incorporating Haemovigilance will:-

- Operate a quality management system to integrate the organisation, procedures, processes and resources.
- Set quality objectives and plans in order to implement this quality policy.
- Ensure that all personnel are familiar with this quality policy to ensure user satisfaction.
- Commit to the health, safety and welfare of all its' staff. Visitors to the department will be treated with respect and due consideration will be given to their safety while on site.
- Uphold professional values and is committed to good professional practice and conduct.
- **The Pathology Laboratory incorporating Haemovigilance complies with the International standard ISO 15189 (current edition) and EU Directive**

2002/98/EC for the scope of services and tests defined in our scope of accreditation* and is committed to:-

- Ensuring staff are familiar with this policy and all other policies and procedures relevant to their work.
- Staff recruitment, training, development and retention at all levels to provide a full and effective service to its users.
- The proper procurement and maintenance of such equipment and other resources as are required for the provision of the service.
- The collection, transport and handling of all specimens in such a way as to ensure the correct performance of laboratory examinations.
- The use of examination procedures that will ensure the highest achievable quality of all tests performed.
- Reporting results of examinations in ways which are timely, confidential, accurate and clinically useful.
- The assessment of user satisfaction, in addition to internal audit and external quality assessment, in order to produce continual quality improvement.
- The safe testing, distribution and transfusion of blood, blood components and blood products.
- The traceability of Blood and Blood Components and notification to the National Haemovigilance Office of Near Misses, Serious Adverse Reactions and Events.

*The scope of accreditation for the Pathology Laboratory and Haemovigilance at Mayo University Hospital is controlled by the Irish National Accreditation Board (INAB) and detailed in Scope Registration Number 207MT on the INAB website www.inab.ie. Additional tests/examinations for which the laboratory claims accreditation via its flexible scope is controlled by the laboratory; refer to PATH/MF/117, 'List of flexible scope changes' which is available directly from the laboratory on request by service users. The Pathology Laboratory and Haemovigilance also comply with INAB accreditation criteria and regulatory requirements.

1.3 LOCATION

The Pathology Laboratory is located on the ground floor of the Main Hospital at the end of the Main Hospital Corridor. Access to the laboratory is restricted to authorised personnel and is controlled by a MUH security issued swipe card. The Main Laboratory Reception area is open to all persons delivering/ collecting samples etc. and for general enquiries.

1.4 OPENING HOURS

1.4.1 Routine Day

The routine working hours are from 08:00 to 20.00. Each laboratory department is manned by a sole operator during the following times; 08.00-09:00 am and 17:00-20.00 and also between 13:00 to 14:00 and provides only an emergency service during these times (Medical Scientist contactable by bleep via switchboard).

1.4.2 On Call, Weekends and Bank Holidays

The on-call period is from 17:00 to 09:00 Monday to Thursday and from 17:00 on Friday to 09:00 on Monday. The on-call period is also in place for 24 hours on Saturdays, Sundays and Bank Holidays.

An emergency service is provided during this period and any routine queries must be left to the next routine day. The Pathology Laboratory departments providing an on-call service are Haematology/Blood Transfusion, Microbiology and Biochemistry. During on-call periods all requests sent to the laboratory must be sent using the Red Emergency Test Request Form (PATH/LF/002). For Blood Transfusion requests, the Emergency Request forms must be accompanied by a Blood Transfusion Request form (BT/LF/001).

The range of tests performed on an emergency basis is necessarily limited, but some other specialised tests may be provided in certain clinical situations on the ***phoned request of a Consultant***. Refer to the reverse of the Emergency Request Form for details of tests provided during on-call hours by the laboratory.

Tests which are not likely to influence the immediate management of a patient should not be requested outside normal working hours.

Please remember that all completed test reports from the routine day is available on the iLAB Web Browser (Ward Enquiry System) for internal users and there may be no need to bleep the person on call for information on these specimens.

1.5 CONTACT DETAILS

1.5.1 Departmental Contact Details

Key members of staff are listed below including their position and contact information during routine working hours.

Name	Position	Contact No	E-mail address
Laboratory Management			
Dr Fadel Bennani	Consultant Histopathologist/ Clinical Director	2569/ bleep 360	Fadel.Bennani@hse.ie
Ms Regina Creighton	Laboratory Manager	2570	Regina.Creighton@hse.ie
Haematology			
Dr Sorcha Ní Loingsigh	Consultant Haematologist	Contact via MUH switch*	Sorcha.Niloingsigh@hse.ie
Mr Sean Leonard	Chief Medical Scientist	2553	Sean.Leonard@hse.ie
Blood Transfusion/ Haemovigilance			
Dr Sorcha Ní Loingsigh	Consultant Haematologist	Contact via MUH switch*	Sorcha.Niloingsigh@hse.ie
Ms Rosemary Sweeney	Chief Medical Scientist	2545	RosemaryB.Sweeney@hse.ie
Ms Mary Rowley	Haemovigilance Officer	3094/Bleep 363	Mary.Rowley@hse.ie

Name	Position	Contact No	E-mail address
Mr Jack Walsh	Haemovigilance Officer	3094/Bleep 363	Jack.Walsh@hse.ie
Ms Emer Hennessy	Haemovigilance Officer	3094/Bleep 363	Emer.Hennessy@hse.ie
Biochemistry			
Dr Michael Louw	Chemical Pathologist	2560	Contact Chief Medical Scientist in Biochemistry for information.
Ray Divilley	Chief Medical Scientist	2574	ray.divilley@hse.ie
Microbiology			
Dr. Shomik Sibartie	Consultant Microbiologist	1335/Bleep 366	Shomik.sibartie@hse.ie
Mr Conor Burke	Chief Medical Scientist	2554	Conor.Burke@hse.ie
	Surveillance Scientist		
Histopathology			
Dr Fadel Bennani	Consultant Histopathologist	2569/ bleep 360	Fadel.Bennani@hse.ie
Dr Tamas Nemeth	Consultant Histopathologist	2568	Tamas.Nemeth@hse.ie
Paul Glacken	Senior Medical Scientist	2567	Paul.Glacken@hse.ie
Laboratory Information Services			
Ms Orla Walsh	Laboratory IT Manager	1376	Orlam.Walsh@hse.ie
Quality Office			
Ms Janet Burke	Quality Manager	2456	Janet.Burke@hse.ie
Specimen Reception			
Ms Leanne Mangan	Senior Medical Scientist	2136	Leanne.mangan@hse.ie

* Consultant Haematologist is available on site on a Thursday.

1.5.2 Routine Day Enquiries

To contact the laboratory for routine enquiries please use the numbers listed below. Telephone requests for results, sampling procedures or add-on tests should be directed to the appropriate department. We endeavour to answer all phone calls as quickly as possible but during busy periods in the day we may not be able to answer the phones as promptly. We would ask that if your call is not answered that you try at a later time.

When calling from outside the hospital insert (094 904) before the extension number if the number begins with 2, or if it begins with 1, replace the digit 1 with a 9 and use the same prefix (094 9049xxx).

Department	Contact Number
Specimen Reception	
General Enquiries	Ext 2573 or 094-9042573
Blood Transfusion	
Laboratory	Ext 2545/2546 or 094-9042545/6
Haemovigilance Officers	Ext 3094/Bleep 363 or 094-9042000 + Ext 3094
Biochemistry	
General Biochemistry Section	Ext 2559/2560 or 094-9042559/60
Haematology	
Haematology Laboratory	Ext 2549 or 094-9042549
Coagulation Laboratory	Ext 2551 or 094-9042551
Histopathology	
General Enquiries	Ext 2564 or 094-9042564
Main Pathology Office	Ext 2571/2572 or 094-9042571/2
Microbiology	
General Enquiries	Ext 2555/2556 or 094-9042555/6
Pathology Laboratory Fax Numbers (refer to section 1.18.5)	
Pathology Office/ Histopathology	094-9038064*
Blood Transfusion/Haematology	094-9027347
Biochemistry	094-9038064*
Microbiology	094-9049383

**Fax machine in Main Pathology Office, accessible 09.00-17.30, Monday to Friday only*

1.5.3 On Call Contact Details

Three laboratory staff provide the on-call service for the each of the Biochemistry, Blood/Transfusion and Microbiology departments.
On call staff must be contacted via the switchboard (094 9042000 or dial 9 if internal). Failure to do this may result in prolonged turnaround times for urgent requests.

1.5.4 Postal Address

The postal address for the Pathology Laboratory is:
Pathology Laboratory, Mayo University Hospital,
Westport Road,
Castlebar,
Co Mayo
F23 H529

If for the attention of a specific laboratory department, please state at the top of the address. Please ensure that the correct address is used as an incorrect address may result in delays in receipt of the package and consequent delays in processing of samples or inability to process due to sample quality issues.

1.6 SPECIMEN CONTAINERS AND REQUEST FORMS

1.6.1 Specimen Container Types and draw order

BLOOD SPECIMEN BOTTLES

Refer to the Test Directory for a list of tests performed in the Pathology Laboratory MUH and the specimens required together with any other information regarding specimen collection.

The BD Vacutainer sample container system is routinely used within the hospital to collect specimens from adults. LIP paediatric tubes may be used to collect blood specimens from paediatric patients. The guide below contains the details of the various tube types in use and associated tests for both adults and paediatrics. Refer to CLN-PATH-014 (PATH/LI/027) for the full document on Saolta Q-Pulse.

BLOOD COLLECTION TUBES USED IN MUH AND GUIDE OF DRAW

Please refer to the Laboratory User Manual for Investigations not listed in this guide.
Note: Ensure gentle mixing of specimen tubes by inverting a minimum of 5 times.

Tube Type	Adult Blood Collection Tube		Paediatric Blood Collection Tube		Investigation(s)
Blood Culture	Reference No: Anaerobic - 259790 Aerobic - 259789		Reference No: Aerobic - 410853		Microbiology Sensitivity testing
Sodium Citrate	Reference No: 363095 Draw Volume: 2.7ml		Reference No: 41.1350.005 Draw Volume: 1.3ml		Coagulation Studies
Sodium Citrate ESR	Reference No: 367740* Draw Volume: 4ml		No Paediatric option available		ESR
Serum (no gel)	Reference No: 367837 Draw Volume: 6ml		No Paediatric option available		Vitamin K, Keppra
Serum SST (gel)	Reference No: 367954 Draw Volume: 5ml		Reference No: 41.1378.005 Draw Volume: 1.1ml		General Biochemistry tests
Plasma Lithium Heparin (non-gel)	Reference No: 367883 Draw Volume: 4ml		Reference No: 41.1393.005 Draw Volume: 1.3ml		Karyotyping (adult tube only)
Plasma Sodium Heparin (non-gel)	Reference No: 3678676 Draw Volume: 6ml		No Paediatric option available		Chromium
Plasma Lithium Heparin PST™ II (gel)	Reference No: 367962 Draw Volume: 4.5ml		No Paediatric option available		
Plasma K_2EDTA Separator	Reference No: 367885 Draw Volume: 4ml		No Paediatric option available		Hepatitis C PCR (RDU patients only)
Plasma K_2EDTA	Reference No: 368857 Draw Volume: 3ml		Reference No: 72001* Draw Volume: 1.3ml		FBC, HbA1C
Plasma K_2EDTA Cross Match	Reference No: 36794 Draw Volume: 6ml		Reference No: 366164 Draw Volume: 4ml		Cross Match only
Plasma K_2EDTA (Aprotinin)	Reference No: 361017 Draw Volume: 5ml		No Paediatric option available		ACTH
Fluoride Oxalate	Reference No: 368920 Draw Volume: 3ml		Reference No: 41.1394.005 Draw Volume: 1.3ml		Glucose
Trace Element	Reference No: 368380 Draw Volume: 6ml		No Paediatric option available		

*All Blood Collection devices listed above can be sourced from MUH Stores and can be requested using Lab Product Order form.

Specimens for some tests must be collected with the patient fasting, or with knowledge of when food was last taken (e.g. glucose). Some tests must be collected in the basal state or with due regard to diurnal variations. Some tests may be performed only after prior arrangement with the laboratory e.g. ammonia. Where doubt exists, the appropriate laboratory department should be consulted.

HISTOLOGY SPECIMEN CONTAINERS

Container Type	Information
Histology 40ml Prefilled Formalin Biopsy Containers	Available from Histopathology Laboratory.
Theatre buckets sizes 1L, 2.3L, 3.1L, 5.5L **Specimen containers sizes 30ml, 120ml, 230ml, 350ml**	Adequate volume of formalin is essential for proper fixation. The volume of formalin should be sufficient to just submerse the tissue to be fixed. Available from Histopathology Laboratory.
Dry Containers 30ml, 120 ml, 230 ml, 350ml	Available if required
Histology 30ml Prefilled Shandon Cytospin Collection Fluid (green fixative fluid) containers	Fluids for cytology examination. Equal volume of specimen to Shandon Cytospin Collection Fluid (green fixative fluid) Available from Histopathology Laboratory.
Formalin (10% buffered) boxes 10L and 20L	Available from Histopathology Laboratory.

URINE SPECIMEN CONTAINERS

Container Type	Information
Sterile plastic container (30 mls) White Cap	Sterile plastic universal container (30mls). This specimen container can be used for urine (paediatric or small samples), fluid samples including CSF, ascitic, peritoneal, synovial, joint, Sputum, tissue for culture; **do not** add formaldehyde
Sterile plastic container (30 mls) Red Cap	Sterile plastic universal container (30mls) with Boric Acid. This specimen container is to be used for urine samples only. Fill container to the 20ml mark.

Container Type	Information
24 hr urine (plain or with 20 mls 50% HCL acids (available in biochemistry))	24 hr urine container with or without preservative. If there is acid in the 24 hr container, Handle with extreme care as strong acid causes severe skin burns and eye damage. DO NOT DISCARD THE CONTENTS OF THE 24 HR URINE CONTAINERS. Procedure: First label patient details on container. Immediately before the beginning of the collection (usually in the morning) the bladder must be emptied and urine discarded. Record the time and date on the container label. All urine passed during the next 24 hours must be collected and added to the urine container. At the end of the 24 hour period, the bladder must be emptied and last urine added to the container. Record time and date, and send directly to biochemistry laboratory.

OTHER SPECIMEN CONTAINERS

Container Type	Information
Sterile plastic container (30 mls) White Cap	Specimen container with no preservative, which should be used for: urines, fluid samples including CSF, ascitic, peritoneal, synovial, joint, sputum and tissue for culture; **Do not add formaldehyde**
Sterile transport Swabs	Use for all swabs including screening. A supply of sterile transport swabs are available on all wards and stock supplied from Hospital Stores.
Virus Transport Medium	All samples for virus culture should be sent in virus transport swabs or in virus culture medium (supplied by the microbiology). Please check with microbiology laboratory before taking samples as there may be special requirements for particular investigations. There is separate medium for the following • Chlamydia • N. gonorrhoea • Perinasal swabs for Bordatella Pertussis which are all available from the Microbiology Dept
Sterile plastic Universal Containers 30 mls (blue cap) with spoon	Faeces samples.
Sterile container 70 mls (white lid) available in theatre and Microbiology	Tissue for culture. **Do not add formaldehyde**

Container Type	Information
Sterile container 100 mls (white lid)	This is used for the collection of Early Morning Urine (EMU) for TB culture.
Faecal Occult Blood Slide Test Cards	Use for Faecal Occult Blood analysis. Slides can be obtained from Biochemistry. Only Hema-Screen slides accepted.
RPMI Transport for Medium for Chromosome Analysis	Available from Histopathology for Fetal and Placental Tissue Samples for Chromosome Analysis. Please note these samples must be accompanied with the consent form and request form for analysis in Eurofins Biomnis Laboratories in France.
Sweat Testing -check	The flexor surface of the forearm is the preferred site for sweat collection using Pilocarpine gel and Marcoduct Wescor Iontophoresis collector system, but the thigh may be used in children where the arm is too thin for the collector, or in conditions such as eczema, where the skin may be dry, flaky or broken. Sweat collection takes approximately 30 minutes.

1.6.2 Expired Specimen containers

Expired specimen bottles will not be accepted in any circumstance.

1.6.3 Disposal of Materials Used

Disposal of all clinical waste must be in accordance with National Guidelines.

- Universal precautions must be adhered to at all times.
- Gloves must be worn at all times.
- Gloves must be changed after each patient.
- Needles must not be recapped after use.
- Dispose of sharps in a suitable sharps container.
- Dispose of all clinical waste into yellow bag.

1.6.4 Form Types

There are nine request forms that are used to request tests within the Pathology Laboratory:

Department	Request Form Colour Code
Specimen Reception (Referral Tests)	*Blue*
Blood Transfusion	*Pink =Anti-D Request/FMH*
	Grey=General
Biochemistry	*Green*
Haematology	*Lavender*
Histopathology	*Buff/Orange*
Microbiology	*Yellow (General/ Molecular)*
Pathology Laboratory Emergency Test Request	*Red*

Each laboratory department is responsible for handling of its own test requests. Failure to provide the correct request form will result in a delay in processing of the sample.

All samples that are for referral, to centres outside of MUH must be presented with the Pathology Referral Request Form (PATH/LF/001). Failure to provide this form will result in a delay in the referral of the sample.

The Emergency Test Request Form (PATH/LF/002) is used during on-call periods and over lunchtime periods. Contact the Medical Scientist on call for all urgent work. For each patient there must be one emergency form for each laboratory department's samples. For Blood Transfusion requests, the emergency request form (PATH/LF/002) must be completed together with the routine Blood Transfusion request form. Failure to provide a request form for each laboratory department may result in a delay in processing of the sample.
The hospital departments facilitated to use Red Emergency Forms throughout the day, are the Emergency Medicine Department and the Paediatric Decision Unit.

NON-APPROVED REQUEST FORMS
Samples submitted with a non-approved Mayo University Hospital (MUH) request form will be processed, provided that all the essential patient identifiers are correct and the form/sample is labeled according to the requirements as detailed in section 1.7. However, all Blood Transfusion requests must be accompanied by the MUH Blood Transfusion form.

1.7 GUIDELINES ON THE PROCEDURE FOR SPECIMEN PHLEBOTOMY

The following details the correct procedure for the collection of specimens from patients.

1.7.1 Request Forms

Patients must have a completed request form before any specimens are obtained. The request form must be labelled as per the requirements detailed in section 1.8 and section 1.9.
IT IS IMPORTANT THAT ANY FACTORS THAT WOULD REQUIRE SPECIAL HANDLING OF THE SAMPLES (E.G. HIV STATUS OR HEPATITIS STATUS) MUST BE INDICATED ON THE REQUEST SO AS TO INFORM THE LABORATORY STAFF.

1.7.2 Patient Identification

Accurate identification of the patient is essential. The minimum identification requirements are detailed in section 1.8 and section 1.9. All sample labelling must be completed at the patient's bedside immediately after sample taking. Please refer to the Positive Patient Identification Policy in Mayo University Hospital (CLN-NM-0511) available on Hospital Q-Pulse.

IDENTIFYING THE CONSCIOUS/COHERENT IN PATIENT
1 Ask the patient to state their name
2 Ask the patient to state their Date of Birth
3 Check Patient Identification Number on request form with the patient's wristband
All patient details must be checked against the request form. Where any detail is incorrect nursing/medical staff should correct it prior to submission to the laboratory.

IDENTIFYING THE CONSCIOUS/COHERENT OUTPATIENT
1 Ask patient to state their name
2 To state their date of birth
3 To state their address
4. When using PDA devices check Patient Identification Number on request form with the patient's wristband. All data is checked against the request form. Where any detail is incorrect or unspecified, the phlebotomist may need to clarify the request form details prior to procedure.

IDENTIFYING THE UNCONSCIOUS/INCOHERENT PATIENT
Name, D.O.B. and Patient Identification Number on the request form should be checked with the wristband. A Carer, relative or nursing staff should confirm the details.

PHLEBOTOMY SHOULD NOT PROCEED UNTIL THE PHLEBOTOMIST IS SATISFIED AS TO THE CORRECT IDENTITY OF THE PATIENT.

***N.B**. ALL SPECIMENS MUST BE LABELLED IN THE PRESENCE OF THE PATIENT.*

1.7.3 Completion of Request Form
The individual who performs the phlebotomy must record their details on the request form as detailed in section 1.8.1 and section 1.9.1 when the specimen has been taken and labeled i.e. Collector's Name, contact no, date and time of collection.

1.8 SAMPLE AND REQUEST FORM LABELLING REQUIREMENTS FOR INTERNAL USERS

1.8.1 Labelling using the BloodTrack PDAs
The BloodTrack System, which is available in each Clinical Area in MUH, can be used to minimise the amount of hand labelling/addressograph labelling of specimens and the collection section of the request forms. The BloodTrack System PDA can be used at the time of sampling to generate labels on scanning the patient's wristband at the bedside; these can be used to label the specimens and also used to complete the sample collector section of the request forms.

Once patient is wearing an MUH wristband PDA, a label generated from the BloodTrack System can be used to label ALL specimens including Blood Transfusion samples. This includes Microbiology samples, swabs etc and Histopathology specimens.

Training is available on the BloodTrack System from the Haemovigilance Officers and this must be completed before the system can be used.

Please note that under NO circumstances are BloodTrack PDA devices permitted to be used to scan and produce labels from wristbands other than those being verified and WORN by the patient.

The following are the sample labelling criteria that are applicable (irrespective of whether hand labelled or using a Blood Track label) to all Laboratory Departments except for Blood Transfusion - which are detailed in the Blood Transfusion section (section 3.3) of this manual.

1.8.2 Request Form labelling requirements

The following ESSENTIAL information must be present on the form:

1. Surname and forename (correctly spelt and no abbreviations)
2. Patient Identification Number
3. Date of Birth – DD/MM/YY (not age)
4. Specimen type and anatomical site must be given on both request form and specimen container where appropriate (Histopathology)
5. Location/Ward/Clinic is required for Histopathology samples.
6. Consultant is required for Histopathology samples.

If the information 1 to 3 is absent from the form, the sample will be rejected and a new sample requested. In the case of 4, where the anatomical site/ specimen type is not present on the request form then the information can be taken from the container; where the container also does not state this required information, the requestor and/or collector will be contacted. In the case of irreplaceable samples (this includes all Histopathology tissue samples) the appropriate individual will be invited to come to the laboratory to amend the request form and complete an Amendment Report Form.

7. The signature of the requestor. A stamp from a Consultant OPD Clinic stating the requesting clinician is acceptable as an alternative to the signature of the requesting clinician.
8. The signature of the specimen collector. A label generated from the BloodTrack system PDA can be used as an alternative to completion by hand.
9. Specimen type and anatomical site where appropriate (Microbiology)

Points 7 and 8 are highlighted on the request form as the area with the grey background. If Points 7 <u>and</u> 8 are <u>both</u> absent, the appropriate individual will be invited to the laboratory to amend the form. They will also be required to complete an Amendment Report Form. If either Requestor or Collector signature is present, the sample may be processed without pursuing the absent signature but this must be documented on the LIS record.

The following REQUIRED information should also be provided on the request form:

10. Patient's Gender
11. Patient's Full Home Address
12. Patient's Location/Ward (Report Destination, if different, should be indicated).
13. The name of the patient's Clinician/Consultant
14. Date and Time of sample collection; the date, at a minimum, should be confirmed and, if relevant to the test being performed, the collection time should be confirmed with the collector. A label generated from the BloodTrack system can be used as an alternative to completion by hand
15. Relevant clinical information appropriate to the test(s) requested must be supplied e.g. history of medication / antibiotics / anticoagulants.

Note: For Microbiology if Test request is not stated with blood culture bottles, swabs in transport media and urines in boric acid, they will be processed for culture.

16. Examination(s) required / Test requests
17. Indicate as to whether the tests requested are urgent or routine

If points 11 – 15 are absent and are deemed necessary for analysis the requesting clinician and/or collector, as appropriate, will be contacted for the information.

The information provided is entered into the Laboratory's Information System and is used to generate accurate and correct reports. It is the requestor's responsibility to ensure that all the details provided to the laboratory are accurate and up to date. If any of the details change, the requestor must inform the laboratory as soon as possible.

1.8.3 Sample labelling requirements

The following ESSENTIAL information must be present on the specimen

1. Full Surname and Forename (correctly spelt and no abbreviations)
2. Patient Identification Number
3. Date of Birth (not age)
4. Anatomical Site (Histopathology) must be stated on each specimen, as appropriate e.g. lesion left arm
5. Anatomical Site (Microbiology) must be stated on each specimen when multiple specimens are received with a single request form e.g. MRSA swabs from nose, groin, axilla etc. However, if only one sample in a multiple sample request has not recorded a stated site, but the site is stated on the form, it is reasonable to accept that the specimen is from that site.
6. Sample Collection Time for Dynamic Function Tests (E.g. Glucose Tolerance Test, Synacten and Cortisol)
7. Signature of sample collector (Blood Transfusion) must be present on Blood Transfusion samples. A label generated from the BloodTrack system can be used as an alternative to completion by hand

Unlabelled, wrongly labelled or inadequately labelled specimens will not be accepted.

In the case of irreplaceable samples (All Histopathology tissue samples), the appropriate individual will be invited to come to the laboratory to amend the specimen container and complete an Amendment Report Form. In the case of 4, where the anatomical site/ specimen type is not present on the container then the information can be taken from the request form; where the request form also does not state this required information, the requestor and/or collector will be contacted Where there are multiple specimens, the sample containers must be labelled with anatomical site information, If information is missing the collector must come down to the laboratory to amend.

Correctly sized printed hospital generated labels (Addressograph) are acceptable on specimens (except for Blood Transfusion samples which **must be handwritten if the BloodTrack PDA is not used**).

A label generated from the BloodTrack System can be used to label ALL specimens including Blood Transfusion samples. This includes Microbiology samples, swabs etc and Histopathology specimens.

1.9 SAMPLE AND REQUEST FORM LABELLING REQUIREMENTS FOR EXTERNAL USERS

The following are the sample labelling criteria that are applicable to all Laboratory Departments except for Blood Transfusion - which are detailed in the Blood Transfusion section of this manual.

1.9.1 Request Form labelling requirements

The following ESSENTIAL information must be present in a legible manner on the form

1. Full Surname and Forename (correctly spelt and no abbreviations)
2. Date of Birth - DD/MM/YY (not age) and must correspond with that on the specimen
3. Patient's correct Full Home Address
4. Specimen type and anatomical site must be given on both request form and specimen container where appropriate (Histopathology)

If the information from 1 to 3 is absent from the form the sample will be rejected and a new sample requested. In the case of irreplaceable Histopathology specimens, the appropriate individual will be contacted by the Consultant Histopathologist to clarify details and send a new request form if deemed necessary. Details of telephone conversations will be recorded by the Consultant Histopathologist.

If the address on the request form is different to the address which is currently recorded on the LIS, contact must be made with the requesting clinician/location to confirm the address. If the address is correct the sample can be accepted for analysis and the LIS address updated, but if the address is incorrect the sample must be rejected (not applicable to Histopathology).

5. The signature of the requestor; a stamp from a GP surgery stating the requesting clinician is acceptable as an alternative to the signature of the requesting clinician.
6. The signature of the specimen collector.
7. Specimen type and anatomical site where appropriate (Microbiology)

Points 5 and 6 are highlighted on the request form as the area with the grey background. If Points 5 <u>and</u> 6 are <u>both</u> absent the appropriate individual will be requested to amend or submit another request form containing all the required details. They may also be required to complete an Amendment Report Form.

If either Requestor or Collector signature is present, the sample may be processed without pursuing the absent signature but this must be documented on the LIS record.

The following REQUIRED information should also be provided on the request form:

8. Patient's Patient Identification Number (If patient has a PID number allocated)
9. Patient's Gender
10. GP/External Location (Report Destination, if different, should be indicated)
11. The name of the patient's Clinician
12. Date and Time of sample collection; the date, at a minimum, should be confirmed and, if relevant to the test being performed, the collection time should be confirmed with the collector.
13. Relevant clinical information appropriate to the test(s) requested must be supplied (e.g. history of medication / antibiotics / anticoagulants.)
14. Examination(s) required / Test requests

15. Note: For Microbiology if Test request is not stated with blood culture bottles, swabs in transport media and urines in boric acid, they will be processed for culture.
16. Indicate as to whether the tests requested are urgent or routine

If points 10 – 14 are absent and are deemed necessary for analysis the requesting clinician will be contacted for the information

The information provided is entered into the Laboratory's Information System and is used to generate accurate and correct reports. It is the requestor's responsibility to ensure that all the details provided to the laboratory are accurate and up to date. If any of the details change the requestor must contact the laboratory so that amendments can be made to the form.

1.9.2 Sample labelling requirements

The following ESSENTIAL information must be present on the specimen

1. Full Surname and Forename (correctly spelt and no abbreviations)
2. Date of Birth (not age)
3. Anatomical Site (Histopathology) must be stated on each specimen, as appropriate e.g. lesion left arm
4. Anatomical Site (Microbiology) must be stated on each specimen when multiple specimens are received with a single request form e.g. MRSA swabs from nose, groin, axilla etc. However, if only one sample in a multiple sample request has not recorded a stated site, but the site is stated on the form, it is reasonable to accept that the specimen is from that site.
5. Sample Collection Time for Dynamic Function Tests (E.g. Glucose Tolerance Test, Synacten and Cortisol)

Unlabelled, wrongly labelled or inadequately labelled specimens will not be accepted.

In the case of irreplaceable samples (All Histopathology tissue samples) the appropriate individual will be contacted by the Consultant Histopathologist to clarify details. Details of telephone conversations will be recorded by the Consultant Histopathologist.

In the case of 4, where the anatomical site/ specimen type is not present on the container then the information can be taken from the request form; where the request form also does not state this required information, the requestor and/or collector will be contacted.

Correctly sized printed (Addressograph) labels are acceptable on specimens (except for Blood Transfusion which must be handwritten and include the Patient Identification Number). Alternatively, the use of a BloodTx PDA label, generated at the patient's bedside following scanning of the wristband worn by the patient, is accepted.

1.10 Requests for Add-On Tests

Telephoned requests for add-on tests are accommodated provided the usual criteria for acceptance of the added test are met by the form and specimen in the laboratory. When additional tests are requested and an adequate sample already exists in the laboratory, a newly completed and signed request form must be sent prior to analysis. Some tests may be time sensitive and therefore may not be available as an add-on request. Please contact the appropriate department to ensure that the specimen that is in the laboratory is valid for any additional requests if you are unsure as to the validity of the specimen.

1.11 NON-CONFORMING SAMPLES AND REQUEST FORMS

Laboratory personnel will inspect, prior to testing, each blood specimen and request form for conformance with labelling requirements. Where these and quality issues are not met, the following will apply.

REQUEST FORM ISSUES	ACTION
No request form provided with Specimen	Specimen not processed. Repeat Specimen and request form sought, if possible, from the Requestor.
Incorrect or absence of any of the three ESSENTIAL patient identifiers on INTERNAL request forms:- • Patient Identification Number • Full Name • Date of Birth	Specimen not processed. Requestor or location informed. Request rejected and repeat specimen and form requested.
Incorrect or absence of any of the three ESSENTIAL patient identifiers on EXTERNAL request forms:- • Full Name • Date of Birth • Full Home Address	
No **signature** of the requestor or the specimen taker	Specimen not processed or test results released until form amended. The requestor or the specimen taker, as appropriate, may amend the request form in the laboratory. The Amendment Report must be signed. Alternatively, MUH staff could be facilitated by sending the Amendment Report Form via chute/porter to the Requestor or Specimen Collector, as appropriate, and asking for a repeat Request Form to be returned with the signed Amendment Report Form to the Laboratory. External test requestors could forward or fax a new correctly completed request form to the laboratory.
Specimen type and **site, where appropriate,** not indicated on Microbiology Request Form.	
Specimen type and **site** not indicated on Histopathology Request Form (and also not indicated on container).	The appropriate Amendment Report must be completed by the requestor/ sample collector and/or laboratory staff member. Record event as incident code on LIS.
No **date and time collected** recorded	The date, at a minimum, should be confirmed and, if relevant to the test being performed, the collection time should be confirmed with the collector.
Inadequacy or absence of the following details:- • Address (In-House samples only) • Ward or Location • Gender • Patient's GP/Consultant • Clinical Information	If any of the details opposite are absent or incorrect, and deemed necessary for processing, they may be sought and added to the form. All information added to the original request form should be initialled and dated. A second specimen and form is requested if the details cannot be provided by the requester.
Incorrect test requested	
No test requested	

SPECIMEN ISSUES	ACTION
Specimen unlabelled	Specimen not processed, Requestor informed and repeat requested.
No specimen received	Request rejected Requestor informed and repeat requested.
Incorrect or absence of any of the three ESSENTIAL patient identifiers on internal specimens:- Patient Identification Number Full Name Date of Birth	Requestor informed a second specimen must be collected.
Incorrect or absence of any of the two ESSENTIAL patient identifiers on external specimens:- • Full Name • Date of Birth	
Miscellaneous specimen issues as deemed necessary by individual departments.	A second specimen must be collected.

SPECIMEN APPEARANCE/ QUALITY ISSUES	ACTION
• Evidence of Haemolysis • Gross Lipaemia • Presence of clots in specimens for FBC and coagulation tests • Age of specimen • Miscellaneous quality issues • Evidence of Incorrect Centrifugation • Absence of formalin fixative in tissue specimens • Absence of cytology fixative in fluids for cytology • PRESENCE of any fixative for fluids for crystal investigation	The individual Pathology Departments will make a decision on whether or not the specimen is suitable for testing and a second specimen requested as appropriate. Specimen quality issues are recorded on the LIS. The individual laboratories may report results within a multi test profile on analytes unaffected by the specimen quality, while not reporting affected analytes in the profile. If tested or appropriate the report will show the specimen quality issue.

Refer to 1.18.8 for management of test reports where the requesting clinician information is unavailable.

1.12 Specimen Transport

The transport of specimens to the Laboratory must follow UN (UN 3373) regulations and guidelines in order to minimise the risk of infection to those who may come in contact with the specimens e.g. taxi drivers, couriers, postal workers, porters, laboratory staff etc. Consignors of specimens must ensure that packages are prepared in such a manner as to

meet the requirements for packaging and transport of biological material by road, rail or post in accordance with the ADR regulations (or any such regulations that may be effected from time to time) and in accordance with any special criteria as required by the laboratory at MUH.

The correct specimen container and laboratory request form must always be used when sending specimens to the laboratory. It must be ensured that the container is appropriate for the purpose, is properly closed, and is not contaminated on the outside. To avoid specimen rejection, please follow the specimen requirement instructions in the test directory. If in doubt, contact the appropriate laboratory. Certain assays require transportation at specific temperatures. Specific instruction is given in the directory of tests section of the manual.

1.12.1 Internal Locations

The transport of specimens to the laboratory from Wards/ Clinical Areas is by use of the portering services or the pneumatic air tube (APT) system. The following guidelines for sending samples internally must be followed:

- Specimens must be placed within the bag that is attached to the request form. This bag must then be sealed.
- Specimen containers that are contaminated externally must not be sent to the laboratory.
- When sending several samples to the laboratory special sealable plastic bags should be used in conjunction with the appropriate secondary specimen transportation container/box.
- Blood gas specimens must **never** be sent to the laboratory with the needle attached.
- Under no circumstances should anyone transport the primary specimen container in one's hand or pocket.
- Blood Culture bottles can be sent directly to Microbiology Dept via APT 'chute' system 2556 or can alternatively be hand delivered to the Microbiology laboratory immediately after collection. During the hours of 8pm to 8am the Microbiology scientist on call must be notified when the sample is in transit to the department.
- Cerebrospinal Fluids (CSF) must always be hand delivered to the Microbiology laboratory. The microbiology laboratory should be informed when a CSF is on its way.
- Urgent Blood Transfusion Samples should be hand delivered to the Blood Transfusion Laboratory.
  Histopathology specimens must always be delivered directly to a staff member of the Histopathology Laboratory using the red rigid specimen boxes.

During 'Out of Hours' periods, specimens (with exception of Histopathology) must be forwarded to the appropriate laboratory via the pneumatic tube system or directly delivered to the Medical Scientist On-call. During Out of Hours, Histopathology specimens should be recorded in the Histopathology Specimen Receipt Log on delivery by the person transporting the sample and this will be confirmed as received by the Histopathology scientist on the next working day.

PNEUMATIC TUBE SYSTEM

The Pneumatic Tube System (APT) commonly referred to as the "Chute" is used mainly for the sending of specimens to any one of the Laboratory Departments. However, it may also be used for the sending of many other items between stations, limited only by size and safety considerations.

Before using the Chute, please familiarise yourself with the correct operation and health & safety procedures. Please be aware of the specimen types that can and cannot be transported using the Chute including the carrier (shuttle) colour and type.

To send a sample:

- Place the sample in the bag attached to the request form.
- Seal the bag attached to the request form by removing the strip and folding the bag onto the sticky surface.
- Place the bag in the correct carrier type – do not overload.
- Dial the station address number and without delay place carrier on the station for dispatch.
- Check for any messages on the station. During busy periods there may be a delay in the carrier leaving the station. It is the sender of the samples responsibility to ensure that the samples have been sent during these periods.

The following are the addresses for the chute to each laboratory

Specimen Reception	2573
Blood Transfusion	2545
Haematology	2549
Microbiology	2556
Biochemistry	2559

There is no chute system in the Histopathology Department as all specimens must be delivered directly by hand.

TRANSPORTABLE ITEMS AND CARRIER TYPE:

Laboratory samples	RED carrier
Pharmacy requests	Yellow carrier
Emergency Department	Blue carrier

NON-TRANSPORTABLE ITEMS:

Blood Products such as Immunoglobulin Anti-D, Hepatect etc
C.S.F samples
Samples for SARS Cov 2 testing
All Histopathology Specimens
Units of blood
Any item which may break or leak in the system

UNATTENDED STATIONS:

The Pathology Specimen Reception station is programmed to shut down from 17.30 pm daily until 09.30 am on the following day, 24 hrs on Saturdays and Sundays along with Bank Holiday Mondays.

All other department chute systems are open 24/7 with the exception of Blood Transfusion which diverts to Haematology after 17.00 to facilitate lone worker cover on-call.

BREAKDOWN
If the pneumatic system fails or is faulty, contact the Hospital Maintenance Department via the online help desk during routine hours or to APT direct Out of Hours on 01 841 3005 or out of hours 087 2580328 for 24/7 cover.

1.12.2 External Locations

WESTDOC
Some GMS participating GP's in County Mayo have access to specimen collections from designated locations by WestDoc Logistics under a Primary Care arrangement.

DROP OFF SERVICE
Pathology Specimen reception is located at the main entrance to the Pathology Laboratory. All samples should be delivered directly to the Laboratory Specimen Reception.

During Out of hours, GP samples can be left at the Main reception in the Hospital Foyer where it will be collected the next routine day. Any urgent samples must be delivered directly to the laboratory.

POST
If samples are sent by post, a secondary transport container compliant with UN 3373 regulations must be used.

1.13 REFERRAL SAMPLES

All referral tests must be sent as soon as possible to the laboratory. Some referral tests require specific storage conditions which are detailed in the Directory of Tests section. If there is any doubt about the taking and storing of referral samples, contact the Pathology Laboratory for advice.

The Pathology Laboratory prepares and dispatches referral samples from both in-house and external locations.

Tests requiring immediate processing or preparation e.g. PTH, are brought directly by the Specimen Reception staff member to the discipline specific Laboratory Department. Samples for preparation as described in the Pathology Laboratory User Manual PATH/PD/001.

Referral samples that do not require immediate processing or preparation are handled and managed directly by Specimen Reception staff.

All referral samples for testing in Galway University Hospital (GUH) Laboratory are dispatched from Laboratory Specimen Reception daily, Monday to Friday (excluding Bank Holidays).

All other requests for any other referral laboratories based in Ireland and the UK are dispatched by Laboratory Specimen Reception staff using the Eurofins Biomnis courier service on a daily basis, Monday to Friday (excluding Bank Holidays).

The Pathology Laboratory utilises three transport methods to referral centres:

- A local courier service transports all applicable referral samples to Galway University Hospital on a daily basis, at approximately 10.15am Monday to Friday. All test requests that are referred to GUH must reach the laboratory by 10:00am at the latest to be included in this transport.
- Eurofins Biomnis Ireland provides a sample transport service to Galway University Hospital and onto all other locations in Ireland and the UK, which leaves the laboratory at 11:30am daily, Monday to Friday. It is important all requests that are sent via Eurofins Biomnis received by 11:00am to ensure that they are dispatched on the same day. These samples are recorded by Specimen Reception staff prior to dispatch. Registration/transfer for requests to referral laboratories is performed on BioTrak.
- First Direct Medical provide transport of samples to the IBTS. First Direct Vans are available Monday-Friday.
- Blood Bike West may, on occasion, provide a courier service for the transport of urgent samples within Ireland.

1.13.1 Reports on Tests from External Laboratories

Hard copy reports are returned from external laboratories by post or by Courier to the Laboratory Main Specimen Reception, where they are sorted for dispatch to the requesting location. A record is maintained of the receipt of this hard copy report.

Hard copy reports are returned to the requestor/ location daily, via the hospital Post Room where electronic reports are not available.

Electronic reports are available for all GUH test reports to all users of the Lab IT system (Internal) and the Healthlink system (external/ GPs).

Electronic reports are available for interfaced Eurofins Biomnis and National Viral Reference Laboratory (NVRL) test requests to all Internal Users. Hard copy reports are issued to users which do not have access to electronic systems.

1.14 Samples Misdirected

If samples cannot be located, it is important that the requestor contacts the appropriate Laboratory Department or Laboratory Management as soon as possible to allow the laboratory to investigate and take corrective action, if appropriate. Every effort will be made to determine the reason for any misdirected specimens reported and to determine the root cause of the problem, if possible, in order to minimise a reoccurrence of the event.

1.15 Repeat Examinations due to Analytical Failure

In the event of an analytical failure, it is the policy of the Pathology Laboratory to repeat the test with a back-up method, or to store the specimen until the cause of the analytical failure is identified and corrected. If this results in a significant delay in processing the specimen, the requesting clinician will be informed.

1.16 Turnaround time

Turnaround time is given as the maximum number of working hours/days between **sample receipt in the laboratory and the issuing of a report under normal operating conditions**. The turnaround time for individual tests is given under each test heading in the Directory of Tests section of this manual. The target turnaround time for urgent tests is generally shorter, where every effort is made to process the samples as soon as possible.

It should be noted that there is a reduced service available over lunch times and therefore the turnaround time for results may be slightly longer than during the rest of the routine day.

1.17 Urgent Requests

The request for urgent analysis MUST be used appropriately. Abuse of the urgent request facility will have an adverse effect on the turnaround times of genuine urgent requests.

If results are urgently required this must be indicated to the laboratory by placing a tick against the "Urgent" box of the Departmental Request Form. The requestor should also contact the relevant Laboratory Department to discuss their requirements and if possible, the request will be facilitated. Specimens requiring immediate attention should be sent to the laboratory as soon as they are drawn.

Specimens from external patients (OPD and GPs) referred after 15:30 may not be reported until the next morning unless marked urgent. Please indicate this on the request form and provide phone numbers for phoning urgent results. The laboratory should be contacted in advance if at all possible, where urgent specimens are not received prior to 15:30 on a routine working day.

For urgent requests out of routine hours, submit the Emergency Request Form indicating the urgency and contact the medical scientist on-call directly via the switchboard.

1.18 Reporting of results

1.18.1 Ward Enquiry (iLab Web Enquiry)

The iLAB Laboratory Information System (LIS) is a single integrated system operating across all laboratory disciplines in Mayo University Hospital, Galway University Hospital and Roscommon University Hospital. The LIS is interfaced to the iPMS, Patient Management System. Histopathology electronic reports are made available to specific Medical Staff /Clinicians and this is arranged with the Lab IT Manager and Consultant Histopathologist(s).

Authorised Test Results for hospital inpatients are available to the clinical areas under a Ward Enquiry function available via the Web Browser. Ward enquiry uses the Patient Identification number as the Primary identifier for the Patient. However, results from external locations where a Patient Identification number may not have been provided, are also accessible using an "unknown" search.
Because the system is shared between Galway, Mayo and Roscommon University Hospitals, results from these three locations are displayed together. Results may extend to more than one visible page.
Note: To use WebLab the user must contact the LIS Manager for a Username and Password. Generic logons/sharing of passwords is not permitted. Accessing of test results are auditable to the username utilised on the Web Brower.

1.18.2 Healthlink

HealthLink is the name given to the Department of Health and Children funded project which allows electronic links to be established between General Practitioners, Hospitals and the Health Service Executive to allow for the timely and secure transfer of patient related administration, clinical data and laboratory reports.
For further information on HealthLink contact support@healthlink@healthmail.ie

1.18.3 Hardcopy Reports

Reports are printed on a daily basis with reference ranges and/or suitable comments wherever appropriate, to aid interpretation of results. Reports will be returned to the requesting Clinician at the Location stated on the Request Form.

Printed reports are delivered via the APT to internal locations on the system. Otherwise reports are sent via the internal post. All Histopathology reports are delivered directly to the requesting Consultant at a specified location. Histopathology reports are available on the iLAB LIS (Apex) System to all requesting Consultants.
General Practitioners and other External reports are dispatched from the Pathology laboratory on a daily basis, Monday to Friday, for those requiring a hard copy.

1.18.4 Telephoned Reports

If indicated on the request form and/or if the results meet the individual laboratory phoning criteria, the results will be phoned to either the clinician or the location provided a contact number is given. For this reason, it is very important that the requesting clinician records their bleep number or contact number on the request form to ensure that results can be phoned to a member of the patient's medical team without delay. For external Service Users, provision of an emergency contact number is essential to ensure timely communication of a critical test result.

1.18.5 Faxed Reports

In line with GDPR, due to the potential of sending patient details to an unauthorised location, faxed reports are not routinely sent to external locations. If a test report is to be faxed to an external location then a Fax Authorisation Form must be completed by the requestor indicating the details of the location where the results are to be faxed. A confirmation of receipt of the faxed information must also be received by the sending laboratory.

1.18.6 Additional Copies of a Report

If indicated on the request form, copy reports will be sent to an alternative location e.g. a GP, if full details are provided. Failure to provide the details will result in the copy report not being sent to the location. It is the requesting clinician's responsibility to provide the correct details for additional copies. If the additional copy must be sent to another external hospital for an out-patients clinic, please ensure that the samples are taken far enough in advance to ensure that the results are received by the external hospital.

1.18.7 Analytical Failures

In the event of a specimen being unsuitable for processing or where there is an analytical failure, the clinician will be informed by phone, or bleep, or where a mobile number is supplied and through the Healthlink or iLAB LIS reporting system. A hard copy report will follow.

1.18.8 Unavailability of Requesting Clinician Information

Where the Test Request Form received by the Pathology Laboratory clearly indicates the Requesting Clinician is a registered user of the Mayo University Hospital Pathology Laboratory, this information is available on the laboratory report.
Where the Requesting Clinician information is illegible, absent or is not recognised as a registered clinician of the MUH Pathology Laboratory Service, then the Requesting Clinician will be stated as 'Unknown' on the laboratory report.
Where the Requesting Clinician information is stated as 'Medical Officer' or 'Doctor-In-Charge', this information is available on the laboratory report.
If any requesting clinician is not currently registered as a service user in MUH, contact the Quality Manager at Janet.Burke@hse.ie to request our Service User registration form. This is also available on our website located at Pathology Laboratory Department | Saolta University Health Care Group.

1.19 ADVISORY SERVICES

1.19.1 Clinical Advisory Services

Clinical advice regarding the results of laboratory investigations is available on request from the Consultant Haematologist (for Haematology/Blood Transfusion only), the Consultant Histopathologist, Consultant Microbiologist and an off-site Consultant Chemical Pathologist who can be contacted via the Biochemistry Department.

Requesting of appropriate tests and subsequent application of the test results and interpretative guidance from the appropriate Laboratory Department must be applied to patient care by the patient's clinician in the overall clinical context of the patient concerned.

For this reason, services are accessible only by medical practitioners or other health care professionals acting on the recommendation of a medical practitioner. Written reports are issued to medical practitioners. Verbal reports are provided when appropriate to medical practitioners.

HAEMATOLOGY AND BLOOD TRANSFUSION
The Consultant Haematologist is on site in MUH on a Thursday where s/he can be contactable via the laboratory; advisory service is available off-site for the remainder of the week.
The Haematology team in Galway University Hospital (GUH) can be contacted for advice via the switchboard in GUH (091-544544).

BIOCHEMISTRY
Currently the formal advisory service available for Biochemistry is the offsite Consultant Chemical Pathologist in Eurofins Ireland. This advisory service is available on a 24/7 basis. The Consultant Chemical Pathologist can be contacted via the Biochemistry laboratory at Ext: 2560 /2562 or email the enquiry to the Chief Medical Scientist at ray.divilley@hse.ie.

MICROBIOLOGY
There is a formal advisory service available for Microbiology on site at MUH. This advisory service is available on a 24/7 basis. The Consultant Microbiologist can be contacted directly at Ext: 1335 or Bleep: 366 or at any time through the main Hospital switchboard.

HISTOPATHOLOGY
There are two Consultant Histopathologists in MUH. They can be contacted at any time during the routine day via the Pathology Office. Urgent contact during non-routine hours is facilitated by the main Hospital switchboard.

1.19.2 Scientific Advisory Services
Each of the departments within the Pathology Laboratory is available for all queries associated with any of the tests which are performed in that laboratory department. If any medical staff requires advice, then they can contact each of the individual laboratories directly.

For information or advice on any referred tests, then the medical staff should contact the referral laboratory, to access specific advice.

1.20 COMPLAINTS, COMPLEMENTS AND SUGGESTIONS
The Pathology Laboratory is constantly striving to improve the service that is offered to the users. To facilitate this there is a complaints and suggestion procedure throughout the laboratory. Any individual who wishes to make a complaint or a suggestion can contact any of the Heads of Departments or the Laboratory Manager and ask for their complaint/suggestion to be documented.

All complaints (a complaint can be defined as an expression of dissatisfaction -a real or perceived grievance), with regard to the provision of a service by the Pathology Laboratory or Haemovigilance Office will be treated promptly, fairly, impartially and in confidence. If a complaint has been verified a full investigation of the complaint will be carried out to include the root cause of the complaint and the factors influencing it and corrective actions will be put in place to ensure that a similar complaint is prevented. A written response will be sent to the complainant with the details of the investigation and the resolution of the complaint, as appropriate.

1.21 LABORATORY USER GROUPS

1.21.1 Hospital Transfusion Committee

Hospital Transfusion Committee meetings are held a minimum of 3-4 times a year where Transfusion issues, policies, inventory management, quality issues, Haemovigilance and Traceability issues are discussed. The meeting include representation from all relevant areas of clinical, scientific, nursing and Haemovigilance staff. To add items to the agenda, please contact the Haemovigilance Officer.

2 HAEMATOLOGY

2.1 KEY PERSONNEL

Name	Position	Contact No	E-mail address
Dr Sorcha Ní Loingsigh	Consultant Haematologist	Contact via MUH switch*	Sorcha.Níloingsigh@hse.ie
Mr Sean Leonard	Chief Medical Scientist	2553	Sean.Leonard@hse.ie
Gemma Kirrane	Senior Medical Scientist	2549	Gemma.Kirrane@hse.ie
Helen Leonard	Senior Medical Scientist	2549	Helen.Leonard3@hse.ie
Ms Janet Burke	Quality Manager	2456	Janet.Burke@hse.ie

* Consultant Haematologist is available on site on a Thursday.

2.2 RANGE OF TESTS

The following is a list of tests that are performed routinely within the laboratory with accompanying sample requirements:

Tests	Sample type	Volume requested
Coagulation Screen (PT and APTT)	**Blood in Tri-sodium Citrate**  Adults  Paeds	2.7 mL blood for adults 1.3 mL blood for Paediatric
Prothrombin Time (PT)/INR		
Activated Partial Thromboplastin Time (APTT)		
Fibrinogen		
D-Dimers		
Full Blood Count	**Blood in EDTA**  Adults  Paeds	3.0 mL blood for adults 1.3mL blood for Paediatric
Reticulocyte Count		
White Blood Cell Differential Cell Count		
Blood Film Morphology		
ESR (Manual)	Blood in Trisodium Citrate 	2.4mls blood for adult
ESR (Automated)	Blood in EDTA 	3.0 mL blood for adult 1.3 mL blood for Paediatric
I.M. (Infectious Mononucleosis) Screen	Blood in EDTA 	3.0 mL blood for adults 1.0ml blood for Paediatric
Malaria Screen	Blood in EDTA 	3.0 mL blood

Sickle Screen (Sickledex)	Blood in EDTA 	2 X 3.0 mL blood

2.2.1 On-call Tests

The following is a list of tests that are performed on–call

- Full Blood count (FBC)
- Infectious Mononucleosis (I.M) Screen
- Malaria Screen
- Prothrombin Time (PT) /I.N.R
- Coagulation Screen (PT and APTT)
- Fibrinogen
- D-dimers

If any of the other tests not listed are required to be performed on-call, the laboratory must first be contacted and the requirements discussed.

All requests sent to the laboratory during on-call periods must be completed on the red Emergency Request Form. Failure to do so could result in a delay in reporting of results.

2.2.2 Sample Receipt Deadlines

The cut-off receipt time for all routine samples received from external locations is 15:30. Routine samples received after this time will be analysed the following day, if suitable.

2.3 URGENT REQUESTS

THE REQUEST FOR URGENT ANALYSIS MUST BE USED APPROPRIATELY. ABUSE OF THE URGENT REQUEST FACILITY WILL HAVE AN ADVERSE EFFECT ON THE TURNAROUND TIMES OF GENUINE URGENT REQUESTS.

For urgent requests tick the urgent box on the Departmental Request Form and contact the Haematology Laboratory directly on extension 2549 or 094-9042549.
For urgent requests out of routine hours, submit the Emergency Request Form indicating the urgency and contact the Medical Scientist on-call directly via the switchboard.

For external users, please provide a contact number for phoning urgent results, especially if required after normal surgery hours.

2.4 REFERENCE RANGES

The Haematology references ranges are available on request. These ranges are age and sex related, as appropriate and will appear as part of the hardcopy or electronically available test report.
Please note this **does not occur** in relation to pregnancy-related reference ranges. The Haematology ranges specific to the trimesters of pregnancy are provided as below:

Full Blood Count – PREGNANCY RELATED REFERENCE RANGES				
Parameters	**Units**	**First Trimester**	**Second Trimester**	**Third Trimester***
WBC	x10^9/L	5.7-13.6	6.2-14.8	5.9-16.9
RBC	x10^12/L	3.52-4.52	3.20-4.41	3.10-4.44
HB	g/dl	11.0-14.3	10.0-13.7	9.8-13.7
HCT	L/L	0.31-0.41	0.30-0.38	0.28-0.39
PLT	x10^9/L	174-391	171-409	155-429
NEUTROPHILS	x10^9/L	3.6-10.1	3.8-12.3	3.9-13.1
LYMPHOCYTES	x10^9/L	1.1-3.5	0.9-3.9	1.0-3.6
MONOCYTES	x10^9/L	0.0-1.0	0.1-1.1	0.1-1.1
EOSOPHILS	x10^9/L	0.0-0.6	0.0-0.6	0.0-0.6
BASOPHILS	x10^9/L	0.0-0.1	0.0-0.1	0.0-0.1

* Third Trimester reference range is applicable for 6 weeks post delivery
Reference : Blood Cells. A Practical Guide. Barbara J. Bain; 4th Edition (H/EXT/072)

Reference Ranges for adults of Afro-Caribbean origin

Parameters	Units	Male	Female
Haemoglobin	g/dL	12.7-16.7	11.3 – 14.9
MCV	fl	80-99	81.5 – 99
White cell count	x10^9/L	3.1 – 9.4	3.2 – 10.6
Neutrophils	x10^9/L	1.2 – 5.6	1.3 – 7.1

Source of Ranges: Blood Cells. A Practical Guide. Barbara J. Bain; 4th Edition

2.5 Critical Alerts Values for Phoning in Haematology

Please refer to the Mayo University Hospital Pathology Laboratory Saolta website for the current test values which are communicated by the Haematology Department at the following link: https://saolta.ie/wards/pathology-laboratory-department-0

2.6 Specimen Retention

FBC samples and coagulation samples are valid for up to 48hrs (but each test will have a different stability time), contact the laboratory if add on requests are required to determine if the sample is still valid. If additional tests are required on samples sent to the laboratory, please contact the laboratory to ensure that the sample is still valid for analysis to prevent delay in the sample processing.

2.7 LIMITATIONS ASSOCIATED WITH TEST METHODOLOGY

Test Method	Associated Limitations
Coagulation Tests (PT/ INR, APTT, Fibrinogen and D-dimers)	Clotted samples will not be analysed Sample volume is critical, and underfilled samples will not be processed Lipaemic samples may not meet expected turnaround times due to the testing methodology used within the laboratory. Trisodium citrate samples received from patients who have a haematocrit greater than 55% may demonstrate spuriously prolonged PT and APTT results. The laboratory will contact the requestor requesting that a sample is taken with a bottle provided by the laboratory Many commonly administered drugs may affect the results obtained in prothrombin time testing According to the manufacturer of ORBACTIV, the drug oritavancin has been shown to artificially prolong PT and INR for up to 24 hours. The monitoring of the anticoagulation effect of warfarin may be unreliable for up to 24 hours after an ORBACTIV dose. Patients on unfractionated heparin must have the sample tested within 1.5hrs after sample taking. Failure to adhere to this limitation will result in falsely reduced APTT values. Heparin contamination will result in prolonged APTT and fibrinogen results. D-dimer samples must be less than 4 hours old from the time of sample taking. Submission by external locations must inform the laboratory in advance. Presence of Rheumatoid arthritis factor may result in falsely elevated D-dimer results.

Test Method	Associated Limitations
FBC	Clotted samples will not be analysed. Sample deteriorates over time resulting in the degradation of the white cells; therefore, a differential white cell count will not be provided on samples greater than 48 hours old. Sample greater than 72 hours old will only have the Hb reported. Lipaemic samples will result in falsely reduced Hb levels.
ESR	The manual ESR should be performed within 4 hours of phlebotomy. Leaving the sample at room temperature for more than 4 hours may cause the red cells to become spherical and inhibit rouleaux formation resulting in false low ESR Sickle Cell anaemia, Hb CC and spherocytosis cause a falsely reduced ESR result. The presence of anaemia invalidates the ESR as a tool for monitoring disease process since anaemia itself increases the ESR.
Infectious Mononucleosis Screen	10-20% of adults and 50% of children <4years do not produce the heterophile antibody tested for and will result in a false negative result. If clinical suspicion persists an EBV titre should be performed
Malaria Screen	Positive rheumatoid factor (Rf) titres may produce false positive results in the rapid malaria screen that is performed
Sickle Screen	Erythrocytosis, hyperglobulinemia, extreme leukocytosis or hyperlipidemia could result in false positives results. False positives or false negatives may occur in patients with severe anaemia (HCT <15%). False negatives may occur in infants under six months of age due to elevated levels of Haemoglobin F. Patients with a recent blood transfusion will not be tested as the transfused blood will interfere with the test methodology. Positive results may occur in patients with some rare sickling haemoglobin subtypes such as Haemoglobin C Harlem or Haemoglobin C Georgetown.

2.8 TURNAROUND TIME FOR HAEMATOLOGY TESTS

Turnaround time is calculated from the time of receipt in the Haematology Laboratory to the time that the results are released. 90% of results should be reported within the time frames given below*:

TEST	TURNAROUND TIMES (ROUTINE)	TURNAROUND TIMES (OUT-OF-HOURS)
FBC/Diff	2 hours	1 hour
Paediatric FBC	2 hours	1 hour
Reticulocyte Count	3 hours	N/A
Infectious Mononucleosis (I.M.) Screen	8 hours	4 hours
ESR	3 hours	N/A
Blood Film	3 days	N/A
Malaria Screen	3 hours	3 hours
Sickle Screen	3 days	N/A
Coagulation Screen and Fibrinogen	2 hours	1.5 hour
D-dimers	4 hours	4 hours
Paediatric Coagulation screen	2 hours	1.5 hour
P.T/I.N.R	2 hours	1.5 hour

***Test Requests from External locations are processed as soon as practicable and generally within 24 hours of receipt during Routine Hours**

- Urgent requests must be notified directly to the laboratory by phone if required to be processed as a priority.
- Urgent films (Clinical Details of Leukaemia/ Haemolytic Anaemia/ ITP/ TTP) will be viewed as soon as possible after discussion with the requesting Medical Officer.

3 BLOOD TRANSFUSION AND HAEMOVIGILANCE

3.1 KEY PERSONNEL

Name	Position	Contact No	E-mail address
Dr Sorcha Ní Loingsigh	Consultant Haematologist	Contact via MUH switch*	Sorcha.Níloingsigh@hse.ie
Ms Rosemary Sweeney	Chief Medical Scientist	2545	rosemaryb.sweeney@hse.ie
Ms Gemma Kirrane	Senior Medical Scientist	2549	Gemma.Kirrane@hse.ie
Ms Helen Leonard	Senior Medical Scientist	2549	Helen.Leonard3@hse.ie
Ms Janet Burke	Quality Manager	2456	Janet.Burke@hse.ie
Mr Jack Walsh	Haemovigilance Officer	3094/ Bleep 363	Jack.Walsh@hse.ie
Ms Emer Hennessy			Emer.Hennessy@hse.ie
Ms Mary Rowley			Mary.rowley@hse.ie

Consultant Haematologist is available on site on a Thursday.

3.2 ROLE OF HAEMOVIGILANCE IN MAYO UNIVERSITY HOSPITAL

3.2.1 Introduction: European Blood Directive 2002/98/EC

The European Communities (Quality and Safety of Human blood and Blood Components) Regulations 2005 Statutory Instrument (SI) No. 360 of 2005 became effective for the purpose of regulations on 8 November 2005 and transposed in to Irish Law August 2006.
The Directive governs the activities of Blood Transfusion Service and Hospital Blood Banks in all EU member states:

- Setting standards of quality and safety for the collection, testing, processing, storage and distribution of human blood and blood components
- Mandates full traceability of all blood/ blood components (Article 14)
- Mandates reporting of all serious adverse reactions and events to blood/ blood components (Article 15)

3.2.2 Definitions As Defined in EU Directive 2002/98/EC

Haemovigilance: shall mean a set of organized surveillance procedures relating to serious adverse or unexpected events or reactions in donors or recipients and the epidemiological follow up of donors.
Serious Adverse Event: shall mean any untoward occurrence associated with the collection, testing, processing, storage and distribution of blood and blood components that might lead to death or life-threatening, disabling or incapacitating conditions for patients or which results in or prolongs hospitalisation or morbidity.

Serious Adverse Reaction: shall mean an unintended response in donor or inpatient associated with the collection or transfusion of blood or blood components that is fatal, life-threatening, disabling, incapacitating or which results in, or prolongs hospitalisation or morbidity.
Traceability: means the ability to trace each individual unit of blood or blood component derived thereof from the donor to its final destination, whether this is a recipient, a manufacturer of medicinal products or disposal and vice versa.

3.2.3 Haemovigilance Service in Mayo University Hospital

The Clinical Haemovigilance Service in Mayo University Hospital is facilitated by the Consultant Haematologist and Haemovigilance Officers, liaising with the Chief Medical Scientist and Quality Officer/ Quality Manager for Blood Transfusion on a daily basis and when the need arises.
Blood Transfusion, Haemovigilance and Traceability services are provided to the Mayo Hospice, Castlebar, following approval by the Irish National Accreditation Board as per www.inab.ie (scope Registration No 207MT). Please refer to the MUH Haemovigilance procedure *Blood Transfusion at Mayo Hospice* (HV/CP/020) for further information.

3.2.4 Purpose of the Haemovigilance Officer Role in Mayo University Hospital

To act as a resource for all health care workers, by offering expert care, advice and support in Haemovigilance in consultation with the Consultant Haematologist. The Haemovigilance Officers embrace the five core concepts of the Haemovigilance role including clinical focus, patient advocacy, education and training, audit and research and consultancy, to ensure the provision of high quality, holistic and integrated service for all patients in Mayo University Hospital. This involves ensuring adherence to the EU Blood Directive 2002/98/EC and the ISO Standard 15189 (current edition) throughout the entire blood transfusion process, assessing current treatments, improving the management and clinical outcomes of care, monitoring cost effectiveness in care provision and supporting practice development and education in Haemovigilance care in order to facilitate the development of competencies within the specialty.
It is the responsibility of each professional in Mayo University Hospital to practice Haemovigilance safely, competently and effectively fulfilling his/ her professional responsibility.

3.2.5 Reporting Relationships

- Consultant Haematologist Responsible for Blood Transfusion
- Chief Medical Scientist – Blood Transfusion Laboratory

3.2.6 Working Relationships

- Quality Officer – Blood Transfusion Laboratory
- Quality Manager – Pathology Laboratory

Haemovigilance is a set of surveillance procedures from the collection of blood and its components to the follow-up of recipients, to collect and assess information on unexpected or undesirable effects resulting from the therapeutic use of labile blood products, and to prevent their occurrence or recurrence.

The role of the Haemovigilance Officer is to implement and maintain blood transfusion guidelines, facilitate continuous education of clinical staff and to investigate undesirable effects of transfusion.

3.3 RANGE OF TESTS

3.3.1 Routine Tests

Tests	Specimen Requirements			Special Requirements	Turnaround time
	Additive	Volume (mls)	BDTube (colour)		
Direct Antiglobulin Test (DAT)	EDTA	4mls	Pink	None	2 Hours
Group&DAT Cord/Newborn	EDTA	1mls	Pink	None	2 Hours
Group & Screen	EDTA	6mls	Pink	None	2 Hours
Group & Serological Crossmatch	EDTA	6mls	Pink	Historical Blood Group	3 Hours
Group & EI crossmatch	EDTA	6mls	Pink	Historical Blood Group	1 Hour
Group, ABID & Crossmatch	EDTA	6mls	Pink		3-5 Hours In-house
Cold Agglutinins	EDTA	6mls	Pink	Immediately to Lab @ 37°C	5 Hours
Transfusion Reaction Investigation*	EDTA	2 X 6mls	Pink	Blood Transfusion Investigations	Preliminary Investigations Within 24 Hours
	Silica clot activator	6mls	Red		
	EDTA	3mls	Lavender	**Haematology** FBC, Coag, Blood Film)	
	Sodium Citrate	3mls	Blue		
	Gel clot activator	6mls	Yellow	**Biochemistry** (LDH, U/E Bilirubin,LFT's)	
	Urine (1st sample post transfusion)	10mls	White	**Microbiology Urinalysis** Haemoglobinuria	
	Blood Cultures	Send to Microbiology (Refer to User Manual)		**Microbiology** Bacterial Screening of Patient	**Additional Investigations**
	Donor units transfused	Send to Blood Transfusion Department		**NBC** Culture of units transfused	
	Gel clot activator	6mls	Yellow	Biochemistry (IgA Levels, Haptoglobins)	**7-9 Days**
KBT	**Post Delivery**				
Maternal Sample	EDTA	1 X 6mls	Pink	None	3 days
Baby Sample		1ml			
KBT	**Sensitising Event**				
Maternal Sample	EDTA	1 X 6mls		None	3 days

*Contact Consultant Haematologist advisory service as per section 1.19, prior to transfusing additional units.

Note: Additional tests may be requested if considered appropriate/relevant

Routine Requests for **Group & Hold** are treated as follows:

- ABO and Rhesus D grouped.
- Antibody screen performed.

Blood is not crossmatched for patients in this instance. Additional examinations may be requested on stored samples, if sample age is appropriate.

For safety reasons and where possible, blood transfusions should only be given during normal working hours and non-urgent requests for blood or products should be limited to the laboratory routine working hours (supported by National Haemovigilance Office Annual Reports).

Crossmatched blood will be held in the Blood Transfusion laboratory fridge for **24-48 hours** only. It will then be cancelled automatically unless notification to 'hold' the blood is received from a Medical Officer. It is important for the efficient use of blood that the laboratory be informed of the cancellation of a blood order as early as possible. Under normal circumstances and where no problems are encountered, a group and crossmatch may take up to 3 hours from receipt of the specimen.

TIMING OF SAMPLE COLLECTION IN RELATION TO PREVIOUS TRANSFUSIONS

Transfusion or pregnancy may stimulate the production of unexpected antibodies. The timing of samples selected for crossmatching or antibody screening must take account of this, as it is not possible to predict when or whether such antibodies will appear.

To ensure that the specimen used for compatibility testing is representative of a patient's current immune status, a sample collected **no more than 72 hours** in advance of the actual transfusion.

Patients who are admitted to the hospital or transferred from another hospital, and require blood or blood components, should have a new pre-transfusion sample taken (even if a previous sample has not outdated). This sample acts as a verification of patient identity and is safer than relying on a previously held sample or an historical group to issue blood components.

A formal deviation from the 72 hour rule may be considered for pregnant women with no clinically significant alloantibodies, who, for example, require blood standing by for potential obstetric emergencies, e.g. placenta praevia. This may be facilitated by completion of a Request to Sample a patient at 7 day intervals rather than the 3 day interval (HV/MF/005); available on hospital Q-Pulse at CLN-HVIG-044.

REQUESTING BLOOD COMPONENTS AND BLOOD PRODUCTS

Each request for a blood component or product must be documented on a laboratory request form and submitted to the laboratory with the blood sample for compatibility testing. There are two types of request form, one for Anti-D only ('Request for Anti-D Immunoglobulin for Rhesus Prophylaxis') and one for all other blood components or products ('Blood Transfusion Request Form').

Telephone requests for additional blood/ blood products must be followed up by a written request before blood can be issued.

PREOPERATIVE SAMPLE RECEIPT DEADLINES

All routine cross match samples must be received in the Blood Transfusion laboratory **before 2p.m. the day preceding surgery** to ensure the availability of blood for surgery the following morning. If the request is received later than this the laboratory cannot guarantee the availability of the blood. It is advisable for the Clinician/ Medical Team to check with the Blood Transfusion Department that blood is available BEFORE the patient is taken to theatre.

Pre-operative samples for Group and Screen or Group and Crossmatch taken on a Sunday or Bank-Holiday Monday must be in the laboratory **by 2pm** to ensure the availability of blood for surgery the following morning, this is provided no atypical red cell antibodies are detected. Where a patient has a known antibody, samples are required by 9am on the morning preceding surgery.

Patients who have had a group and antibody screen taken at a pre-assessment clinic (usually up to ten days prior to admission) must have a new pre-transfusion sample for group/screen and/or crossmatch taken on the day of admission. Where a patient has a known antibody, samples are required by 9am on the morning **preceding** surgery.

FETAL MATERNAL HAEMORRHAGE INVESTIGATIONS BY KLEIHAUER-BETKE TEST (KBT)

FMH estimation should be carried out:

1. If an Rh (D) negative woman gives birth to a Rh (D) positive infant
2. Following a sensitising event if the pregnancy is > 20 weeks gestation. Sensitising events include but not limited to;
   - Termination of pregnancy
   - Abdominal trauma
   - Amniocentesis
   - Antepartum haemorrhage
   - Chorionic villous sampling
   - Cordocentesis (fetal blood sampling)
   - Delivery
   - Ectopic pregnancy
   - Fetal manipulation
   - Intrauterine fetal death
   - Miscarriage
   - Stillbirth.

Please refer to ***CLN-OGCP-248, WAC Group Clinical Practice Guidelines for the Use of Anti D Immunoglobin for the prevention of RHD Haemolytic Disease of the Newborn National Guideline*** and ***CLN-OGCP-305 WAC Guideline for screening of cffDNA and the administration of targeted Anti-D (I g) Prophylaxis in the antenatal period (CLN-OGCP-305)*** for guidance on the indications for of Anti-D immunoglobulin to prevent sensitization to the D antigen during pregnancy or at delivery for the prevention of Haemolytic Disease of the Foetus and Newborn.

In exceptional cases where there has been significant abdominal trauma in an RhD- positive woman in late pregnancy, consideration may be given to performing the KBT. The Consultant must contact the laboratory with the indication for the test in Rh D-positive women.

3.3.2 On-call Tests

THE REQUEST FOR URGENT ANALYSIS MUST BE USED APPROPRIATELY. ABUSE OF THE URGENT REQUEST FACILITY WILL HAVE AN ADVERSE EFFECT ON THE TURNAROUND TIMES OF GENUINE URGENT REQUESTS.

IT IS HOSPITAL POLICY TO AVOID ROUTINE TRANSFUSIONS OUT OF HOURS. THE OUT OF HOUR'S TRANSFUSION SERVICE PROVIDED ONLY APPLIES TO EMERGENCIES AND TO SITUATIONS WHERE THE PATIENTS CANNOT WAIT UNTIL THE NEXT ROUTINE PERIOD. REQUESTS FOR BLOOD FOR ELECTIVE SURGICAL PROCEDURES ARE NOT PROCESSED OUT OF HOURS.

The on-call tests performed include Group and Holds and the crossmatching of blood only. All other tests will be processed on the next routine day, if sample age is appropriate.

Possible transfusion reactions should be reported immediately to the laboratory and investigations as appropriate will be performed with completion during the next routine day. Further transfusion of these individuals prior to completion of the investigations should be discussed with the Consultant Haematologist and avoided unless absolutely necessary.

Crossmatch problems encountered on-call (e.g. those due to irregular antibodies) will not be investigated unless it is an emergency situation.

During on-call periods, contact the Blood Transfusion Laboratory if ordering blood components or products. An Emergency Request Form must be completed and forwarded to the Blood Transfusion Laboratory along with a general 'Blood Transfusion Request Form'.

3.4 SPECIMEN AND REQUEST FORM LABELLING REQUIREMENTS

The following sample labelling criteria are based on guidelines that were released by the British Committee for Standards in Haematology (BCSH) and are universally applied in most laboratories.

The information provided is inputted into the laboratory's information system and is used to generate accurate and correct reports. It is the requestor's responsibility to ensure that all the details provided to the laboratory are accurate and up to date. If any of the details e.g. ward location changes, the requestor must contact the laboratory so that the LIS can be updated.

3.4.1 Procedure for Collection of a Pre-Transfusion Sample

The pre-transfusion sample must be taken by a Registered Nurse/ Doctor/ Phlebotomist who has received training in pre-transfusion sampling and venepuncture.

Minimum transfusion standards demand the patient must have an identity band in place at all times recording the patient's unique identifier, surname, forename and date of birth. In the event of removal of the identity band e.g. to access a blood vessel, it is the responsibility of the person who removes the identity band to ensure that a new identity band is applied.

Patient Preparation, venepuncture technique and consent shall be as outlined in the Mayo University Hospital Venepuncture policy, available on the hospital Q-Pulse. An educational VENEPUNCTURE module is available on www.hseland.ie and is also provided by the on-site education of staff in Venepuncture and Cannulation courses for Mayo University Hospital.

Prior to sampling, the patient must be positively identified by asking him/her to state their full name and date of birth and crosschecking this against the full name, date of birth and patient's Patient Identification Number on their identity band. Do not ask patient to confirm their details e.g. 'Are you Mr. X?' The patient's wristband details should be cross-checked against the Blood Transfusion Request form demographics. Please refer to the Positive Patient Identification Policy in Mayo University Hospital (CLN-NM-0511) available on Hospital Q-Pulse. The blood sampling procedure should then be carried out according to the Hospital Venepuncture Policy.

3.4.2 Procedure for Blood Transfusion Specimen Acceptance
Hospital generated Addressograph labels are not accepted on the specimen.

IT IS A REQUIREMENT THAT ALL BLOOD TRANSFUSION SAMPLES BE TAKEN AND LABELLED USING THE BLOOD TRACK SYSTEM OR HANDWRITTEN. FOR INSTRUCTION ON THE USE OF THE BLOOD TRACK SYSTEM FOR PRE-TRANSFUSION BLOOD SAMPLING, REFER TO THE HAEMOVIGILANCE SOP – HV/CP/004 PRE-TRANSFUSION SAMPLING FOR COMPATIBILITY TESTING (HV/CP/004), AVAILABLE ON MUH Q PULSE AS CLN-HVIG-0044 (KEYWORD SEARCH MUHHV).

The BloodTrack system PDA is used to generate labels at the patient's bedside, which are used to label the sample and placed in the 'Patient Identification, Specimen Collection and Labelling Performed by' section of the request form, where they serve as the collectors electronic signature. For details of use of the Blood Track PDA refer to HV/CI/004; EBTS Quick Guide Sample collection and HV/CP/004 Pre-Transfusion Sampling for Compatibility Testing; available on hospital Q-Pulse at CLN-HVIG-0044.

Where it is not possible to use the Blood Track PDA device (cord samples), patient details may **be hand-written on the sample tube,** legibly and preferably in block capitals using a black ballpoint pen and completed immediately after sampling while still at the patient's side. The following information should be recorded on the sample tube:

- Surname and forename - (in full)
- Patient's Patient Identification Number
- Ward
- Gender
- Date of birth
- Date and time the sample was drawn
- Signature of person drawing the sample (the signature confirms positive verification of the patient's identity)

The sample taker must then complete the 'Patient Identification, Specimen Collection and Labelling Performed by' section of the request from.

The use of hospital generated addressograph labels or the pre-labelling of blood sample tubes is **specifically prohibited.**

3.4.3 Confirmatory Sample Requirement for Blood Transfusion

A second sample is requested for confirmation of the ABO group of a first time patient prior to transfusion, where this does not impede the delivery of urgent red cells or other components. The confirmatory sample **must** be taken as a separate venepuncture from the initial sample, ideally by a different sample taker. Ideally the requirement for the confirmatory sample will be notified to the requestor by the Blood Transfusion Laboratory who will also supply the request form and sample bottle to be used.

3.5 BLOOD COMPONENT AND PRODUCT AVAILABILITY DURING ROUTINE HOURS

Product	Specimen Requirements			Turnaround time (Routine hours)
	Additive Required	Volume Required	Sample Tube	
Red Cells – Current Sample (when no historical blood group available)	EDTA	6mls	Pink	3 hours
Red Cells – Current Sample suitable for electronic issue (when historical blood group available **and no alloantibodies detected)**	EDTA	6mls	Pink	1) Current Sample already processed – 5 mins 2) Current Sample to be processed – 30 mins
Red Cells – Current Sample (when historical blood group available and alloantibodies detected and/or sample not suitable for electronic issue)	EDTA	6mls	Pink	1) Current Sample already processed and antibody identified – 2-6 hours, dependent on antigen negative blood availability 2) Current Sample to be processed - 2-6 hours, dependent on antigen negative blood availability
Neonatal Unit/ Pedipack	EDTA	Maternal – 6mls Neonate – 1ml	Pink	• Stock neonatal unit 1hour. • Up to 6 hours if fresh pedi-pack supplied by the IBTS

Product	Specimen Requirements			Turnaround time (Routine hours)
	Additive Required	Volume Required	Sample Tube	
Platelets	EDTA	6mls	Pink	A unit of platelets in case of emergencies is generally available on standby in the laboratory In emergency 1.5 - 2 hours from GUH (if available) 3.5 to 4.5 hours if available from the IBTS. If not available the requesting clinician will be contacted
FFP Octaplas®	EDTA	6mls	Pink	30 minutes if blood group already established by laboratory (otherwise 1 hour)
Immunoglobulin Anti-D	EDTA	6mls	Pink	2 hours
Albumin	None	None	None	1 hour
Fibrinogen	None	None	None	1 hour
Alprolix®	None	None	None	1 hour
Novoseven® *	None	None	None	2 hours
Octaplex	None	None	None	1 hour
Hepatect®	None	None	None	1 hour
Varitect®	None	None	None	1 hour
Wilate® *	None	None	None	1 hour
Elocta®	None	None	None	1 hour
Coagadex	None	None	None	1 Hour

* Supply of Alprolix, Elocta, Novoseven®, Octaplex®, Wilate® and Coagadex, only following discussion with the Consultant Haematologist.

Refer to the Maximum Surgical Blood Ordering Schedule (CLN-HVIG-0044); the document is located on hospital Q-Pulse.

3.6 Blood Component and Product Availability during Emergency Situations

3.6.1 Urgent Requests for Blood or Blood Products

The Medical Officer must contact the Blood Transfusion Laboratory directly (ext 2545/2546) during routine hours or bleep the medical scientist on call via switchboard explaining the urgency and indicating the details of the blood or products required.

- Urgent crossmatch on a sample already Group and Held can take 20 minutes.
- Urgent crossmatch on a new patient sample can take 30 – 60 minutes and if the antibody screen is positive there may be a further delay providing blood.
- Patients that qualify for EI are issued red cells when requested i.e. "On Demand". If a valid sample is already tested and available in the lab, red cells can be issued electronically in approximately 5 minutes.
- A new sample with a request for Group Screen and Crossmatch will take approximately 25 minutes to issue red cells electronically. The sample must first be centrifuged, processed on the analyser, results transferred electronically to APEX LIS and authorised, prior to electronic issue of red cells.

3.6.2 Timelines in terms of Blood Component/Product availability

In an emergency the urgent need for blood transfusion may preclude the performance of standard compatibility testing prior to issue of blood/components. The requesting medical officer **must** personally speak to the Blood Transfusion laboratory in this situation indicating the urgency and timeline involved and the Quantity of Blood Component/Product required.

The timelines in terms of Blood Component/Product availability are as follows:

Blood/Product	Timeline
O Negative RC, Uncrossmatched	Available Immediately (Limited to 4 RC)
Group Compatible RC, Uncrossmatched	15 Minutes from sample receipt
Emergency Crossmatch	RC 30 Minutes from sample receipt
Standard Crossmatch (URGENT)	30-60 Minutes from sample receipt
EI (Electronic Issue)	5 minutes if sample already processed and no antibodies detected
EI (Electronic Issue)	30 minutes if sample to be processed and no antibodies detected
FFP (LG Plasma i.e. Octaplas®	30 Minutes from sample receipt
Octaplex	Immediately on approval by the Consultant Haematologist
Platelets	A unit of platelets in case of emergencies is generally available on standby in the laboratory 1.5 - 2 hours from GUH (if available)
Platelets	3.5-4.5 Hours from Dublin dependant on the order time

Blood/Product	Timeline
Fibrinogen	Immediately
Novoseven®	Immediately, on approval by the Consultant Haematologist
Wilate®	Immediately, on approval by the Consultant Haematologist
Coagadex	Immediately, on approval by the Consultant Haematologist
Alprolix®	Immediately, on approval by the Consultant Haematologist
Elocta®	Immediately, on approval by the Consultant Haematologist

A Blood-warmer is indicated if large volumes of red cells are being transfused rapidly.

It is best practice in emergencies to assign a single medical officer to communicate with the Blood Transfusion Laboratory and to document transfusions.

The management of massive haemorrhage should be discussed with the Consultant Haematologist at an early stage.

Refer to the Haemovigilance Document HV/CP/019 Guideline for the Management of Acute Major Haemorrhage in Mayo University Hospital – Major Transfusion Protocol "Code Red" available on hospital Q-Pulse at CLN-HVIG-045, Acute Massive Haemorrhage Policy for details regarding protocols for a Massive Haemorrhage.

When a crossmatch or blood product request is submitted, the General Blood Transfusion crossmatch or product request form **must** also be completed in full and sent to the Laboratory **for each** individual request.

In emergency cases, where a non-conforming sample cannot be replaced, the originator must accept responsibility for the error prior to testing. The report will show the non-conforming event.

If an emergency occurs out of routine hours and more than one patient is involved, the Blood Transfusion staff member on-call should be contacted as soon as possible so as to allow additional staff to be contacted to support the services required.

3.7 Turnaround Times

The turnaround times are detailed in the table in section 3.2 for each of the individual tests.

It is laboratory policy to monitor turnaround times to comply with targets. However, in emergency situations and out-of-hours, the laboratory staff must prioritise sample throughput and turnaround time targets may not always be met.

3.8 SPECIMEN RETENTION

Blood Transfusion specimens are held for a minimum of 7 days. Refer to section 3.2.1 for details on the timing of samples for transfusion.

3.9 CRITICAL ALERTS

The clinician or the ward will be contacted if there is a delay in the turnaround time of the test. If there is difficulty in crossmatching blood for a patient due to red cell antibodies or the supply of blood the clinician will also be contacted. Critical alerts are available to view at https://saolta.ie/wards/pathology-laboratory-department-0

3.10 TRANSFUSION PROCEDURE ON THE CLINICAL AREAS

The *BloodTrack*® System is used in MUH to track blood and blood products from receipt in the Laboratory through issue to the clinical area and transfusion to the patient. It enhances patient safety, aids in efficient workflow (single nurse checking) and creates a centralised electronic transfusion record. Verification of transfusion is performed on the ward by either using the BloodTrack PDAs (where the information is automatically transferred to the LIS for blood and platelets) or by the manual_completion of the Transfusion Verification Record section of the compatibility label which is then detached and returned to the Blood Transfusion Laboratory for completion of the fating process. The BloodTrack PDAs are the preferred mode of electronically managing the recording of transfusions in MUH
It is a mandatory requirement that all Blood Transfusion samples be taken and labelled using the Blood Track system. The BloodTrack Tx module includes sample collection, Begin Transfusion, recording transfusion reaction details and End Transfusion.
Training on the use of the Blood Track system in MUH is delivered by the Haemovigilance officers at staff induction and can be arranged at any time by contacting the HVO on bleep 363.

3.10.1 Provision of Information to Patients regarding the Administration of a Blood Component or Product

It is a requirement in Mayo University Hospital that all patients receiving a Blood Transfusion are provided with information regarding the transfusion. The document to be provided to patients is "Blood Transfusion – Information for Patients" PATH-Saolta-HV-001 and the Clinical Procedure to be referred to is HV/CP/001 'Provision of Information to Patients regarding the Administration of a Blood Component or Product'; the document is located on hospital Q-Pulse at CLN-HVIG-044.

2) Prescription of a Blood Transfusion

When blood products/components are required for a patient the Blood Component/ Product Prescription and Transfusion Record must be completed in block capitals and signed by the requesting clinician. All blood components or products must be prescribed by a registered Doctor prior to administration to a patient. The Clinical Procedure to be referred to is

HV/CP/002 'Prescription of Blood Components and Products'; the document is located on hospital Q-Pulse at CLN-HVIG-044.

A CONFIRMATORY SAMPLE is now required for all samples received for Transfusion, where a patient does not have a previous historical ABO and Rh D group. The confirmatory sample must be taken at a separate venepuncture from the initial sample, ideally by a different sample taker. The requirement for the confirmatory sample will be notified to the requestor by the Blood Transfusion Laboratory who will also supply the form and sample bottle to be used.

Having a confirmatory group will mean that, for approximately 70% of patients, the Electronic Issue of Red Cells, rather than a serological crossmatch may be possible.

SPECIAL REQUIREMENTS

If CMV negative or irradiated blood components are required, mark the appropriate tick boxes on the request form and also contact the Blood Transfusion laboratory and record in the Prescription section of the Blood Component/Product Prescription and Transfusion Record (HV/CF/001).

Requests are required in advance as these are not routinely stored on site and can take up to 6 hours to obtain from the National Blood Centre in Dublin.

If the patient has a history of red cell antibodies, the clinician must give details of the antibody detected.

MAXIMUM SURGICAL BLOOD ORDER SCHEDULE

The hospital's Maximum Surgical Blood Order Schedule (refer to CLN-HVIG-0044) should be utilized when ordering Red Cells for elective surgical procedures.
Refer to the document on hospital Q-Pulse at CLN-HVIG-044.

3) Completion of the Blood Transfusion Request Form for the Issue of Blood Components and Products

The requesting clinician must complete a Blood Transfusion request for the required blood product/component. It is the requestor's responsibility to ensure that all appropriate information e.g. special transfusion requirements are detailed on the request form. The Blood Transfusion Department request forms are 'Blood Transfusion Request Form BT/LF/001, Request for Anti-D Immunoglobulin for Rhesus Prophylaxis BT/LF/003 and Request for Feto-Maternal Haemorrhage Estimation Request Form BT/LF/142'. The Clinical Procedure to be referred to is HV/CP/005 'Completion of the Blood Transfusion Request Form for the Issue of Blood Components and Products'; the document is located on hospital Q-Pulse at CLN-HVIG-044.

Crossmatches for patients with circulating **antibodies** to red cell antigens can take a considerable amount of time. The Blood Transfusion Laboratory will inform the appropriate medical staff if this situation should arise.

3.5.1 Storage of Crossmatched Blood

Crossmatched blood is stored in the Blood Issue fridge located in the the Blood Transfusion Laboratory.

3.5.2 Collection of Blood Components and Products from the Laboratory

The Blood Issue fridge is connected to the BloodTrack Electronic Blood tracking System. To access the fridge the collector must first log into the BloodTrack system. All new staff members must contact the Haemovigilance Officer to set up their User ID and to receive training on the system. When blood products/components are for collection, the Blood Component and Product Collection Form must be completed on the ward, signed and dated by the requestor. This form is then given to a collector where they will proceed to the laboratory to collect the product/component.

The Clinical Procedure to be referred to is HV/CP/012 'Collection and Internal Hospital Transportation of Blood Components and Products'; the document is located on hospital Q-Pulse at CLN-HVIG-044.

This clinical procedure contains all information regarding collection and transport of Blood Components and Products internally.

3.5.3 Transport of Blood with a Patient to an External Location

If blood is required for transport to the hospice or with a patient to an external location contact the laboratory with details of the departure time. The laboratory staff will place the blood in the transport box and will ensure that all of the appropriate paperwork is available for the transport. This should be checked by the staff member responsible for transport prior to the box being closed.

If the blood is transfused on route to the external location the paperwork must be completed as if the transfusion occurs within MUH.

Any blood transported should be sent to the receiving location's Blood Transfusion laboratory as soon as possible after arrival. If this is not possible then the blood should be returned to MUH.

The Clinical Procedure to be referred to is HV/CP/013 'Transport of Blood Components or Products with a patient to External Hospitals'; the document is located on hospital Q-Pulse at CLN-HVIG-044. This clinical procedure contains all information regarding collection and transport of Blood Components and Products that are to be transferred with a patient.

Procedure for the Transfusion Process in the Clinical Area

As the information required for the transfusion process in the Clinical Areas is extensive and detailed it is not possible to synopsis it for this manual. Please refer to the Clinical Procedures referenced below:

HV/CP/012 Collection and Internal Hospital Transportation of Blood Components and Products

HV/CP/003 Positive Patient Identification prior to Pre-Transfusion Blood Sampling and Administration of a Blood Component or Product.

HV/CP/005 Completion of the Blood Transfusion Request Form for the Issue of Blood Components and Products

HV/CP/006 Request to the Laboratory for Issue of Blood Components and Products

HV/CP/007 Administration of a Blood Component or Product to the Patient

HV/CP/008 Disposal of Used Blood Packs and Administration Equipment

HV/CP/009 Care and Monitoring of Serious Adverse Reactions in the Clinical Area

HV/CP/010 The Management of Serious Adverse Events in the Clinical Area

All documents are available from the Hospital Q-Pulse at CLN-HVIG-044 (keyword search MUHHV).

3.6 BLOOD COMPONENT/ PRODUCT DETAILS

3.6.1 Red Cells

Red cells units are a red cell suspension obtained from whole blood by centrifugation and removal of plasma with subsequent addition of a nutrient solution of SAG-M. The removal of the majority of leucocytes is achieved by filtration. A stock of red cells is maintained in the laboratory, however for certain patient's blood may have to be ordered from the IBTS. The clinician will be advised on how long blood will take to arrive to MUH.

3.6.2 Platelet Transfusions

Platelets are ordered from the IBTS in Dublin on a named patient basis only. Requests for platelets should be made directly to the Blood Transfusion laboratory by the Medical Officer, giving the patient's blood group and baseline platelet count. The Blood Transfusion request form should be completed and sent to the Blood Transfusion Laboratory. Delivery time from Dublin can take from 3.5 to 4.5 hours. In an emergency, it may be possible to obtain platelets from GUH, dependant on availability. Also, the Blood Transfusion laboratory, where possible, maintains a unit of platelets on standby for emergency use. For platelet transfusion guide refer to Platelet Transfusion Guidelines (HV/CP/014); the document is located on hospital Q-Pulse at CLN-HVIG-044.

3.6.3 FFP (LG Plasma, Octaplas®)

When FFP (LG Plasma i.e. Octaplas®) is required, the Laboratory should be notified at least 30 minutes in advance, as it must be thawed at 37^0C for this time. The patient's blood group

must also be known. The Blood Transfusion request form should be completed and sent to the Blood Transfusion Laboratory. Once thawed, the plasma should be used immediately. If delay in transfusion is unavoidable the plasma is stored at ambient temperature in the laboratory and must be used within 8 hours of defrosting (a label is placed on the pack to indicate the expiry time).
For frozen plasma use, refer to Plasma 'LG-Octaplas' Administration Guidelines (HV/CP/016); the document is located on hospital Q-Pulse at CLN-HVIG-044.

3.6.4 Anti-D Immunoglobulin

A fully completed Anti-D request form is required including the patient demographic details, blood group and antenatal history together with the baby's details if the request is postnatal. A patient current blood group and screen (less than 3 days old) must be on file. If not, a fresh group and screen sample and form must accompany the request for Anti-D.

3.6.5 Blood Derivatives

Blood derivatives are issued on a named patient basis only. Patient details on the general Blood Transfusion form should include the Name, DOB, Patient Identification Number PID and Consultant. It must be signed by the requesting Medical Officer. It is preferable that a historical blood group is on file and if not, a fresh sample for group and screen is advised to accompany the request. Requests for Alprolix®,Elocta, Wilate® and Octaplex®, Coagadex, Novoseven require Consultant Haematologist oversight.

ALBUMIN

Albumin is available as a 5% or 20% protein solution in volumes of 500mls or 100mls.

ALPROLIX®

Alprolix®, Coagulation Factor IX (Recombinant), Fc Fusion Protein, is a recombinant DNA derived coagulation Factor IX concentrate indicated in adults and children with haemophilia B for:

- On-demand treatment and control of bleeding episodes,
- Perioperative management of bleeding,
- Routine prophylaxis to reduce the frequency of bleeding episodes.

It may be used under the direction of the Consultant Haematologist.

NOVOSEVEN® FVIIA

Novoseven® contains a recombinant activated form of clotting Factor VII. It is used to treat and prevent bleeding episodes in patients with acquired Haemophilia or with low levels of factor VII. It may be used under the direction of the Consultant Haematologist to treat severe haemorrhage.

PROTHROMBIN COMPLEX (OCTAPLEX®)

Prothrombin Complex (Octaplex®) is licensed for use in the Republic of Ireland for the treatment of bleeding and peri-operative prophylaxis of bleeding in patients receiving Warfarin. It is also licensed for treatment of bleeding and peri-operative prophylaxis in congenital deficiency of any of the vitamin K dependant coagulation factors (FII, FVII, FIX

& FX) when purified specific coagulation products are not available. *REFER TO OCTAPLEX® TRANSFUSION GUIDELINE (HV/CP/015)*; the document is located on hospital Q-Pulse at CLN-HVIG-044.

FIBRINOGEN
The purified concentrate of Fibrinogen (coagulation factor I) is derived from human plasma. Its therapeutic indications include therapy and prophylaxis of haemorrhagic diathesis in congenital hypo-, dys-, or afibrinogenaemia and acquired hypofibrinogenaemia resulting from disorders of synthesis in cases of severe liver damage, increased intravascular consumption e.g. as a result of DIC or hyperfibrinolysis, or increased loss.

WILATE®
Wilate® contains factor VIII and von Willebrand factor (vWF). Wilate® is used to treat and prevent bleeding in patients with von Willebrand Disease. Wilate® is also used to treat and prevent bleeding in patients with Haemophilia A. It may be used under the direction of the Consultant Haematologist.

ELOCTA®

- Elocta® is an extended half-life recombinant factor VIII. It is indicated for the treatment and prophylaxis of bleeding in patients with haemophilia A (congenital factor VIII deficiency). Elocta® can be used for all age groups. It may be used under the direction of the Consultant Haematologist.
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COAGADEX
Coagadex contains human coagulation factor X and is indicated for the treatment of Factor X deficiency.
It may be used under the direction of the Consultant Haematologist.

3.7 INDICATIONS FOR TRANSFUSION

3.7.1 Red Blood Cells

Single-unit red blood cell transfusions are recommended [National Institute for Health and Care Excellence (NICE), 2015] for adults (or equivalent volumes calculated based on body weight for children or adults with low body weight) who do not have active bleeding, with further clinical assessment to determine whether additional transfusion is required.Refer to NICE Guidelines for red Cell Transfusions when prescribing Red Cells for transfusion (https://www.nice.org.uk/guidance/ng24)

3.7.2 FFP (LG Plasma, Octaplas®)

For Frozen Plasma (LG Plasma i.e. Octaplas®) use, refer to Plasma 'LG-Octaplas' Administration Guidelines (HV/CP/016); the document is located on hospital Q-Pulse at CLN-HVIG-044.

3.7.3 Platelets

For platelet transfusion guide, refer to Platelet Transfusion Guidelines (HV/CP/014); the document is located on hospital Q-Pulse at CLN-HVIG-044.

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3.7.4 Octaplex (

- Bleeding and prevention of bleeding during vitamin K antagonist treatment. The dose is dependent on the INR before treatment and the targeted INR
- Bleeding and perioperative prophylaxis in congenital deficiency of the vitamin K dependent coagulation factors II and X when specific coagulation factor product is not available.

Refer to Prothrombin Complex - Octaplex Guidelines (HV/CP/015); the document is located on hospital Q-Pulse at CLN-HVIG-044.

3.7.5 Fibrinogen

- Congenital hypo-, dys-, or afibrinogenaemia
- Acquired hypofibrinogenaemia resulting from
  - ❖ disorders of synthesis in cases of severe liver parenchyma damage
  - ❖ increased intravascular consumption e.g. as a result of disseminated intravascular coagulation, hyperfibrinolysis
  - ❖ increased loss

DOSAGE

Before administration the fibrinogen level should be determined. The amount to be administered and the frequency of application should always be oriented to the degree of bleeding and the clinical efficacy in the individual case. Generally 1 to 2g is administered initially, with subsequent infusions as required. The critical plasma fibrinogen level below which haemorrhages may occur is 1.0 g/L. Normal values are in the range of 2.0-4.0 g/L. The circulating fibrinogen level should not be raised beyond the lower limit of normal to minimize the risk of thromboembolic complications. In cases of severe haemorrhage amounts of 4 to 8g fibrinogen may be required immediately. To avoid overdose, precise monitoring of the substitution therapy by means of laboratory control is required.

Note: Discuss the use of Fibrinogen with a Haematologist if planning on giving outside the context of a major bleed.

3.7.6 Anti-D

- Prevention of Rh(D) isoimmunisation in Rh(D) negative women
- Antepartum prophylaxis - Planned antepartum prophylaxis - Antepartum prophylaxis following complications of pregnancy including: Abortion/threatened abortion, ectopic pregnancy or hydatidiform mole, intrauterine foetal death, transplacental haemorrhage resulting from antepartum haemorrhage, amniocentesis, chorionic biopsy, obstetric manipulative procedures e.g. external version, invasive interventions, cordocentesis, blunt abdominal trauma or foetal therapeutic intervention.
- Postpartum prophylaxis - Delivery of a Rh(D) positive (D, Dweak, D Partial) baby An Rh(D) incompatible pregnancy is assumed if the foetus/baby is either Rh(D)

positive or Rh(D) unknown or if the father is either Rh(D) positive or Rh(D) unknown.

- RhD Negative adults, children and adolescents after transfusion of RhD positive blood or blood products containing red blood cells. This will require Consultant Haematologist oversight.

For guidance on the indications for of Anti-D immunoglobulin to prevent sensitization to the D antigen during pregnancy or at delivery for the prevention of Haemolytic Disease of the Foetus and Newbornlease refer to;
CLN-OGCP-248 WAC Group Clinical Practice Guidelines for the Use of Anti D Immunoglobin for the prevention of RHD Haemolytic Disease of the Newborn National Guideline
CLN-OGCP-305 WAC Guideline for screening of cffDNA and the administration of targeted Anti-D (I g) Prophylaxis in the antenatal period.
For administration of Anti D Immunoglobulin please refer to HV/CP/017 Guidelines for Anti-D Immunoglobulin administration; the document is located on hospital Q-Pulse at CLN-HVIG-044.

3.7.7 Albumin

5% Albumin may be administered in the following conditions:

- Shock associated with significant hypoalbuminaemia
- Plasmapheresis

20% Albumin may be administered in the following conditions:

- Extremely low albumin in critically-ill patients
- Burns
- Paracentesis of ascites in patients with cirrhosis
- Haemodialysis

3.7.8 WILATE®

Wilate® contains factor VIII and von Willebrand factor (vWF). Wilate® is used to treat and prevent bleeding in patients with von Willebrand Disease. Wilate® is also used to treat and prevent bleeding in patients with Haemophilia A. It may be used under the direction of the Consultant Haematologist.

3.7.9 ELOCTA®

Elocta® is an extended half-life recombinant factor VIII. It is indicated for the treatment and prophylaxis of bleeding in patients with haemophilia A (congenital factor VIII deficiency). Elocta® can be used for all age groups. It may be used under the direction of the Consultant Haematologist.

3.7.10 COAGADEX

Coagadex contains human coagulation factor X and is indicated for the treatment of Factor X deficiency. It may be used under the direction of the Consultant Haematologist.

3.7.11 HEPATECT

Hepatect CP contains the active ingredient human hepatitis B immunoglobulin, which can protect you from hepatitis B. Hepatect CP is used to give immediate and long-term immunity (protection) to:

- prevent hepatitis B infection in patients who have not been vaccinated or fully vaccinated against hepatitis B and who are at risk of infection with hepatitis B.
- prevent infection of a transplanted liver in patients who test positive for hepatitis B.
- newborn babies whose mothers are infected with the hepatitis B virus.
- protect patients for whom hepatitis B vaccination has not provided adequate protection.

3.7.12 VARITECT

Varitect CP is used for prophylaxis of varicella infection after exposure for;

- Children with negative history of varicella who are receiving immunosuppressive, cytostatic or radiotherapy or suffer from hereditary immunodeficiencies.
- Immunocompromised adults who, after careful evaluation are believed susceptible and have had significant exposure.
- Newborns of mothers who develop chicken pox within 5 days before and 2 days after delivery.
- Premature infants whose mothers have negative histories of varicella, as long as they require hospital care.
- Premature infants of less than 28 weeks of gestation or with a birth weight of 1000 g or less, regardless of maternal varicella history.

3.7.13 INDICATIONS FOR IRRADIATED BLOOD PRODUCTS

Guidelines on the use of irradiated blood components (2010) British Committee for Standards in Haematology Blood Transfusion Task Force

- Intrauterine and neonatal exchange transfusions
- Donations from first, or second degree, relatives

- Human Leucocyte antigen (HLA) selected components
- Granulocyte components
- All known or suspected severe T-cell immunodeficiency syndromes
- **Hodgkins Lymphoma at any stage of the disease and for life**

- Allogeneic haemopoietic stem cell transplant recipients
- Haemopoietic stem cell donors before/during harvest
- Aplastic anaemia treated with ATG*
- Patients treated with purine analogue*(fludarabine) and anti-CD52 therapy

**There is a life-long requirement for irradiated products after treatment with ATG and Purine analogues.*

Newer immunosuppressive drugs and biological agents are under review (seek haematology advice)

3.7.14 INDICATIONS FOR CMV NEGATIVE BLOOD PRODUCTS

(National Transfusion Advisory Group NTAG; Guidelines for use of CMV antibody screened negative (CMV negative) cellular blood components (red cells, platelets and granulocytes) in the Irish healthcare setting

- Intrauterine transfusion and neonates up to 28 days post expected delivery date
- Elective transfusions during pregnancy (not delivery)
- Haemopoietic stem cell transplant recipients, please contact the laboratory

Contact the Consultant Haematologist for recommendations in specific clinical cases.

3.8 MANAGEMENT OF ACUTE MASSIVE HAEMORRHAGE

Acute Massive Haemorrhage (Life Threatening Bleed) as defined by the National Blood User Group 2002:

An on-going transfusion requirement, in an adult, of more than 150mls per minute *or*

Massive Obstetric Haemorrhage of >1500mls *or*

Replacement of more than 50% of blood volume in 3 hours or less (blood volume is 60ml-80ml/kg in pregnant females) *or*

Replacement of one blood volume, or transfusion of 10 units or more of red cells in a 24 hour period *or*

Haemodynamic instability: estimated blood loss enough to compromise the haemodynamic status of the patient

For the management of acute massive haemorrhage, refer to the following two documents on the MUH Q-Pulse document system:-
Policy for the Management of Acute Massive Haemorrhage in MUH and its attached appendix, Massive Transfusion Protocol Flowchart "Code Red", CLN-HVIG-045. Refer to the Guideline for the Management of Acute Major Haemorrhage in Mayo University Hospital – Major Transfusion Protocol "Code Red" available on hospital Q-Pulse at CLN-HVIG-045.

3.8.1 Contact Key Personnel

'Code Red' is the alert used in MUH to advise the Blood Transfusion Laboratory of an Acute Massive Haemorrhage. The calling of a 'Code red' alert indicates to the Blood Transfusion Laboratory the urgency of the situation and results in a specific set of protocols being instigated within the laboratory to manage the situation.

The Doctor/Nurse are to request Switch Board (Dial 9) to activate the "Code Red" alert **and to then contact the Blood Bank Ext. 2545/ 2546 or out of hours to contact Scientist On-Call Bleep 362**, with details of patient identity and approximate blood requirements.

A Code Red emergency should be declared if:

- Active haemorrhage is suspected
- and/or an ongoing transfusion requirement in an adult of more than 150mls per minute
- and/or the systolic BP is < 80mmHg or/and there is a poor response to fluid resuscitation

3.9 MANAGEMENT OF EXCESSIVELY ANTICOAGULATED PATIENTS

Refer to HV/MI/013, Instruction for Warfarin Reversal on hospital Q-Pulse; the document is located on hospital Q-Pulse at CLN-HVIG-044.

The product to be requested from Blood Transfusion Laboratory is Prothrombin Complex (Octaplex®).
Note: The use of Frozen Plasma (i.e. Octaplas®) is NOT indicated for the reversal of the effects of Warfarin.

4 HISTOPATHOLOGY DEPARTMENT

4.1 PROFILE

The aim of the Department is to provide a high quality diagnostic service to meet National and EU objectives of reducing the incidence of cancer through early detection and appropriate service delivery, and also to provide a high-quality non-cancer related diagnostic service.

Histopathology provides a diagnostic and consultative service to clinicians and indirectly to their patients. The Department receives, processes and reports on tissue specimens that result from Medical, Surgical, Obstetrics and Gynaecology and General Practice investigations The service works closely with clinical, radiological and screening services to provide best practice patient care for diagnosis of disease and patient management.

The Department provides Routine Histopathology, Cytology (Non-Gynae) and Immunohistochemistry services.

This service is provided by Consultant Histopathologists, Medical Scientists, Laboratory Aide and Clerical personnel.

The department aims to provide a comprehensive, effective and high-quality service and to support the ongoing education and training of Medical and Scientific staff. The Department is recognised by the Academy of Medical Laboratory Science for the training of Medical Scientists.

4.1.1 Key Personnel

Name	Position	Contact No	E-mail address
Dr Fadel Bennani	Consultant Histopathologist	2569/ bleep 360	Fadel.Bennani@hse.ie
Dr Tamas Nemeth	Consultant Histopathologist	2568	Tamas.Nemeth@hse.ie
Paul Glacken	Senior Medical Scientist	2567	Paul.Glacken@hse.ie

4.2 URGENT REQUESTS AND CRITICAL ALERT REPORTING

THE REQUEST FOR URGENT ANALYSIS MUST BE USED APPROPRIATELY. ABUSE OF THE URGENT REQUEST FACILITY WILL HAVE AN ADVERSE EFFECT ON THE TURNAROUND TIMES OF GENUINE URGENT REQUESTS.

For urgent requests indicate that the examination of the specimen is urgent by handwriting "urgent" on the Histopathology request form. Alternatively, contact the laboratory on ext.2564 to indicate the priority of the sample has changed to urgent. Ensure a contact number /bleep is on the Histopathology request form for verbal communication of the Consultant Histopathologist report.

Such samples will receive priority reporting by the Consultant Histopathologist.

Unexpected results are communicated to the requesting Consultant by the Consultant Histopathologist.

For external users, please provide a contact number for phoning urgent results.

4.3 ROUTINE HISTOPATHOLOGICAL EXAMINATION

4.3.1 Specimens

Specimens should be submitted intact and should not be dissected in the theatre as this may prevent proper gross examination in the laboratory and may interfere with the selection of appropriate tissue sections for microscopy.

All specimens must be in the laboratory by 4.00pm to facilitate optimal fixation and standardisation of results.

4.3.2 Containers

Specimen containers and buffered formalin for use in the theatres, wards and out-patient clinics for biopsies and larger tissue specimens are available from the Histopathology Laboratory ext. 2564.

Ensure that the container selected is large enough to allow the specimen to be immersed in at least twice its own volume of buffered formalin.

4.3.3 Labelling

The container and the lid (size permitting) must be clearly labelled with the patient's Patient Identification number, full name, date of birth, and specimen type and anatomical site. The request form must also be clearly labelled with the required information (refer to section 1.8 and 1.9 for sample and form labelling requirements).

The specimen type and anatomical site are particularly important in Histopathology where specimens may be multipart or left or right etc.

Failure to submit essential information will result in the delay of specimen processing pending amendment to form or specimen. This may cause unnecessary delays in issuing reports.

Failure to amend specimen/form issues in a timely manner will automatically generate a form (Extended Specimen Delay HP/LF/002) to the requesting consultant detailing the reason for the delay and all communications with relevant medical staff.

4.3.4 Frozen Section

This service is no longer available in Mayo University Hospital.

4.3.5 Fresh Lymph Nodes query Lymphoma

Please notify the Histopathology Department (ext. 2564) at least 24 hours in advance. Place the biopsy in a fully labelled, suitable sized container without any fixative and deliver to the laboratory immediately, with completed request form and include contact details.

4.3.6 Immunofluorescence on Skin Biopsies

Please notify the Histopathology Department (ext. 2564) at least 24 hours in advance. Place the biopsy in a fully labelled suitable sized container in saline and deliver to the laboratory immediately, with completed request form. Include contact details.

Sample must be received in the laboratory by12.00 midday to ensure transport to the referral laboratory and timely processing of the tissue.

4.3.7 Renal Biopsies for Immunofluorescence and Electron microscopy

Please notify the Histopathology Department (ext. 2564) at least 24 hours in advance. Place the biopsy in normal saline to maintain hydration and deliver to the laboratory immediately, with completed request form. Include contact details.
Sample must be received in the laboratory by12.00 midday to ensure transport to the referral laboratory and timely processing of the tissue.

4.3.8 Muscle Biopsies

Please notify the Histopathology Department (ext. 2564) at least 24 hours in advance. Please insert a stitch to indicate the long axis. Place the biopsy in a fully labelled, suitable sized container without any fixative and deliver to the laboratory immediately, with completed request form.

4.3.9 POC (Products of Conception) Material

Miscarriage is defined as a death prior to 24th week of pregnancy and with a birth weight of less than 500grams.
Products of Conception (POC) include placental tissue and blood clot. This does **not** equate to foetal parts identified.
Stillbirth is a baby weighing 500grams or more or having a gestational age of 24 weeks or more, who shows no sign of life at birth.
Neonatal death is a death that occurs within a month of birth.

Stillbirths and neonatal deaths are sent directly to the Mortuary. Product of conception (POC) material is sent to the Histopathology Laboratory.

The Consultant Histopathologist examines the specimen and if foetal parts are identified they are sent to the mortuary for optional home burial with the accompanying completed burial request form.

If no foetal parts are identified and the patient requests the material, the patient must apply to the General Manager to remove surgical material from the hospital. The hospital does not bury POC material where no foetal parts have been identified.

4.4 ROUTINE CYTOLOGY (NON-GYNAE) EXAMINATION

Specimens: A list of fluids for cytology examination is contained in the test directory.

Containers: 30mls containers containing 15 mls of Shandon Cytospin Collection Fluid (green fixative fluid) are available from the Histopathology Laboratory ext 2564.
The container (not the lid) must be clearly labelled with the patient's full name, Patient Identification number, date of birth, and specimen type and anatomical site. This is particularly important in Cytology where specimens may be left or right e.g. RUL, LUL etc.

All specimens must be received with an accompanying legible request form containing required information.

Failure to submit essential information will result in the delayed processing the specimen and will cause unnecessary delays in issuing reports.

Failure to amend specimen/form issues within two days will automatically generate a form (Extended Specimen Delay HP/LF/002) to the consultant detailing the reason for the delay and all communications with relevant medical staff.

4.4.1 Joint Fluid for Uric Acid Analysis

Place the fluid in a fully labelled suitable sized clean dry container **without** any fixative and deliver to the laboratory immediately with completed request form.

4.5 STORAGE OF SPECIMENS

Specimens are stored in the laboratory for a minimum of 4 weeks post authorisation. If a clinician requires further testing of the specimens, they must contact the reporting Consultant Pathologists and discuss the request.

After the storage period, specimens are disposed of according to HSE procedure for the disposal of clinical waste.

4.6 AUTOPSY

The Autopsy Service involves the examination of the body after death primarily to establish the cause of death. It may be used in rare cases to examine the extent of disease, disease progression or the response to treatment.
All bodies of persons dying in Mayo University Hospital are initially transferred to the mortuary with a fully completed Notification of Death Form to facilitate decisions on whether a post-mortem is required.
Funeral arrangements cannot be finalised and bodies cannot be released from the mortuary until the mortuary staff are sure that an autopsy will or will not be required.
Therefore, please contact the mortuary as soon as possible after all deaths to clarify whether or not an autopsy will be requested.

4.6.1 Coroner's Autopsies

The Coroner is an independent office holder with responsibility under the law for the medico-legal investigation of certain deaths. A Coroner must inquire into the circumstances of sudden, unexplained, violent and unnatural deaths. This may require a post mortem examination, sometimes followed by an inquest. The Coroners inquiry will establish whether death was due to natural of unnatural causes. If a death is due to unnatural causes then an inquest must be held by law.
However, where a death occurs suddenly, unexpectedly or from a cause which is unknown, unclear or unnatural, the Coroner must be informed.

In a case of sudden, unnatural or violent death, there is a legal responsibility on the Doctor, Register of Deaths Funeral Director, householder and every person in charge of any institution of premises in which the deceased person was residing at the time of death to inform the Coroner.

The death may be reported to a Sergeant of the Garda Siochana who will notify the Coroner. However, any person may notify the Coroner of the circumstances of a particular death.

Coroner's Autopsies Include:
When a patient dies or is brought in dead, the Coroner must be contacted if:

- Death occurred suddenly or unexpectedly
- Death occurred from an unnatural cause (e.g. accident, burns, drug overdose), - irrespective of the duration between injury and death
- Death occurred from an unknown or uncertain cause
- Death occurred during or soon after a procedure or operation
- Death occurred within 24 hours of admission
- The body will be removed from the State
- There is any question of negligence
- The patient dies during transfer from one institution to another.
- A doctor has not seen the deceased during his last illness or for one month prior to death.
- Infectious diseases notifiable to the Coroner include: MRSA and Clostridium difficile related deaths.

IF IN DOUBT CONTACT THE CORONER

If a coroner's case is suspected, do not ask the next of kin for consent for an autopsy until after you have clarified the situation with the Coroner.
If the coroner takes jurisdiction of the case, consent is not required from the next of kin. In addition to contacting the Coroner, the Consultant Histopathologist must be notified and provided with any available details on the case.
The body must be officially identified with a member of the Garda and next of kin/doctor who knew the deceased.
For further information see booklet (The Role of the Coroner in Death Investigation)

CORONERS SERVING COUNTY MAYO:

Dr. Eleanor Fitzgerald	Mr. Pat O'Connor
Main St.	'The Old House',
Crossmolina	Market Street
Co. Mayo	Swinford
	Co. Mayo
Ph: 096-31313	Ph: 094-9251107
Fax: 096-31309	Fax: 094-9251833

CORONER INPATIENT POST MORTEM CHECKLIST

- The Consultant or Registrar speaks to the relatives of the deceased and informs them about the necessity for a post-mortem examination and why the Coroner needs to be involved.
- The Consultant or Registrar discusses the autopsy with the Next of Kin, explaining in detail what the examination entails.
- A copy of the information leaflet re: post mortem examination and the hospital bereavement booklet are given to the family.
- The Coroner is then contacted by the Consultant or Registrar giving him/her details about the death.

- A fax of the Coroners Notification Form (available on every ward) is sent to the relevant Coroner's office and to the Mortuary Department (094-9022383)
- The Consultant Histopathologist is contacted and given details of the death and to perform the post-mortem with the consent of the Coroner.
- The case notes together with a clinical summary of the case are sent to the Pathologist prior to the post-mortem examination.
- The Garda are contacted and asked to come to the Ward/Department to facilitate with the formal identification with the next of kin.
- The General Practitioner, Public Health Liaison Nurse, Nursing Administration, Switchboard and are notified of the death.
- The Pastoral Care Team is informed.
- The deceased is prepared in accordance with the hospital policy for transfer to the mortuary.
- The family/next of kin can contact the mortuary dept. directly at 094 9042660 to find out the expected time of release of the body so that they can make the necessary funeral arrangements.

CORONER'S POST-MORTEMS BROUGHT IN FROM THE COMMUNITY

- The Garda is to inform the Mortuary Dept. prior to bringing in bodies for a Coroner's post-mortem.
- The Garda to accompany the body to the mortuary for identification purposes.
- Details to be filled into the mortuary register, post-mortem register and organ retention register.
- The Garda faxes details of the death to the relevant coroner.
- The post mortem protocol to be filled out.
- I.D. bands to be put on to deceased wrist and leg.
- The weight and height are recorded.
- The deceased clothing, jewellery or valuables are recorded in the patient's property book in the presence of the Garda.
- The Pathologist or pathology technician is contacted for formal identification with the Garda (if late at night the Garda is requested to attend the mortuary the following morning at 9.30 am for the identification.
- The deceased is prepared in accordance with hospital policy for the post-mortem examination.
- If organs need to be retained for further examination the Coroner is informed as to inform the next of kin.

4.6.2 Cremation

If the family wishes to have the body cremated, arrangements must be made by them through the Funeral Director. The Funeral Director will meet the consultant team to complete the cremation form and to ensure no autopsy is required. The doctor completing the form must be registered for at least 3 years and must have seen the body before and after death. When completed, the form should be given to the Funeral Director. Cardiac pacemakers or any radioactive implant must be removed prior to cremation, and this action notified to the Coroner.

4.6.3 House (Non-Coroner) Autopsies

The autopsy is requested by the clinician for academic reasons. A consent form is required for the next of kin. A brief clinical history with a clinical diagnosis and a list of questions to be answered should be included. These deaths should always be discussed with a Consultant Histopathologist ahead of time.

The patient's chart must accompany the body to the Mortuary.

4.6.4 Foetus

The protocol is as for a mature baby i.e. fully informed written consent of the parent for post-mortem examination and signed burial consent form is required.

5 MICROBIOLOGY DEPARTMENT

5.1 DEPARTMENT PROFILE

The Microbiology Department provides services to Mayo University Hospital, General Practitioners and Nursing Homes in the community and is committed to the delivery of an equitable and responsive service within the limits of the resources available.

5.1.1 Key Personnel

Name	Position	Contact No	E-mail address
Mr Conor Burke	Chief Medical Scientist	2554	Conor.Burke@hse.ie
Ms Grainne Cashin	Senior Medical Scientist	2556	Grainne.Cashin@hse.ie
Ms Niamh Kilroy	Senior Medical Scientist	2556	Niamh.Kilroy@hse.ie
Ms Eileen Dever	Senior Medical Scientist	2556	Eileen.Dever@hse.ie
Ms Deborah Carey	Senior Medical Scientist	2556	Deborah.Carey@hse.ie
	Surveillance Scientist		
Dr. Shomik Sibartie	Consultant Microbiologist	1335 Bleep 366	Shomik.Sibartie@hse.ie

5.2 ACCESS TO SERVICE

Requesting of appropriate tests and subsequent application of the test results and interpretive guidance from the Department of Microbiology must be applied to patient care by a clinician in the overall clinical context of the patient concerned.
For this reason, services are in general accessible only by medical practitioners or other health care professionals acting on the recommendation of a medical practitioner. Written reports are issued to medical practitioners. Verbal reports are provided to medical practitioners or in certain circumstances to other health care professionals.

It is not appropriate to instruct patients or their relatives / friends to telephone the department of Microbiology for results. The Department cannot verify the identity of the caller and does not have a relationship with the patient to ensure that the result is properly understood and acted on.

The name and contact details of the medical practitioner requesting a test must be clearly legible on the request form. The request form should have a legible signature.
The medical practitioner signing the request form is responsible for ensuring that the test request is appropriate and that issues of consent to testing and privacy have been dealt with appropriately.

5.3 OUT OF HOURS SERVICE

There is a Medical Scientist on duty to provide an out-of-hours service as follows:

- Each weekday evening from 20.00 until 08.00h (Monday – Friday)
- Saturdays, Sundays and Bank Holidays from 09:00am until 09:00 h (24 hours).

During this period the following service is available:

- CSF's
- Urines
- Blood cultures; samples can be transported to the Microbiology laboratory via APT Chute system [2556] or can also be hand delivered to the lab immediately after collection. Between 8pm and 8am the medical scientist on call must be contacted when the sample is in transit to the laboratory to ensure loaded within the required 4 hours as per Irish Guidelines
- Viral Respiratory Molecular Investigation (Sars-CoV-2 and other respiratory viruses), as per current arrangements with the Consultant Microbiologist.

Samples other than those stated, if DIRECTLY requested by the Team Consultant, can be facilitated.

All specimens requiring urgent work must be sent with an Emergency Request form outside of normal working hours. Specimens are processed in order of priority with CSF normally being given priority.

To contact the Medical Scientist on-call via the hospital switchboard, Dial '9'.

Results of Microscopy, Blood Culture updates are available as soon as the Medical Scientist has performed and authorised them on the LIS.

5.4 URGENT SPECIMENS

THE REQUEST FOR URGENT ANALYSIS MUST BE USED APPROPRIATELY. ABUSE OF THE URGENT REQUEST FACILITY WILL HAVE AN ADVERSE EFFECT ON THE TURNAROUND TIMES OF GENUINE URGENT REQUESTS.

For urgent requests during routine hours, tick the urgent box on the Departmental Request Form and contact the Microbiology Laboratory directly on extension 2556 or 094-9042556.

For urgent requests out of routine hours, submit the Emergency Request Form indicating the urgency and contact the Medical Scientist on-call directly via the switchboard.

For external users, please provide a contact number for phoning urgent results, especially if required after normal surgery hours.

In all cases where a test result is considered urgent the medical practitioner making the request or other responsible medical practitioner should contact the laboratory in advance of specimen submission if possible or after a reasonable interval to ensure that the specimen has been received and that he/she receives the result.

5.5 RANGE OF TESTS

The following is a list of tests that are performed routinely within the laboratory:

- CSF Examination
- Urines
- Blood Cultures
- Sputum
- Swabs
- Tissues
- Fluids
- Samples for molecular investigations including respiratory testing.
- Faecal sample for FOB testing only

Tests	Sample type	Volume requested
Microscopy and culture of urine samples	Urine in universal container (with or without Boric acid preservative	Minimum of 20mls in boric acid container. Minimum of 2 mls in plain sterile universal
All swab types for culture and investigation	Swab in transport medium or charcoal	N/A
Microscopy, culture and sensitivity on Cerebrospinal fluid	Minimum of 3 samples	If possible 1 ml in each container, more volume required if extra tests requested Minimum of 1ml is required for Xanthochromia testing
Blood Culture Microscopy and sensitivity	Blood	Paediatrics: Up to 4mls Adults: 10mls
Urines for Legionella and Pneumococcal antigen testing.	Urine	Minimum 5 mls in either plain universal or with boric acid preservative
Respiratory samples for culture and investigation	Expectorated/suctioned Sputum, Brochoaveolar lavage	Minimum 5 mls- The more sample received the more accurate the results
Culture and sensitivity investigations	Intravascular tips	Tip should be cut to 4cm and placed in sterile universal container
Microscopy, culture and sensitivity investigation	Fluids including but not limited to; Ascites, Pleural, Synovial (joint), Pericardia, Amniotic, hydrocele, Drain fluids e.g. pigtail fluids etc	Minimum volume of 5mls.
Culture and sensitivity investigation	Tissues, Bones, Biopsies	Send small quantities of these sample types. This allows for easier processing and more accurate results. If sample is very small place in sterile gauze

Tests	Sample type	Volume requested
		moistened with sterile water to prevent desiccation.
Samples for molecular investigations	Nasopharyngeal swab, BAL or Sputum for certain assays	NPSW send in UTM [3ml] available from Microbiology Department Expectorated/suctioned Sputum, Brochoaveolar lavage
Samples for Faecal Occult Blood testing	Faeces sample collected into **NADAL VON MINDEN** test cassettes	Collected as per instructions with pack

5.5.1 Sample Receipt Deadlines

The cut-off receipt time for all routine samples from external locations is 16:30. Routine samples received after this time will be analysed the following day, if suitable.

5.6 General Collection

Where possible, collect specimen prior to the administration of antimicrobial therapy. Collect specimen with as little contamination from indigenous microbial flora as possible to ensure that the specimen will be representative of the infective site. Collect specimen using sterile equipment and aseptic technique to prevent introduction of foreign microorganisms. Collect an adequate amount of specimen. Inadequate amounts may yield false-negative results.

Identify the specimen source and / or specific site correctly so that proper culture media will be selected during processing in the laboratory. Special requests such as Diphtheria, actinomyces, nocardia etc., should be noted on the request form.

5.6.1 CSF Collection

Collect the CSF into three 25ml sterile universal containers labelled 1, 2 and 3. A 4th separate sample in a darkened sterile container i.e. covered with tin foil (minimum volume of 1ml) is required for xanthochromia testing. Notify the Microbiology Department that a CSF is on the way. **Important: If xanthochromia test** requested then **1ML** of sample needs to be with Medical Scientist within 1 hour of collection.
PCR for bacterial and viral investigations can be performed on CSF samples in house but if PCR for meningococcal investigation is required on a **blood sample** then this requires an EDTA sample, which can be sent to Microbiology laboratory for referral to the Meningococcal Reference Laboratory [IMSRL].

5.6.1.1 Expected CSF Results with meningitis:

Lab. Test	Normal CSF	Bacterial meningitis	Tubercular or Mycotic Meningitis	Viral Meningitis
Leucocytes	**Neonates <28 days old** 0-30/cmm **Infants1-12 months** 0-15cmm **Children/Adults 1yr+** 0-5 /cmm	300 – 50,000 /cmm	30 – 600 /cmm	10 – 1000 /cmm
Leucocyte to Erythrocyte Ratio	1:500 to 1:1000**	N/A	N/A	N/A
Differential WBC	N/A	Mainly polymorphonuclear cells. During the first hours, mononuclear cells may predominate or there may be a mixture.	Mainly Mononuclear cells. At the beginning mainly polymorphonuclear cells.	Mainly Mononuclear cells.

**A WBC: RBC ratio of 1:500 to 1:1000 is generally regarded as not indicative of infection. CSF obtained more than 12 hours post intra-cranial haemorrhage may show raised WBC counts of up to 500 x 106/L as a result of an inflammatory response.

5.6.1.2 Molecular testing CSF:

The BioFire FilmArray Meningitis/Encephalitis (ME) Panel is a qualitative multiplexed nucleic acid-based *in vitro* diagnostic test intended for use with BioFire FilmArray Systems. The BioFire ME Panel is capable of simultaneous detection and identification of multiple bacterial, viral, and yeast nucleic acids directly from cerebrospinal fluid (CSF) specimens obtained via lumbar puncture from individuals with signs and/or symptoms of meningitis and/or encephalitis.

The following targets are included in the Meningitis Encephalitis Biofire Assay:

Bacteria:

•Escherichia coli K1
• Haemophilus influenzae
• Listeria monocytogenes
• Neisseria meningitidis (encapsulated)
• Streptococcus agalactiae
• Streptococcus pneumoniae

Viruses:

• Cytomegalovirus
• Enterovirus
• Herpes simplex virus 1
• Herpes simplex virus 2
• Human herpesvirus 6
• Human parechovirus
• Varicella zoster virus

Yeast:
• Cryptococcus neoformans/gattii
Results are reported as DETECTED or NOT DETECTED but users must be aware that a result of not detected does not exclude infection and clinical correlation advised.

5.6.2 Blood Culture Collection

Blood Culture Bottles are available from Microbiology
Adults: 2 bottles (aerobic and anaerobic). Sample volume 3 – 10ml (8-10ml optimal)
Paediatrics: 1 Paed Bottle. Sample volume 1- 3ml
Please do not remove the small barcode label from the blood culture bottles
Please do not cover the barcode label with the addressograph label.
Please do not cover any portion of the base of the bottle with the addressograph Label.

Samples can be transported to the Microbiology laboratory via APT Chute system [2556] or can also be hand delivered to the Microbiology laboratory immediately after collection.

Please state on the request form the blood culture site, antibiotic therapy and clinical details as certain conditions such as Endocarditis require prolonged incubation periods. Blood Cultures are incubated for 5 days; the current status of the blood culture can be viewed at any time on the Laboratory Information System (LIS IT system) via iLab Web Browser for Ward Enquiry. The clinical areas are notified by phone of any positive blood cultures.

PROCEDURE FOR OBTAINING BLOOD CULTURES

1. Wash hands with soap and water. Dry.
2. Clean visible soiled skin at site of venepuncture with soap and water. Dry.
3. Remove dust covers from both bottles.
4. Clean top of each bottle with one sanicloth. **Allow to dry**.
5. Apply disposable tourniquet and palpate vein.
6. Clean skin with ChloraPrep Frepp with an up/down, over /back motion for 20 secs. Allow to dry**.**
7. Decontaminate hands with antiseptic solution. Dry. Apply sterile gloves.
8. Perform venepuncture. Select **aerobic bottle first**. Push vial holder over top of vial to puncture septum.
9. Repeat with anaerobic (purple) bottle. Discard used vacutainer and collection set into sharps bin.

Remove gloves and decontaminate hands with antiseptic solution

5.6.3 Urine for Culture & Sensitivity

Fill a Boric Acid (Red Cap) Universal Container. If only small sample volumes are available (e.g. paediatric samples) use white cap universal containers. It is recommended that all external users use boric acid containers for urine sample collection.

5.6.4 Sputum Collection for Culture and Sensitivity

Collect purulent or mucopurulent sample into a plain (white cap) universal container
Salivary or mucosalivary samples are not a reliable guide to therapy of lower respiratory tract infections.

Sputa specimens that are older than 48 hours old on receipt in laboratory are unsuitable for routine culture and may be rejected.
Please send separate samples and request forms for TB and cytology

5.6.5 Sputum Collection for AFB

Collect 3 consecutive purulent samples into plain universal containers and send to MUH lab for referral to UCH Galway. Please refer to UCHG Pathology user manual or Phone UCHG 091 544570 for any additional information required

5.6.6 Pleural Fluids for Culture and Sensitivity

Please state sample type on request form
Collect fluid into plain (white cap) universal
Send separate samples and request forms for C&S, TB and Cytology

5.6.7 Swabs for Culture and Sensitivity

Use a transport swab containing suitable transport media for the investigation requested. Dry swabs are unsuitable.

5.6.8 Swabs for Viral Culture

Use specific viral transport swab and 3ml Copan UTM and send to laboratory for referral to National Virus Reference Laboratory

5.6.9 Nasopharyngeal Swab Collection Procedure

For Viral Respiratory Molecular Investigation (Sars-CoV-2 and other respiratory viruses)
Using Collection kit [swab and 3ml Copan UTM];
Insert the swab into either nostril, passing it into the posterior nasopharynx. Rotate swab by firmly brushing against the nasopharynx several times. Remove and place the swab into the tube containing 3 ml of viral transport medium. Break swab at the indicated break line and cap the specimen collection tube tightly.

5.6.9.1 Molecular Testing on Biofire Platform:

When samples are tested on Biofire Platform [this is indicated on report] the following targets are included in the assay:

Viruses:

Adenovirus
Coronavirus 229E
Coronavirus HKU1
Coronavirus NL63
Coronavirus OC43
Middle East respiratory syndrome coronavirus (MERS-CoV)
Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)
Human metapneumovirus
Human rhinovirus/enterovirus
Influenza A virus
Influenza A virus A/H1
Influenza A virus A/H3
Influenza A virus A/H1-2009
Influenza B virus

Parainfluenza virus 1
Parainfluenza virus 2
Parainfluenza virus 3
Parainfluenza virus 4
Respiratory syncytial virus
Bacteria:
Bordetella parapertussis
Bordetella pertussis
Chlamydia pneumoniae
Mycoplasma pneumonia

Results are reported as DETECTED or NOT DETECTED but users must be aware that a result of not detected does not exclude infection and clinical correlation advised.

5.6.10 Faecal Occult Blood [FOB] Collection: General Information

FOB service is available in Microbiology department Mayo University Hospital; the faecal sample must be collected using a ***NADAL FOB Patient Faecal sample collection Set.*** These NADAL FOB Patient Faecal sample collection sets are available from Microbiology department **on request only**.

Included within the NADAL FOB Patient Faecal sample collection set is:

- Sample collection card with instructions for stool sample collection and transport
- Stool collection paper
- Stool collection / transport tube which contains preservative buffer

PLEASE NOTE THE FOLLOWING:

- Do not empty the buffer liquid out of the Stool collection / transport tube. The buffer liquid is a preservative. If there is no buffer present when the sample arrives into the Microbiology, then the sample will not be processed.
- Place addressograph label with patient demographics on both stool collection / transport tube and sample collection bag.
- Once sample is collected in stool collection/transport tube, delivery to Microbiology ASAP from time of collection.
- Completed Microbiology request form must also be included.

To order NADAL FOB Patient Faecal sample collection sets please contact the Microbiology department on 094 – 90 42555 or email mgh.labmicro@hse.ie detailing approx. number required. (they are not available from General Hospital Stores).

Only order NADAL FOB Patient Faecal sample collection sets when required. DO NOT ORDER LARGE QUANTITIES AS THEY WILL NOT BE DELIVERED.

5.7 SPECIMEN TRANSPORT GUIDELINES

Specimens should be transported as soon as possible. If processing is delayed, refrigeration is preferable to storage at ambient temperature, with the following exceptions:

- Bloods Cultures – hold at room temperature to await transport to lab. Samples can be transported to the Microbiology laboratory via APT Chute system [2556] or can also be hand delivered to the Microbiology laboratory immediately after collection within an hour of venepuncture. Between the hours of 8pm and 08.00am the medical scientist must be contacted through switch when the sample is in transit to the microbiology laboratory
- CSF- deliver immediately by hand directly to a Medical Scientist in the department.
- Swabs for Viral Respiratory Molecular Investigation (Sars-CoV-2 and other respiratory viruses) must reach the laboratory as soon as possible after collection; if delay of >8hours then refrigerate at 2 to 8ºC until transport can be arranged. All of these samples must be **HAND DELIVERED** directly to the Microbiology Department.

Specimens which are difficult to replace e.g. CSF, should be given directly BY HAND to one of the scientific staff of the Department, to minimise risk of delay or loss. **Do NOT submit CSF specimens to the laboratory via the APT "chute" transport system.**

Specimens submitted in formalin preservative are unsuitable for Culture.

Where there is a suspicion of Brucellosis or other Hazard Group 3 pathogen, it is essential that this be indicated clearly on the request form. A "group 3 biological agent" means one that can cause severe human disease and presents a serious hazard to employees and which may present a risk of spreading to the community, though there is usually effective prophylaxis or treatment available. Examples of group 3 pathogens are Zika virus, Mycobacterium microti, certain viruses and those listed in the current Guidelines to the Safety, Health and Welfare at Work (Biological Agents) Regulations.

5.8 ENTERIC SPECIMENS FOR CULTURE & SENSITIVITY, OVA & PARASITES

Please refer to the Referral Test Directory A-Z for further information relating to the referral laboratory and sample requirements.

5.9 SPECIMEN RETENTION

Additional examinations may be requested during specimen storage time by telephoning the Department.

Specimen	Retention Time
Swabs	1 week @ 2 – 8°C
Fluids	
Tissues	4 weeks @ 2 – 8°C
CSF	3 months @ 2 – 8°C

Specimen	Retention Time
Urines	1 week @ 2 – 8°C
Swabs for PCR	1 week @ 2 – 8°C

5.10 Test Values Currently Phoned to Wards/Clinicians

Please refer to the Mayo University Hospital Pathology Laboratory Saolta website for the current test values which are communicated by the Microbiology Department at the following link: https://saolta.ie/wards/pathology-laboratory-department-0

In addition to the criteria listed above, all requests for telephoned results are responded to as soon as possible. Unsuitable samples, unexpected results or suspicion of sample mislabelling are all brought to the attention of the ward or the clinician/ medical team.

5.11 Turnaround Times

Turnaround time is defined as the time from receipt of specimen in the laboratory until the result is reported either by LIS (Laboratory Information System) or by phone. Turnaround times are quoted in the alphabetical test directory and are intended as a guide which we will endeavour to meet. If further work is required, the turnaround times may be extended by one or more days.
*95% of results should be reported within the time frames given below

Sample and Test Request	Turnaround Time
Urine- Microscopy, **Culture and sensitivity testing**	Urine Microscopy on urgent samples reported within 4 hours. *Culture; 2-3 working days
Urine for urinary antigen testing	24 Hours of receipt in laboratory
Blood Cultures	**New Samples:** Loading onto Instrument, within 4 hours of collection [venepuncture] **Negatives:** Report available on APEX from entry onto instrument. Final negative within 6 days for aerobic, anaerobic and paediatric vials and 14 Days for query endocarditis **Positive results:** Gram stain result reported to clinician/relevant staff member within 2 hours of flagging positive. Identification and provisional direct sensitivity result within 24 hours. Final identification and susceptibility result within 48 hours.
General Swabs – Culture and Sensitivity	*3 working days
Fluids Culture and Sensitivity	*3 Working days

Sample and Test Request	Turnaround Time
Sputum samples – Culture and Sensitivity	*3 Working days
Tissue/Biopsy for Culture and Sensitivity	*Provisional result available after 3 working days
CSF- Microscopy, culture and sensitivity	Microscopy within 1 hr *Culture 3 days
Fluids- Microscopy, culture and sensitivity	*Culture 3 Working days
Molecular Inhouse Testing Assays on rapid platform –GeneXpert,Biofire	1 day
Molecular In House Testing: Assays on Batch platform – Seegene	36 hours
Faecal Occult Blood	24 hours of receipt in laboratory

- Test Requests from External locations are processed as soon as practicable and generally within 24 hours of receipt during Routine Hours
- Urgent requests must be notified directly to the laboratory by phone if required to be processed as a priority.
- Urgent gram stains (from STI Clinic, theatre etc) will be viewed as soon as possible once received and processed in the Microbiology laboratory.
- These turnaround times are a guideline only. If further workup is required on any isolate from a sample, this may result in the TAT being exceeded.

5.11.1 Blood Cultures

New Samples: Loading onto Instrument, within 4 hours of collection [venepuncture]

Negatives: Report available on APEX from entry onto instrument, displayed as 'No Growth To Date' at ward enquiry on LIS. Final negative within 6 days for aerobic, anaerobic and paediatric vials and 14 Days for query endocarditis

Positive results: Gram stain result reported to clinician/relevant staff member within 2 hours of flagging positive. Identification and provisional direct sensitivity result within 24 hours. Final identification and susceptibility result within 48 hours.

6 BIOCHEMISTRY

6.1 KEY PERSONNEL

Name	Position	Contact Extension	E-mail address
Dr Michael Louw	Chemical Pathologist	2560	Contact Biochemistry department for information
Ray Divilley	Chief Medical Scientist	2574	ray.Divilley@hse.ie
Mary Murphy	Senior Medical Scientist	2559 2560	marybrid.murphy@hse.ie
Cathy Gruddy	Senior Medical Scientist	2559 2560	cathy.gruddy@hse.ie
Sarah Ní Shúilleabháin	Senior Medical Scientist	2559 2560	sarah.nishuilleabhain@hse.ie
Mary Lavin	Senior Medical Scientist	2559 2560	mary.lavin8@hse.ie

6.2 RANGE OF TESTS

The following is a list of test profiles with associated specimen requirements that are performed routinely within the laboratory.

Test	Adult Sample Type and Volume			Paediatric Sample Type and Volume			Special Precautions
	Preferred Choice	Maybe used*	Vol. Mls **	Preferred Choice	Reserve sample	Vol. mls. **	
Albumin			5			1.3	
Alcohol			5				Serum/ Plasma samples should be sent to lab promptly, If receipt is delayed >12 hrs, Grey top Fluoride oxalate should be used.
ALP			5			1.3	
ALT			5			1.3	
Ammonia			5			1.3	Must be received in Lab < 15 mins

Test	Adult Sample Type and Volume			Paediatric Sample Type and Volume			Special Precautions
	Preferred Choice	Maybe used*	Vol. Mls **	Preferred Choice	Reserve sample	Vol. mls. **	
							post venepuncture. Please inform the lab prior to sending.
Amylase			5			1.3	
AST			5			1.3	Must be received in lab on same day post venepuncture.
Bicarbonate			5			1.3	Please send to Lab promptly. Must be received in lab within 4 hrs post venepuncture. Please fill tube adequately.
Bilirubin Total			5			1.3	Send to lab promptly to avoid light deterioration
Bilirubin Direct			5			1.3	
Calcium			5			1.3	
Chloride			5			1.3	
Cholesterol			5			1.3	Patient should be >12 hr fasting
CK			5			1.3	
Creatinine			5			1.3	Must be received in lab on same day post venepuncture.
CSF Protein & glucose						1.3	Send to Lab immediately. Sterile White

Test	Adult Sample Type and Volume			Paediatric Sample Type and Volume			Special Precautions
	Preferred Choice	Maybe used*	Vol. Mls **	Preferred Choice	Reserve sample	Vol. mls. **	
							Top Universal Container. Preserve glucose if delay in testing
C-Reactive Protein			5			1.3	
Ferritin			5			1.3	
Folate			5			1.3	
Free T4			5			1.3	
Gentamicin			5			1.3	
GGT			5			1.3	
Glucose			2			1.3	>12 hr Fast. Serum must be received in lab within one-hour post venepuncture. Fluoride Oxalate should be used.
HDL -Chol			5			1.3	>12 hr Fast.
			5			1.3	
HCG+β (Beta)			5			1.3	
Iron			5			1.3	
Lactate Dehydrogenase (LDH)			5			1.3	Please send to Lab promptly. Must be received in lab within 4 hrs post venepuncture.

Test	Adult Sample Type and Volume			Paediatric Sample Type and Volume			Special Precautions
	Preferred Choice	Maybe used*	Vol. Mls **	Preferred Choice	Reserve sample	Vol. mls. **	
Lactate						1.3	Please send to Lab promptly. Must be received in lab within 4 hrs post venepuncture.
Lithium			4.5			1.1	Must be received in lab on same day post venepuncture. Do not use lithium Heparin (Green Top)
Magnesium			5			1.3	Please send to Lab promptly. Must be received in lab on same day post venepuncture.
Paracetamol			5			1.3	Must be received in lab on same day post venepuncture.
Phosphate			5			1.3	Must be received in lab within six hours post venepuncture.
Potassium (K)**			5			1.3	Must be received in lab within four hours post venepuncture.
PCT			5			1.3	Please send to Lab promptly.
PSA (Total)			5			1.3	
Salicylate			5			1.3	
Sodium (Na)			5			1.3	
Transferrin			5			1.3	

Test	Adult Sample Type and Volume			Paediatric Sample Type and Volume			Special Precautions
	Preferred Choice	Maybe used*	Vol. Mls **	Preferred Choice	Reserve sample	Vol. mls. **	
Total Protein			5			1.3	
Total Iron Binding Capacity / TIBC			5			1.3	
Troponin I			5			1.3	
Triglyceride			5			1.3	Patient should be >12 hr fasting
TSH			5			1.3	
Urea			5			1.3	
Uric Acid			5			1.3	
Vancomycin			5			1.3	
Vitamin B12			5			1.3	

TubeType (Colour Key)	Additive	Code	Size (ml)
Fluoride Oxalate	BD Vacutainer® Fluoride Tubes **(FX)**	367925	2
Serum Separator Tube	Clot Activator - Silica Particles with Gel **(SST)**	367954	5
1.1mls lithium Heparin	Sarstedt Micro Tube 1.3ml LH	41.1393.005	1.3
1.1mls serum Z-gel	Sarstedt Micro Tube 1.1ml Z Gel	41.1378.005	1.1
1.1ms FX tube	Sarstedt Micro Tube 1.3 ml FH	41.1394.005	1.3
Plasma Separator Tube	Lithium Heparin with Separating Gel **(PST)**	367375	4.5

***Note:** Lithium Heparin may be used for adults instead of serum gold top bottle with the exception of Lithium. Use of plasma samples for blood tests in the dialysis population

eliminates delays in sample processing while waiting for clotting to complete, laboratory technical issues associated with fibrin formation, repeat sample collection, and patient care issues caused by delay of results because of incompletely clotted specimens. Additionally, a larger volume of plasma is produced than serum for the same amount of blood collected, making them the sample of choice for paediatric testing. It is recommended that plasma and serum samples are not interchangeable for Troponin. Lithium heparin samples will be analysed as the primary sample especially from wards such as ICU and RDU where there can be clotting issues with certain patient's serum samples. Results obtained using lithium heparin samples have the same reference ranges as serum samples with some exceptions e.g. potassium reference ranges. Serum (brown capped) can be used for all paediatric sample instead of Lithium heparin and make better 2nd samples in case additional testing is required as they contain gel. Lithium Heparin also reduces haemolysis.

6.3 SAMPLE VOLUME

**It is preferable that blood tubes, especially those containing preservative, are filled to the stated capacity line. This reduces the risk of insufficiency or gel contamination of our instruments. We will always try to maximise the use of any sample, however where a sample is less than half-full please indicate the tests of greater importance.

6.4 BIOCHEMISTRY PROFILES

Profile	Test Included
Oncology Profile-	U/E, LFT, LDH, AST, Calcium, Magnesium
Maternity Profile	U/E, LFT, AST, Uric Acid, LDH & Bicarbonate
ICU Profile	U/E, Total Protein, Albumin, Calcium, Magnesium, Phosphate
Cardiac Enzymes –	AST, CK, Troponin
Bone Profile –	Calcium, Inorganic Phosphorus, ALP , ALB
Haematinics -	Vitamin B12, Folate, Ferritin
Liver Function Tests (LFT)-	Total Protein, Albumin, Total Bilirubin, ALP, GGT, ALT
Lipids -	Cholesterol, Triglyceride, HDL-cholesterol, LDL-cholesterol (calculated)
Urea & Electrolytes (U&E)	Urea, Creatinine, Sodium, Potassium, Glucose
Iron Profile	Iron, Transferrin, TIBC, TSAT %
Thyroid Profile	FT4, TSH
RDU Profile	U/E, LFT, Chloride, Bicarbarbonate, Calcium, Phosphate, Magnesium, Lipid & CRP

Profile	Test Included
GP Profile	**U**/E, LFT, Lipid, Calcium - *Separate Specimen Required for Glucose, Potassium must be received in Biochemistry within 4 hrs post phlebotomy. Note: if sample is badly centrifuged on arrival to Biochemistry then no ISE tests will be done due to gel contamination.*
Toxicology Screen -	Alcohol, Paracetamol, Salicylate
Blood Gas Analysis	PH, PO2,PCO2, Bicarbonate, Base excess, O2 saturation

Albumin Alcohol ALP ALT Amylase AST Bicarbonate Bilirubin Total Bilirubin Direct Calcium Cholesterol Creatinine Total Iron Binding Capacity / TIBC C-Reactive Protein GGT HDL –Cholesterol LDL – Cholesterol (calculated) Lactate Dehydrogenase (LDH) Magnesium Phosphate Total Protein	Triglyceride Urea Uric Acid Iron Transferrin Sodium (Na) Potassium (K)** Chloride (Cl) Lithium Paracetamol Salicylate Alcohol PSA (Total) HCG+β (Beta) Troponin T TSH Free T4 Transferrin Saturation (TSAT) Gentamicin Vancomycin Vitamin B12 Folate Ferritin Procalcitonin (PCT)

Internal Test Repertoire	Specimen Requirements
Glucose, Lactate	Fluoride Oxalate Sample **Adult :** BD Vacutainer ® System SST ™ II tube, Colour Code: Grey **Paediatrics:** Yellow capped 1.1mls tube

Profile	Test Included
Ammonia	**Paediatrics:** Orange capped 1.1mls Lithium Heparin tube **Adult:** Lithium heparin (green bottle) sample **PLEASE NOTE:** Biochemistry department must be contacted prior to sample collection and Send immediately to Biochemistry after taking.
Blood Gases (Arterial & Venous)	Heparinised Syringe Specimen/ heparinised capillary sample. Send immediately to Biochemistry & indicate time specimen drawn clearly on request form. Biochemistry dept must be contacted POC blood gas analysers available in ICU, Emergency department, SCBU and Labour Ward.
Estimated GFR (eGFR) **(Calculation, requires creatinine results)**	BD Vacutainer ® System SST ™ II tube, Colour Code: Gold (must be sufficiently filled)

Internal Miscellaneous Test Repertoire	
Internal Test Repertoire	**Specimen Requirements**
Sweat Test (Chloride)	By appointment only.
Carbon Monoxide	Heparinised Syringe Specimen/ EDTA sample (Send immediately to Biochemistry & indicate time specimen drawn clearly on request form)

6.5 PROCESSING OF BODILY FLUIDS

Internal CSF And Fluid Test Repertoire	
Internal Test Repertoire	**Specimen Requirements**
CSF Analysis Total Protein Glucose	Sterile Universal Container (White Top). All CSF samples must be sent to Microbiology Department first prior to biochemical analysis.
FLUID (pleural, ascitic, etc) Total Protein Albumin LDH Glucose	Fluids: Sterile Universal Container (White top) Glucose must be collected in grey bottle unless fresh (<3hrs)
Urine Pregnancy Test (BHCG)	Fresh Urine Specimen in Sterile Universal Container (White Top)
Urine amylase, Urine chloride, Urine potassium, Urine sodium, Urine urea, Urine calcium, Urine total protein, Urine creatinine, Urine glucose,	**Spot Urine:** Fresh Urine Specimen in Sterile Universal Container (White Top) OR **24 Hour Urine collection:** 3-litre brown 24 hr urine collection container available from biochemistry. Acidified sample required for 24 hr urine Calcium Please contact Biochemistry if 50% HCL acid is required. Information leaflet is available for patients taking bottle home.
Urine Calculations: Creatinine Clearance, Urine Osmolality, Protein / Creatinine Ratio	Samples as above

Internal Miscellaneous Test Repertoire	
Internal Test Repertoire	**Specimen Requirements**
Sweat Test (Chloride)	By appointment only.
Carbon Monoxide	Heparinised Syringe Specimen (Send immediately to Biochemistry & indicate time specimen drawn clearly on request form)

6.6 URINE SAMPLES

Test	Plain	HCL added	Spot
Amylase	YES		YES
Calcium	YES	YES	YES
Chloride	YES		YES
Creatinine	YES		
Potassium	YES		YES
Protein	YES		YES
Sodium	YES		YES
Urea	YES		YES
Glucose			YES
Protein creatinine ratio			YES

Table 6: List of Appropriate Containers for Use for Each Test

Samples for Creatinine, Urea and Urate (if taken into plain container) should be sent to the laboratory promptly. The container should be stored in the refrigerator during the collection. For 24-hour specimens the request form should state the start time and end time of the collection. If more than one container is used over this period they should be sent to the lab together once the collection is finished.

Urine sodium should be interpreted in the light of serum levels and intake. Urine sodium cannot be meaningfully interpreted in patients on saline infusions.

6.7 URINE COLLECTIONS

Urine containers are available in the Biochemistry Laboratory. The containers available contain acid or no preservative.

6.7.1 24 hour Urine Collection: General Information for Patients

You will receive the following:

- A large plastic 24 hrs urine container in which to store urine.
- A request form with your details on it.
- A plastic bag in which to return your collection and request form.

1. You may need more than one storage container to contain all of your urine for the 24-hour period.
2. Make sure each storage container is labelled with your full name and hospital number written on it. If your container is not labelled properly, you may be asked to repeat the 24-hour collection.

3. Keep your storage container cool throughout the 24-hour collection period until you bring it back
4. For certain collections, a blood sample may need to be taken within the 24 hour collection period; you will be informed if this is the case.

24-Hour Urine Collection (Acidified): Information for Patients

HCl can cause burns and irritate the respiratory system. It is designated harmful and corrosive and bears the following hazard warnings.

You will receive

- A large plastic container with acid in which to store urine.
- A request form with your details on it.
- A plastic bag in which to return your collection and request form.

1. You may need more than one storage container to contain all of your urine for the 24-hour period.
2. Make sure each storage container is labelled with your full name and hospital number written on it. If your container is not labelled properly, you may be asked to repeat the 24-hour collection.
3. Keep your storage container in a cool place throughout the 24-hour collection period and until you return it to the laboratory.
4. For certain collections, a blood sample may need to be taken within the 24 hour collection period; you will be informed if this is the case.

How to handle acid safely

1. Your storage container is supplied with a small volume of acid, do not throw this out.
2. You should open the container in a well-ventilated area as fumes may escape from the acid.
3. Do not urinate directly into an acidified container.
4. Pour the urine slowly down the inside wall of the container, trying not to splash the acid.
5. Close the lid and swirl the container gently, to mix the acid and the urine.
6. Repeat steps 2~4 each time you add urine to the container.
7. Should you spill any acid on your skin, wash it off at once with plenty of running water.
8. If you experience soreness or reddening of your skin, as a result of a splash, consult your doctor & take these instructions with you.
9. ***Keep the container in a safe place and out of the reach of children at all times.***

How to correctly collect your 24-hour urine sample

A good time to start this collection is 8am in the morning and finish at 8 am the next morning.

1. Start the 24-hour urine test by urinating directly into the toilet (i.e. at 8am of the first morning). Do not save this urine.
2. After this urination, write the date and time on your storage container, ***this is the start of your test***.
3. For the next 24 hours, collect all your urine into your storage container.
4. Exactly 24 hours after you started the test, urinate one last time and collect this urine in your storage container. ***This is the end of your test***. Write the date and time the test ended on your storage container.
5. If you need to use more than one container during the 24-hour period, use one container at a time. When it is full, collect your urine in the next container.
6. Please bring the urine to the hospital as soon as possible. To prevent leaks, make sure the lid is on tightly, and that the container is transported upright inside a plastic bag.
7. If you are an inpatient, your nurse will tell you what time to begin and end the collection and will set up more containers, as needed. If you have questions about the procedure, please ask.

6.8 24 Hour Urine Collection Instructions:

6.8.1 Preparation

- Before you begin the collection you will be given a container or containers and a form. The containers available may contain acid or no preservative.
- Ensure the container and form contains all details. These must include your full name, date of birth and hospital number if available. If your container is not labelled properly you may be asked to repeat the collection.
- Ensure the form and container also includes the start and end date and time of the urine collection.
- During collection keep the container refrigerated until you bring the sample back to the hospital. If this is not possible keep in a cool dry area.
- Some tests require an acid preservative. These containers will have a red acid preservative danger label with instructions to keep upright, avoid contact with acid fumes and do not pass urine directly into container. The acid is vital for the test so do not empty the container.
- For collection in the acid container collect urine in a clean receptacle (jug/vessel) and transfer. Pour slowly and carefully in to the acid container.

6.8.2 Collection Method: Day 1 on aking

- Start the 24 hour urine test by emptying your bladder directly into the toilet. The collection begins now. Write the start date and time on the container.
- For the next 24 hours all urine passed (no matter how small) must be collected in the container or by receptacle and transferred carefully to the container. If you do not

collect all the urine passed in the 24hr your test result may be inaccurate and you may have to repeat the collection again.

- You may need to use more than one container during the 24 hour period. Only when the first container is full should you collect into the second container.

6.8.3 *Collection Method: Day 2 on Waking*

- Collect the first urine sample into the container. This is the end of the test.
- Write the date and time the test ended on the container.
- Bring the 24 hour collection to the hospitals specimen reception as soon as possible.
- To prevent leaks ensure the cap is on tightly and the container is stored upright.
- If travelling a long distance transport on ice or in a cooler.

Notes

1. Ensure that urine and faeces are passed separately.
2. If the container is full before completion of collection, use a second container with the same preservative, and send both to the laboratory. Label containers 1 of 2, 2 of 2 etc.
3. If any specimen of urine is not collected or accidentally discarded during the collection, discontinue the test and start again.
4. Patients should be cautioned not to urinate directly into a bottle containing acid preservative. Below is a list of the appropriate containers for use for each test:

Samples for pH should be transferred to a heparinised ABG syringe and sent to the laboratory immediately for analysis.

6.9 OTHER FLUIDS

6.9.1 Pleural fluids

All samples from suspected TB patients must be labelled as “suspected TB”. This will help to minimise the exposure to the laboratory staff and allow samples to be handled in a safe manner.

6.9.2 CSFs

CSF’s are always handled by Microbiology first to maintain sterility for culture and sensitivity testing. An aliquot is then dispatched into Biochemistry for protein and glucose analysis.

FLUID TYPE	ANALYTES MEASURED
Cerebrospinal Fluid (CSF)	Glucose, Protein. Preserve glucose if testing is delayed by > 1 hour.
Pleural Fluid	Glucose, Protein, LDH, pH. pH only- as soon as fluid is collected, take a sample into blood gas tube and expel all air. **Serum should be tested for protein and LDH at the same time**. Preserve glucose if testing is delayed by > 1 hour.
Peritoneal Fluid/Ascitic Fluid	Protein, LDH, Albumin, Amylase, Triglycerides. **Serum and Fluid samples should be taken concurrently**.
Knee Aspirate	Protein, LDH
Synovial Fluid	Protein, LDH
Wound or abscess drain	Protein
Drain Fluid(Robinsons)	Creatinine, Urea
Pericardial	Glucose, Protein, LDH, pH. pH only- as soon as fluid is collected, take a sample into blood gas tube and expel all air. Preserve glucose if testing is delayed by > 1 hour.

6.10 REFERENCE RANGES

Biochemistry Reference Ranges for Assays/ Calculated Parameters

NOTE: *Reference ranges for assays are derived from current manufacturer's guidelines in consultation with the Chemical Pathologist. Any additional notes on reference ranges are listed in references below.*

(*Calculated parameters)

CLINICAL CHEMISTRY – SERUM / PLASMA / BLOOD GAS and their related CALCULATED PARAMETERS					
Assay *(iLab HOST test code)* *(Remisol test code)*	**Units**	**Sex**	**Age**	**Reference Range**	
				Low	**High**
Albumin *(ALB)* *(C_ALB)*	g/L	ALL	**4D**	**28**	**44**
			120Y	**35**	**52**
ALP *(ALP)* *(C_ALP)*	U/L	**F**	**30D**	**48**	**406**
			01Y	**124**	**341**
			04Y	**108**	**317**
			07Y	**96**	**297**
			10Y	**69**	**325**

CLINICAL CHEMISTRY – SERUM / PLASMA / BLOOD GAS and their related CALCULATED PARAMETERS					
Assay *(iLab HOST test code)* *(Remisol test code)*	**Units**	**Sex**	**Age**	**Reference Range**	
				Low	**High**
			13Y	**51**	**332**
			16Y	**50**	**162**
			19Y	**47**	**119**
			120Y	**30**	**120**
		M	**30D**	**75**	**316**
			01Y	**82**	**383**
			04Y	**104**	**345**
			07Y	**93**	**309**
			10Y	**86**	**315**
			13Y	**42**	**362**
			16Y	**74**	**390**
			19Y	**52**	**171**
			120Y	**30**	**120**
ALT *(ALT)* *(C_ALT)*	U/L	**F**	**02M**	**13**	**45**
			120Y	**0**	**35**
		M	**02M**	**13**	**45**
			120Y	**0**	**50**
Ammonia *(AMMO)* *(C_AMMO)*	µmol/L	**ALL**	**4W**	**0**	**100**
			120Y	**0**	**53**
Amylase *(AMY)* *(C_AMY)*	U/L	**ALL**	**120Y**	**28**	**100**
AST *(AST)* *(C_AST)*	U/L	**F**	**04D**	**25**	**75**
			02M	**15**	**60**
			120Y	**0**	**35**
		M	**04D**	**25**	**75**
			02M	**15**	**60**
			120Y	**0**	**50**
βHCG *(HCGB)* *(IA_HCG)*	IU/L	**F**	**120Y**	**0**	**5**
Bicarbonate *($SHCO_3$)* *(C_BIC)*	mmol/l	**ALL**	**03Y**	**16**	**24**
			120Y	**21**	**31**
Blood Gas Arterial – Lactate (ALACT) (N/A)	mmol/L	**ALL**	**ALL**	**0.4**	**0.8**
Blood Gas Arterial – Calcium (A) (N/A)	mmol/L	**ALL**	**ALL**	**1.15**	**1.29**
Blood Gas Arterial – Chloride (A) (N/A)	mmol/L	**ALL**	**ALL**	**98**	**107**
Blood Gas Arterial – Sodium (A)	mmol/L	**ALL**	**ALL**	**136**	**145**

CLINICAL CHEMISTRY – SERUM / PLASMA / BLOOD GAS and their related CALCULATED PARAMETERS					
Assay *(iLab HOST test code)* *(Remisol test code)*	Units	Sex	Age	Reference Range	
				Low	High
(N/A)					
Blood Gas Arterial – Potassium (A) (N/A)	mmol/L	ALL	ALL	3.5	4.5
Blood Gas Arterial – Glucose (A) (N/A)	mmol/L	ALL	ALL	3.5	5.3
Blood Gas Arterial – Base Excess (ABE) (N/A)	mmol/L	ALL	ALL	-2.0	2.0
Blood Gas Arterial – Carboxy Haemoglobin (ACOHB) (N/A)	%	ALL	ALL	0.5	2.5
Blood Gas Arterial – Bicarbonate ($AHCO_3$) (N/A)	mmol/L	ALL	ALL	22	26
Blood Gas Arterial – pCO_2 ($APCO_2$) (N/A)	KPa	ALL	ALL	4.6	6.0
Blood Gas Arterial – pH (APH) (N/A)	-	ALL	ALL	7.35	7.45
Blood Gas Arterial – pO_2 (APO_2) (N/A)	KPa	ALL	ALL	11.0	14.5
Blood Gas Arterial – Saturated Bicarbonate ($ASHCO_3$) (N/A)	mmol/L	ALL	ALL	22	26
Blood Gas Arterial – SATURATED O_2 Arterial (ASO_2) (N/A)	%	ALL	ALL	95	99
Blood Gas Arterial – Total CO_2 ($ATCO_2$) (N/A)	mmol/L	ALL	ALL	23	27
Blood Gas Venous – Bicarbonate ($VHCO_3$) (N/A)	mmol/L	ALL	ALL	24	28
Blood Gas Venous – Base Excess (VBE) (N/A)	mmol/L	ALL	ALL	-2.0	2.0
Blood Gas Venous – pCO_2 ($VPCO_2$) (N/A)	KPa	ALL	ALL	5.4	6.8
Blood Gas Venous – pH (VPH) (N/A)	-	ALL	ALL	7.32	7.43
Blood Gas Venous – pO_2	KPa	ALL	ALL	3.00	5.32

CLINICAL CHEMISTRY – SERUM / PLASMA / BLOOD GAS and their related CALCULATED PARAMETERS					
Assay *(iLab HOST test code)* *(Remisol test code)*	Units	Sex	Age	Reference Range	
				Low	High
(VPO_2) (N/A)					
Blood Gas Venous – Saturated Bicarbonate ($VSHCO_3$) (N/A)	mmol/L	ALL	ALL	22	26
Blood Gas Venous – Total CO_2 ($VTCO_2$) (N/A)	mmol/L	ALL	ALL	25	29
Blood Gas Venous – Lactate (VLACT) (N/A)	mmol/L	ALL	ALL	0.6	1.4
Blood Gas Venous – Calcium (VCA) (N/A)	mmol/L	ALL	ALL	1.15	1.33
Blood Gas Venous – Chloride (V) (N/A)	mmol/L	ALL	ALL	98	107
Blood Gas Venous – Sodium (V) (N/A)	mmol/L	ALL	ALL	136	145
Blood Gas Venous – Potassium (V) (N/A)	mmol/L	ALL	ALL	3.5	4.5
Blood Gas Venous – Glucose (V) (N/A)	mmol/L	ALL	ALL	3.5	5.3
Calcium *(CA)* *(C_CA)*	mmol/l	ALL	10D	1.9	2.6
			12Y	2.2	2.7
			120Y	2.2	2.65
Cord Bilirubin *(CBILI)* *(C_CBILI)*	µmol/l	ALL	-	0	50
Cholesterol *(CHOL)* *(C_CHOL)*	mmol/l	ALL	ALL	3.3	5.0
Creatine Kinase *(CK)* *(C_CK)*	U/L	F	120Y	0	145
		M		0	171
Chloride *(CL)* *(C_CL)*	mmol/l	ALL	ALL	98	106
Creatinine *(MCRE)* *(C_CREA)*	µmol/l	F	02D	22	90
			03Y	11	34
			15Y	21	65
			120Y	49	90
		M	02D	22	90
			03Y	11	34

CLINICAL CHEMISTRY – SERUM / PLASMA / BLOOD GAS and their related CALCULATED PARAMETERS					
Assay *(iLab HOST test code)* *(Remisol test code)*	**Units**	**Sex**	**Age**	**Reference Range**	
				Low	**High**
			15Y	**21**	**65**
			120Y	**64**	**104**
CSF Glucose * *(CSFG)* *(C_CSF_GLU)*	mmol/l	**ALL**	**28D**	**1.94**	**5.55**
			58D	**1.55**	**5.55**
			01Y	**1.94**	**5.0**
			120Y	**2.22**	**4.44**
CSF Protein * *(CSFP)* *(C_CSF_TP)*	g/L	**ALL**	**28D**	**0.65**	**1.5**
			56D	**0.5**	**0.9**
			18Y	**0.05**	**0.35**
			60Y	**0.15**	**0.45**
			120Y	**0.15**	**0.6**
C Reactive Protein *(MCRP)* *(C_CRP)*	mg/L	**ALL**	**01Y**	**0**	**5**
			10Y	**0**	**5**
			19Y	**0**	**5**
			120Y	**0**	**5**
Direct Bilirubin *(DBILI)* *(CC_DBILI)*	µmol/l	**ALL**	**120Y**	**0**	**3.4**
eGFR* *(MGFR)* *(CC_EGFR)*	ml/min	**ALL**	**ALL**	**90**	**160**
Ethanol *(MALCO)* *(C_ALC)*	%mg	**NO REFERENCE RANGE**			
Free T4 *(FT4M)* *(IA_FT4)*	pmol/l	**ALL**	**20D**	**17.4**	**57.7**
			03Y	**9.52**	**17.8**
			19Y	**7.85**	**13.6**
			120Y	**7.86**	**16.29**
Fasting Glucose – Serum *(FTGLU)* *(C_FTGLU)*	mmol/l	**ALL**	**ALL**	**4.1**	**5.9**
Fasting Glucose – Plasma *(FTPGLU)* *(C_FTPGLU)*	mmol/l	**ALL**	**ALL**	**4.1**	**5.9**
Ferritin *(FERM)* *(C_FERR)*	ng/ml	**F**	**ALL**	**11**	**306.8**
		M	**ALL**	**23.9**	**336.2**
Folate *(FOLM)* *(C_FOL)*	ng/ml	**ALL**	**ALL**	**3.1**	**19.9**
Gentamicin *(MGENT)* *(C_GENT)*	mg/L	**Gentamicin doesn't have reference ranges but instead a guide:** **<u>Desirable levels:</u>** **Gentamicin (pre-dose): <1mg/L** **Gentamicin (post-dose): 3 – 5mg/L**			
GGT *(GGT)*	U/L	**F**	**06M**	**15**	**132**
			01Y	**1**	**39**

CLINICAL CHEMISTRY – SERUM / PLASMA / BLOOD GAS and their related CALCULATED PARAMETERS					
Assay *(iLab HOST test code)* *(Remisol test code)*	**Units**	**Sex**	**Age**	**Reference Range**	
				Low	**High**
(C_GGT)			**13Y**	**4**	**22**
			19Y	**4**	**24**
			120Y	**0**	**38**
		M	**06M**	**12**	**122**
			01Y	**1**	**39**
			13Y	**3**	**22**
			19Y	**2**	**42**
			120Y	**0**	**55**
Glucose – Random *(GLU)* *(C_GLU)*	mmol/l	**ALL**	**ALL**	**4.1**	**7.8**
Glucose – Random Plasma *(PGLU)* *(C_PGLU)*	mmol/l	**ALL**	**ALL**	**4.1**	**7.8**
Glucose Tolerance Test – Fasting *(AFGLU)* *(Not currently set up)*	mmol/l	**ALL**	**ALL**	**0**	**5.1**
Glucose Tolerance Test – 1 hour PP *(A1GLU)* *(Not currently set up)*	mmol/l	**ALL**	**ALL**	**0**	**10**
Glucose Tolerance Test – 2 hours PP *(A2GLU)* *(Not currently set up)*	mmol/l	**ALL**	**ALL**	**0**	**8.5**
HDL Cholesterol *(HDL)* *(C_HDL)*	mmol/l	**ALL**	**ALL**	**1.03**	**2.38**
Inorganic Phosphate *(IP)* *(C_PHOS)*	mmol/l	**ALL**	**02M**	**1.5**	**2.55**
			14Y	**1.2**	**2.0**
			120Y	**0.81**	**1.45**
Intrinsic Factor Antibody *(IFABM)* *(IA_IFAB)*	AU/ml	**IF Ab doesn't have reference ranges but instead interpretative ranges:** **Whole value result** / **Results Interpretation** <1.20 AU/ml — Negative ≥ 1.20 to < 1.53 AU/mL — Equivocal ≥ 1.53 AU/mL — Positive			
Iron *(IRON)* *(C_IRON)*	µmol/l	**F**	**06D**	**17.9**	**44.8**
			03M	**7.2**	**17.9**
			11Y	**9.0**	**21.5**
			120Y	**9.0**	**30.0**
		M	**06D**	**17.9**	**44.8**
			03M	**7.2**	**17.9**
			11Y	**9.0**	**21.5**
			120Y	**12.0**	**31.0**
Potassium – Serum *(K)* *(C_K)*	mmol/l	**ALL**	**ALL**	**3.5**	**5.1**

CLINICAL CHEMISTRY – SERUM / PLASMA / BLOOD GAS and their related CALCULATED PARAMETERS					
Assay *(iLab HOST test code)* *(Remisol test code)*	**Units**	**Sex**	**Age**	**Reference Range**	
				Low	**High**
Potassium – Plasma *(KP)* *(C_KP)*	mmol/l	**ALL**	**ALL**	**3.4**	**4.5**
Lactate *(LACT)* *(C_LACT)*	mmol/l	**ALL**	**ALL**	**0.5**	**2.2**
LDH *(LDH)* *(C_LDH)*	U/L	**ALL**	**04D**	**290**	**775**
			10D	**545**	**2000**
			01Y	**180**	**430**
			13Y	**110**	**295**
		F	**120Y**	**0**	**247**
		M	**120Y**	**0**	**248**
LDL Cholesterol* *(LDL)* *(Not on Remisol at present)*	mmol/l	**ALL**	**ALL**	**0**	**2.6**
LDL Cholesterol - MEASURED *(MLDL)* *(C_LDL)*	mmol/l	**ALL**	**ALL**	**0**	**2.6**
Lithium *(MLI)* *(C_LI)*	mmol/l	**ALL**	**ALL**	**0.5**	**1.0**
Magnesium *(MG)* *(C_MG)*	mmol/l	**F**	**120Y**	**0.77**	**1.03**
		M	**120Y**	**0.73**	**1.06**
Sodium *(Na)* *(C_NA)*	mmol/l	**ALL**	**ALL**	**136**	**146**
Paracetamol *(PARAC)* *(C_PARA)*	mmol/l	**NO REFERENCE RANGE**			
Procalcitonin (PCT) *(PCTM)* *(IA_PCT)*	ng/ml	**PCT doesn't have reference ranges but instead a guide:**			
Procalcitonin (PCT) Diluted *(IA_PCT_DIL)*					

PCT (ng/ml)	Interpretation
<0.5	Low risk of severe sepsis and/or septic shock
≥ 0.5 to ≤2.0	Moderate risk of progression to severe sepsis and/or septic shock
>2.0	High risk of severe sepsis and/or septic shock

CLINICAL CHEMISTRY – SERUM / PLASMA / BLOOD GAS and their related CALCULATED PARAMETERS					
Assay *(iLab HOST test code)* *(Remisol test code)*	**Units**	**Sex**	**Age**	**Reference Range**	
				Low	**High**
Salicylate *(MSSAL)* *(C_SALI)*	mmol/l	**NO REFERENCE RANGE**			
Serum Osmolality* *(SOSMOC)* *(CC_SOSM)*	mOsm/kg	**ALL**	**ALL**	**285**	**295**
Tobramycin *(MTOB)* *(C_TOBR)*	mg/L	**Tobramycin doesn't have reference ranges but instead a guide:** **Desirable levels:** **Tobramycin (pre-dose): <1mg/L for once daily dosing**			
Total Bilirubin *(TBILC)* *(C_TBILI)*	µmol/l	**ALL**	**01D**	**24**	**149**
			03D	**58**	**197**
			06D	**26**	**205**
			120Y	**0**	**21**
Total Iron Binding Capacity* *(TIBC)* *(CC_TIBC)*	µmol/l	**F**	**120Y**	**53**	**95**
		M	**120Y**	**50**	**85**
Total Protein *(TP)* *(C_TP)*	g/L	**ALL**	**30D**	**41**	**63**
			18Y	**57**	**80**
			120Y	**66**	**83**
Total PSA *(PSAM)* *(IA_PSA)*	µg/l	**M**	**50Y**	**0**	**1.9**
			60Y	**0**	**2.9**
			70Y	**0**	**3.9**
			120Y	**0**	**4.9**
Transferrin *(TRF)* *(C_TRANS)*	g/L	**ALL**	**04D**	**1.3**	**2.7**
			120Y	**2.0**	**3.6**
Transferrin Saturation* *(TSAT)* *(CC_TSAT)*	%	**F**	**120Y**	**19**	**43**
		M	**120Y**	**21**	**45**
Triglyceride *(TRIG)* *(C_TRIG)*	mmol/l	**ALL**	**ALL**	**0.84**	**1.71**
Troponin I *(TPNI)* *(IA_TROPI)*	ng/L	**F**	**120Y**	**0**	**11.6**
		M	**120Y**	**0**	**19.8**
TSH *(TSH)* *(IA_TSH)*	mIU/L	**ALL**	**12Y**	**0.79**	**5.85**
			19Y	**0.68**	**3.35**
			120Y	**0.38**	**5.33**
Uric Acid *(UA)* *(C_UA)*	µmol/l	**F**	**120Y**	**155**	**357**
		M	**120Y**	**208**	**428**
Urea	mmol/l	**ALL**	**ALL**	**2.8**	**7.2**

CLINICAL CHEMISTRY – SERUM / PLASMA / BLOOD GAS and their related CALCULATED PARAMETERS					
Assay *(iLab HOST test code)* *(Remisol test code)*	Units	Sex	Age	Reference Range	
				Low	High
(MUREA) *(C_UREA)*					
Vancomycin *(MVANC)* *(C_VANC)*	mg/L	Vancomycin doesn't have reference ranges but instead a guide: **Desirable levels:** Vancomycin (post-dose): 20 – 40mg/L Vancomycin (trough): Aim for 10 – 15mg/L For serious infections e.g. septicaemia, endocarditis, osteomyelitis etc. aim for 15 – 20mg/L.			
Vitamin B12 *(B12M)* *(C_B12)*	pg/ml	ALL	ALL	180	914

Reference Ranges Urines and Fluids and their for Calculated Parameters

Assay *(iLab HOST test code)* *(Remisol test code)*	Units	Sex	Age	Reference Range	
				Low	High
24 Hour URINE Amylase *(UAM24C)* *(CC_U_24AMY)*	U/24hrs	ALL	ALL	42	321
24 Hour URINE Calcium *(UCA24C)* *(CC_U_24CA)*	mmol/24hrs	ALL	ALL	2.5	7.5
24 Hour URINE Chloride *(UCL24C)* *(CC_U_24CL)*	mmol/24hrs	ALL	ALL	110	250
24 Hour URINE Phosphate *(UIP24C)* *(CC_U_24IP)*	mmol/24hrs	ALL	ALL	12.9	42.0
24 Hour URINE Potassium *(UK24C)* *(CC_U_24K)*	mmol/24hrs	ALL	ALL	25	125
24 Hour URINE Sodium *(UNA24C)* *(CC_U_24NA)*	mmol/24hrs	ALL	ALL	40	220
24 Hour URINE Protein *(UTP24C)* *(CC_U_24TP)*	g/24hrs	ALL	ALL	0.05	0.08
24 Hour URINE Urea *(UNA24C)* *(CC_U_24UR)*	mmol/24hrs	ALL	ALL	250	570
24 Hour URINE URIC ACID *(UUA24C)*	mmol/24hrs	ALL	ALL	1.48	4.43

CLINICAL CHEMISTRY – SERUM / PLASMA / BLOOD GAS and their related CALCULATED PARAMETERS					
Assay *(iLab HOST test code)* *(Remisol test code)*	Units	Sex	Age	Reference Range	
				Low	High
(CC_U_24UA)					
24 Hour URINE CREATININE *(UNA24C)* *(CC_U_24CRE)*	mmol/24hrs	F	120Y	7.0	14.0
		M	120Y	8.8	17.7
Urinary Osmolality * *(UOSMOC)* *(CC_SOSM)*	mOsm/kg	ALL	ALL	50	1500
Urinary Volume *(UVOL)* *(Not set up on Remisol)*	mls/24hrs	ALL	ALL	-	-
Protein Creatinine Ratio * *(UPCR)* *(CC_UPCR)*	mg/mmol/L	ALL	ALL	0	15
FLUID Albumin *(FALB)* *(C_F_ALB)*	g/L	No Reference Range			
FLUID Amylase *(FAMY)* *(C_F_AMY)*	U/L	No Reference Range			
FLUID Glucose *(FGLU)* *(C_F_GLU)*	mmol/L	No Reference Range			
FLUID L.D.H *(FLDH)* *(C_F_LDH)*	U/L	No Reference Range			
FLUID Total Protein *(FTP)* *(C_F_TP)*	g/L	No Reference Range			
URINE Amylase *(UAML)* *(C_U_AMY)*	U/L	No Reference Range			
URINE Calcium *(MUCA)* *(C_U_CA)*	mmol/L	No Reference Range			
URINE Chloride *(UCL)* *(C_U_CL)*	mmol/L	No Reference Range			
URINE Creatinine *(UMCRE)* *(C_U_CRE)*	mmol/L	No Reference Range			

CLINICAL CHEMISTRY – SERUM / PLASMA / BLOOD GAS and their related CALCULATED PARAMETERS					
Assay *(iLab HOST test code)* *(Remisol test code)*	Units	Sex	Age	Reference Range	
				Low	High
URINE Glucose *(UGLU)* *(C_U_GLU)*	mmol/L	No Reference Range			
URINE Potassium *(UK)* *(C_U_K)*	mmol/L	No Reference Range			
URINE Sodium *(UNA)* *(C_U_NA)*	mmol/L	No Reference Range			
URINE Phosphate *(UIP)* *(C_U_IP)*	mmol/L	No Reference Range			
URINE Protein *(UTP)* *(C_U_TP)*	g/L	No Reference Range			
URINE Uric acid *(UUA)* *(C_U_UA)*	mmol/l	No Reference Range			
URINE Urea *(UUREA)* *(C_U_UR)*	mmol/L	No Reference Range			

References:

- Reference ranges for assays are derived from current manufacturer's guidelines in consultation with the Chemical Pathologist;
- * CSF Protein and Glucose reference range in line with expected Biochemical and Differential Results with Meningitis from PHE SMI B27 Issue 6.1, 31/05/2017 (Micro INAB inspection April 2019 NC). Also PHE SMI for CSFs B 27 | Issue no: 6.1 | Issue date: 31.05.17 as reference point for clinicians.

6.11 TURNAROUND TIMES

Turnaround Times for Biochemistry Tests

80% of results should be reported within the time frames given below:

TEST	URGENT*	ROUTINE**	EXTERNAL***
ABG	15 minutes	N/A	N/A
General Biochemistry Profile including antibiotics	1 hour	3 hours	48 hours
Troponin	1 hour	3 hours	N/A
General Immunoassay Profile including haematinics	Same routine working day	Same routine working day	48 hours
Urine Chemistry	1 hour	1-2 working days	N/A
Pregnancy Test	1 hour	3 hours	Same day
Sweat Test	N/A	3-4 working days	N/A
Serum HCG	N/A	3 hours	48hrs
CSF	1 hour	N/A	N/A
Fluid	N/A	3 hours	N/A

***Urgent Samples:** Emergency Department, Special Care Baby Unit, Paediatrics, Oncology, Intensive Care Unit, Medical Assessment Unit, Acute Covid Assessment Unit.

****Routine:** All MUH Internal wards, External hospitals, nursing homes, OPD and any GP sample marked URGENT

Note: External hospitals, nursing homes, OPD and any GP sample marked URGENT are processed within 3 hours between the working day 9:30 -16:30)

*** **External:** GP samples.
Note: Turnaround times may be extended during analyser downtimes or maintenance procedures.

6.11.1 G.P. Specimens

Ideally, samples for analysis should arrive as soon as possible or at least within 4 hours of collection. **If a longer delay is expected then blood specimens should be centrifuged prior to submission.**

Potassium is not available as part of UE or GP profiles for GP samples. If potassium is required please specifically request it on form and ensure sample is centrifuged at source or arrives in directly into Biochemistry less than 4 hrs post phlebotomy. Do not leave samples for potassium at the main hospital reception as these samples are collected only at certain times of the day.

GP samples arriving before 4.00pm will be centrifuged (subject to workload) on the day of receipt. Specimens due to be delivered after 4.00pm should be centrifuged at point of collection as such work may not be centrifuged until the following routine working day, thus specimens will be aged.

Turnaround time for GP specimens is 48 hours from time of receipt into the Biochemistry department.

6.12 Test Values Currently Phoned to Wards/Clinicians

Results falling outside defined limits and where the patient has no previous history or relevant clinical details will be telephoned to the requesting clinician/location. In addition, all requests for telephoned results are responded to as soon as possible. Unsuitable samples, unexpected results or suspicion of sample mislabelling are all brought to the attention of the ward or the clinician/ medical team. A list of test results currently phoned to clinicians are available to view at *https://saolta.ie/wards/pathology-laboratory-department-0*

6.12.1 On-call tests

The following is a list of tests that are performed on–call. A detailed list of all tests/ specimen requirements/ turnaround time is outlined in the Indexed List of Tests section. Access to out-of-hours service for GP's is available by prior consultation with the laboratory.

Internal On Call Blood Test Repertoire

Profiles	
Oncology Profile-	U/E, LFT, LDH, AST, Calcium, Magnesium
Maternity Profile	U/E, LFT, AST, Uric Acid, LDH & Bicarbonate
ICU Profile	U/E, Total Protein, Albumin, Calcium, Magnesium, Phosphate
Cardiac Enzymes –	AST, CK, Troponin
Bone Profile –	Calcium, Inorganic Phosphorus, ALP , ALB
Liver Function Tests (LFT)-	Total Protein, Albumin, Total Bilirubin, ALP, GGT, ALT
Urea & Electrolytes (U&E)	Urea, Creatinine, Sodium, Potassium, Glucose
RDU Profile	U/E, LFT, Chloride, Bicarb, Calcium, Phos, Magnesium, Lipid & CRP
Toxicology Screen -	Alcohol, Paracetamol, Salicylate
Blood Gas Analysis	PH, PO2,PCO2, Bicarbonate, Base excess, O2 sat
Urine Protein/creatinine ratio PCR (Maternity only)	
CSF- Protein, Glucose	
Individual Tests	

Amylase Bilirubin (Total, Direct, Cord) Chloride C – Reactive Protein (CRP) Glucose Urate Serum HCG	Bicarbonate Lactate Lactate Dehydrogenase (LDH) Lithium Magnesium Troponin T Urine Pregnancy Test
Sample Requirement : ***One*** *correctly drawn and properly mixed specimen is sufficient for the listed Assays* **Adult :** Serum Sample **BD Vacutainer ® System SST ™ II tube,** **Colour Code: Gold (must be sufficiently filled)** **Paediatrics:** Serum sample, **Brown capped 1.1mls Z-gel tube** Plasma sample, **Orange capped 1.1mls Lithium Heparin tube (preferred sample for paediatrics)**	

Internal On Call Blood Test Repertoire	
Internal Test Repertoire	**Specimen Requirements**
Glucose **Lactate**	Fluoride Oxalate Sample Adult: BD Vacutainer ® System SST ™ II tube, Colour Code: Grey Paediatrics: Yellow capped 1.1mls tube
Ammonia Only if requested by the Paediatric Register or Consultant (Biochemistry dept must be contacted prior to sample collection)	Paediatrics: Orange capped 1.1mls Lithium Heparin tube (Biochemistry dept must be contacted prior to sample collection) (Send immediately to Biochemistry)
Blood Gases (Arterial & Venous)	Heparinised Syringe Specimen/ Heparinised Capillary sample. Send immediately to Biochemistry & indicate time specimen drawn clearly on request form. POC blood gas analysers available in ICU, C Block, Emergency dept, SCBU and Labour Ward. Training and password provided by Biochemistry

If any of the other tests not listed are required to be performed on-call, the laboratory must first be contacted and the requirements discussed. The Chemical Pathologist advisory service is available 24/7 to discuss clinical issues/ test requirements.

All requests sent to the laboratory during on-call periods must be completed on the red Emergency Request Form. Failure to do so could result in a delay in reporting of results.

6.12.2 Sample Receipt Deadlines

The cut-off receipt time for all routine samples from external locations is 16:30. Routine samples received from sources other than MUH inpatients after this time will be analysed the following day, if suitable.

6.13 Urgent Requests

The request for urgent analysis MUST be used appropriately. Abuse of the urgent request facility will have an adverse effect on the turnaround times of genuine urgent requests.

For urgent requests tick the urgent box on the Departmental Request Form and contact the Biochemistry Laboratory directly on extension 2560/62 or 094-9042560/62.
For urgent requests out of routine hours, submit the Emergency Request Form indicating the urgency and contact the Medical Scientist on-call directly via the switchboard.

For external users, please provide a contact number for phoning urgent results, especially if required after normal surgery hours.

6.14 Specimen Retention and Time Limits for Requesting Additional Examinations

Biochemistry samples will be stored for approximately one week. Additional tests or Add-on test must be requested by sending a form to the Biochemistry department. A member of the biochemistry staff will assess whether the sample is still acceptable for analysis.

Analyte Stability

Test Name	Sample type / Other Comments	Pre-Processing Stability / Specimen Requirements	Post-Separation Stability / Specimen Requirements (Add on)	Reference
Albumin	Serum / Plasma	<48 hours	<96hrs	2,7
ALT	Serum / Plasma	<48 hours	<96hrs	6,7
ALP	Serum / Plasma	<48 hours	<96hrs	2,7
Ammonia	Lithium heparin plasma. Must be delivery immediately on	<15 minutes	Not applicable	1

Test Name	Sample type / Other Comments	Pre-Processing Stability / Specimen Requirements	Post-Separation Stability / Specimen Requirements (Add on)	Reference
	Biochemistry directly.			
Amylase	Serum / Plasma	<48 hours	<96hrs	2,7
Amylase	Urine	<48 hours	<96hrs	2
AST	Serum / Plasma	<24 hours (tested same day)	<96hrs	6,7
Bicarbonate	No add on Bicarbonate permitted once sample is been exposed to air	<4 hours	Not applicable	1
Bilirubin (Direct)	Serum / Plasma	<24 hours	< 72 hrs protected from light	3,5
Bilirubin (Total)	Serum / Plasma	<48 hours	< 72 hrs protected from light	3,5
Blood Gas	Whole Blood - Must be completed within 20 minutes post phlebotomy.	<20 minutes	Not applicable	7
Calcium	Serum / Plasma	<48 hours	<96 hours	2, 7
Calcium (Urine)	Urine - Acidified	<48 hours	<96 hours	2, 11
Chloride	Serum / Plasma	<48 hours	<96 hours	6,7
Cholesterol (Total)	Serum / Plasma	<48 hours	<96 hours	2,7
Cholesterol (HDL)	Serum / Plasma	<48 hours	<96 hours	2,7
C-Reactive Protein (CRP)	Serum / Plasma	<48 hours	<96 hours	6,7
Creatinine Kinase (CK)	Serum / Plasma	<24 hours (tested same day)	<12 hours	1,7

Test Name	Sample type / Other Comments	Pre-Processing Stability / Specimen Requirements	Post-Separation Stability / Specimen Requirements (Add on)	Reference
Creatinine	Serum / Plasma	<48 hours	<96 hours	2,6,7
Creatinine	Urine	<48 hours	<96 hours	2
Ethanol (Alcohol, Serum)	Serum / Plasma	<12 hours	<12 hours	3,6
Ethanol (Alcohol, Plasma)	Fluoride Oxalate (Grey top) sample	<48 hours	<48 hours	3,6
Ferritin	Serum / Plasma	<72 hours	<120 hours	12
Folate	Serum / Plasma	<72 hours	<120 hours	12
Gentamicin	Serum / Plasma	<4 hours	<24 hours	11, 13
GGT	Serum / Plasma	<48 hours	<96 hours	6,7
Glucose (Plasma)	Fluoride Oxalate (Grey top) sample	<48 hours	<96 hours	1
Glucose (Serum)	Serum / Plasma	<4 hours	Not applicable	12
Glucose (Urine)	Urine	<2 hours	<2 hours	2
Glucose (CSF)	CSF	<72 hours (should analyse fresh but will keep for 72hours at 4◦C)	Not applicable	2, 11
hCG, Beta	Serum / Plasma	<24 hours	<96 hours	2,7
hCG, Beta (Urine)	Urine – Qualitative – White top universal	<24 hours	<24 hours	11
Intrinsic Factor Antibody	Serum / Plasma	<72 hours	<120 hours	12

Test Name	Sample type / Other Comments	Pre-Processing Stability / Specimen Requirements	Post-Separation Stability / Specimen Requirements (Add on)	Reference
Iron	Serum / Plasma	<48 hours	<96 hours	6,7
Lactate	Fluoride Oxalate (Grey top) sample	<4 hours	Not applicable	1
LDH	Serum / Plasma	<4 hours	< 72 hours	6,7
Lithium	Serum / Plasma	<24 hours (tested same day)	<96 hours	8,7
Magnesium	Serum / Plasma	<24 hours	< 72 hours	1,6,7
Magnesium (Urine)	Urine	< 72 hours	< 72 hours	2
Paracetamol	Serum / Plasma	<24 hours (tested same day)	<96 hours	1,7
Phosphate	Serum / Plasma	<6 hours	<72 hours	1,7
Potassium	Serum / Plasma	<4 hours	<96 hours	1,7
Potassium (Urine)	Urine	<96 hours	<96 hours	2
Procalcitonin	Serum / Plasma	<24 hours	<48 hours	11, 13
Prostate Specific Antigen (PSA)	Serum / Plasma	<48 hours	<96 hours	10
Protein, Total	Serum / Plasma	<48 hours	<96 hours	6,7
Protein (CSF)	CSF	<96 hours (should analyse fresh but will keep for 72hours at 4◦C)	Not applicable	2,11
Protein (Urine)	Urine	<48 hours	<48 hours	2
Salicylate	Serum / Plasma	<24 hours	<96 hours	6,7

Test Name	Sample type / Other Comments	Pre-Processing Stability / Specimen Requirements	Post-Separation Stability / Specimen Requirements (Add on)	Reference
Sodium	Serum / Plasma	<48 hours	<96 hours	6,7
Sodium (Urine)	Urine	<96 hours	<96 hours	2
Thyroid Stimulating Hormone (TSH)	Serum / Plasma	<48 hours	<96 hours	7
Tobramycin	Serum / Plasma	<4 hours	<24 hours	11, 13
FT4	Serum / Plasma	<48 hours	<96 hours	7
Transferrin	Serum / Plasma	<48 hours	<96 hours	7
Triglycerides	Serum / Plasma	<48 hours	<96 hours	2,7
Troponin I	Serum / Plasma	<24 hours	<96 hours	7
Urea	Serum / Plasma	<48 hours	<96 hours	6,7
Urea (Urine)	Urine	<48 hours	<96 hours	2
Uric Acid	Serum / Plasma	<48 hours	<96 hours	2,7
Uric Acid (Urine)	Urine	<48 hours	<96 hours	2
Vancomycin	Serum / Plasma	<4 hours	<24 hours	11, 13
Vitamin B12	Serum / Plasma	<72 hours	<120 hours	12

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4. **None relevant**
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6. **Dr Louw recommendations, Consultant Chemical Pathologist/Laboratory Director, Clinical Advisor, Mayo University Hospital.**
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9. **Li A, Brattsand G. Stability of serum samples and hemolysis interference on the high sensitivity troponin T assay. Clin Chem Lab Med. 2011;49: 335–336**
10. **PSA Test Harmonisation Outcomes Agreed at the NCCP PSA Harmonisation Board Workshop Held on 3rd December 2014, www.cancercontrol.hse.ie, 2nd February 2015**
11. **Manufacturer's insert.**
12. **In-house historical.**
13. **BD - Quality of Diagnostic Samples -** *3rd completely revised edition 2010*

6.15 LIMITATIONS ASSOCIATED WITH TEST METHODOLOGY

Interference Flag	ASSAYS AFFECTED		
	Lipaemia – LIP (mg/dl Intralipid)	**Icteraemia – ICT (mg/dl Bilirubin)**	**Haemolysis – HAEM (mg/dl Haemoglobin)**
No Interference **LIP: <40 mg/dL** **ICT: <2.5 mg/dL** **HAEM: <50 mg/dL**			
1+ Interference **LIP: 40- 99 mg/dL** **ICT: 2.5 – 4.9 mg/dL** **HAEM: 50-99 mg/dL**	IRON; Ammonia; TSAT; UCSFP.	UCSFP.	Ammonia; AST; B12; Folate; Intrinsic Factor Ab; IRON; K; KP; LDH; Phosphate; TSAT; UCSFP.
2+ Interference **LIP: 100-199 mg/dL** **ICT: 5.0 – 9.9 mg/dL** **HAEM: 100-199 mg/dL**	**Assay(s) listed above including:** Magnesium**.**	**All assays listed above including:** Cholesterol; Ferritin; LDL (calculated).	**All assays listed above including:** CK*****; DBILI; Magnesium.
3+ Interference **LIP: 200-299 mg/dL** **ICT: 10.0 – 19.9 mg/dL** **HAEM: 200-299 mg/dL**	**Assay(s) listed above only.**	**All assays listed above including:** B12; Folate; Total Protein; Lactate; FT4; SOSMO; Urea.	**All assays listed above including:** Chloride*****; Lithium; Sodium*****; SOSMO; Total Protein.
4+ Interference **LIP: 300-500 mg/dL** **ICT: 20 – 40 mg/dL** **HAEM: 300 – 500 mg/dL**	**Assay(s) listed above including:** Glucose (Fl. ox and serum); SOSMO.	**All assays listed above including:** Ammonia*****, ALP; Amylase; Ethanol; Gentamicin; Glucose (Fl. ox and serum); Intrinsic Factor Ab; Magnesium; Paracetamol**;** Salicylate; Sodium, TPSA; Trop I; Tobramycin; Vancomycin.	**All assays listed above including:** Cholesterol; Ferritin; PCT; Trop I; LDL (calculated); Vancomycin.
5+ Interference **LIP: >500 mg/dL** **ICT: >40 mg/dL** **HAEM: >500 mg/dL**	**All assay(s) listed above including:** Albumin; ALP; ALT; Amylase; AST; B12; Folate; Ferritin; Bicarbonate; Calcium; CBILI; Chloride; Cholesterol; CK; Creatinine; CRP; DBILI; eGFR; Ethanol; FT4; Gentamicin; GGT; HDL; Intrinsic Factor Ab; K; KP; Lactate; LDH; LDL (calculated); Lithium; Paracetamol; PCT; Phosphate; PSA; Salicylate; Sodium; TBILI; Total Protein; TPSA; Transferrin; Triglyceride; Troponin I; TSH; Urate; Urea; βHCG; TIBC; Tobramycin; Vancomycin.	**All assays listed above including:** Albumin; ALT; Ammonia, Amylase; AST; Bicarbonate; Calcium; Chloride; CBILI; CK; Creatinine; CRP; DBILI; eGFR; GGT; HDL; IRON; K; KP; LDH; LDL; Lithium; PCT; Phosphate; TBILI; Transferrin; Triglyceride; TSH; Urate; βHCG; TSAT; TIBC.	**All assays listed above including:** Albumin; ALP; ALT; Amylase; Bicarbonate; Calcium; CBILI; Creatinine; CRP; eGFR; Ethanol; FT4; Gentamicin; GGT; Glucose; HDL; Lactate; LDL; Paracetamol; Salicylate; TBILI; Tobramycin; TPSA; Transferrin; Triglyceride; TSH; Urate; Urea; βHCG; TIBC.

6.15 SAMPLES

6.15.1 AGE OF SAMPLE

In general, the age of the sample refers to the time from sample collection to sample centrifugation.

Uncentrifuged samples

- Uncentrifuged samples times refers to the maximum time between phlebotomy and the sample been centrifuged either at source or within Biochemistry.
- Certain tests have a limited stability when uncentrifuged. Please contact lab for details.
- All other tests received within Biochemistry >2 days old will not be analysed and receive the test code SNU. This expands to "Specimen >2 days old, Uncentrifuged - Please repeat." GP samples with no collection date - assumed the sample is aged and test requests as >1 day old.
- Ward samples with illogical date (e.g. received with phlebotomy but dated yesterday) will be queried with the requesting doctor or phlebotomist
- Ward samples with no collection date – given same day profile but recorded as U/K (unknown) for collection date. Samples with unknown collection date have a comment attached by LIS which states – 'Date/time of specimen collection absent on request form'.

Centrifuged samples

- Assumed to be spun on the day of collection and age of sample is <1day.
- If received > 5 days after collection date it will not be analysed for any tests and will receive the test code SNC. This expands to "Specimen >5 days old, Centrifuged – please repeat."

6.15.2 Badly Centrifuged Sample

Samples badly centrifuged at the point of collection will be processed as an aged sample and none of the electrolytes (sodium, potassium, chloride) will be processed.

APPENDIX 1: CURRENT EDITION AMENDMENTS

The amendments of the current edition are recorded in the Document Change Description Details Record maintained on Q-Pulse. A summary of the amendments are detailed below:

Section	Description of Change
ALL	Removal of reference to separate section for Referral Test Directory within this document. New document identifier assigned to Referral Test Directory, PATH/PD/014, active 24/05/2023 and will be controlled separately and held on www.saolta.ie
1.2	Addition of statement relating to flexible scope management in the laboratory
1.5.1, 2.1, 3.1	Contact details amended for consultant haematologist from a specific extension number/ day to "Contact via MUH switch*"