PATHOLOGY USER HANDBOOK

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GENERAL PATHOLOGY

Introduction

The Pathology department is accredited by the United Kingdom Accreditation Service (UKAS) to the International Standard **'Medical laboratories - Requirements for quality and competence (ISO 15189:2012)'** and maintains a quality service by the implementation of a comprehensive internal Quality Management System coupled with an extensive External Quality Assurance programme.

Accreditation activities are limited to those described on the UKAS schedule of accreditation, available on the UKAS website using the following link: http://www.ukas.com/search-accredited-organisations and by entering the Accreditation number **8429**.

Laboratory tests, technology and methodology are evolving, and as such some tests are not yet accredited. Consequently, these are not listed on the schedule of accreditation. Please contact the laboratory for further information regarding specific tests or if you have any concerns. Non-accredited tests are identified within this document.

This handbook has been produced to provide information regarding Pathology Services, which users may find helpful and to allow the best use of Pathology Services.
Information on the services provided and contact telephone numbers are available within this document and on the hospital intranet.

Pathology is part of the Clinical Service Unit- Diagnostics and Screening, hereby referred to as the **Pathology CSU**.

The Pathology CSU provides a comprehensive, consultant lead service comprising a combination of tests carried out on site at MKUH and others carried out by external laboratories. Routine high volume and emergency investigations are provided in-house, with specialist investigations sent to accredited reference laboratories.

The Pathology CSU comprises Pathology Support Unit, Haematology, Phlebotomy, Blood Transfusion and Immunology, Chemical Pathology, Microbiology and Cellular Pathology (Histopathology, Diagnostic Cytology and the Mortuary). Cervical Screening Cytology is provided by Norfolk and Norwich University Hospital Cellular Pathology.

Pathology Consultants are available to advise on the selection of appropriate tests and with the interpretation of results.

Pathology results are stored on a centralised Pathology computer system and are made available to Acute Trust service users via eCare. eCare training and passwords are available from the IT helpdesk, extension 87000.

GP requested results are transmitted electronically via the GP Messaging server into the GP system in regular downloads and GP practices have access to ICE for requesting and reporting.

Please contact Pathology System Manager or System Support Officer on 01908 995812 for support with results.

Pathology reception is located on Level 2 of the Hospital building, adjacent to the Haematology Outpatient's Clinic. The Blood Bank Issue Refrigerator is situated in a room just outside Pathology reception and is clearly signposted. Access to this room is via authorised swipe card only.
Cellular Pathology and the Mortuary are located on Level 1 at the rear of Ward 3.

Pathology staff are always willing to be involved in clinical audit, please contact the appropriate Head of Department.

Pathology is pleased to accept samples from non-NHS institutions for private, category 2 and contract health screening. Prices are available on request, please discuss your requirements with the Pathology Services Manager on 01908 995811or contact the Pathology Business Support Officer on 01908 995794.

Pathology welcomes the opportunity to allow users to visit on site and gain an insight into laboratory services. Please contact Nazia Hussain on 01908 995811or or via email: nazia.hussain@mkuh.nhs.uk

Despite every effort, it is possible that mistakes will exist in this handbook. If errors are identified please inform Rebecca Potter, Acting Pathology Quality Manager on 01908 996977 or email – rebecca.potter@mkuh.nhs.uk. Please use this handbook and let us know your views so that it can be improved.

Measurement Uncertainty

The laboratory considers measurement uncertainty when interpreting measured quantity values. Estimates of measurement uncertainty for test values will be made available on request.

Feedback and Complaints Procedure

The Pathology Department welcomes feedback from our service users. Should you wish to contact Pathology to lodge a complaint or comment, please contact the appropriate Head of Department, Pathology Services Manager or Quality Manager.

A copy of the Pathology complaints procedure [MPCOMP Pathology Complaints Procedure] is available on request and is written to conform to the Trust Complaints Policy, available on the intranet.

Complaints and comments can be made verbally, electronically or in writing and will be documented by Pathology staff and investigated as soon as possible.

All written complaints will be acknowledged within 2 working days of receipt by the Pathology Quality Manager or Head of Department.

A written response will be provided following investigation.

Protection of Personal Information

The Pathology Department strictly adheres to the requirements of the Data Protection Act and to the requirements of the Trust Data Protection Policy available on the Trust intranet.

PATHOLOGY CSU TELEPHONE NUMBERS

(MKU HOSPITAL SWITCHBOARD: 01908 660033)

General Pathology	**Ext.**	**Direct Dial**	**Bleep**
Laboratory Director -- Dr Poonam Kapila	85786	99 5786	
Director of Pathology – Helen Smith	85823	99 5823	
Pathology Services Manager – Nazia Hussain	85811	99 5811	07989 144737
Pathology Business Support Officer – Alex Badger	85794	99 5794	
Pathology Quality Manager – Rebecca Potter	86977	99 6977	
Pathology Quality & Safety Officer – Shane Breckenridge			
Pathology Systems Managers – Ky Ashby & Pirran Salter	85812	99 5812	
Pathology Supplies (bottles & cards)	85793	99 5793	
Pathology Support Unit			
Results/Enquiries	85768	99 5768	
Urgent samples	85842	99 5842	
Enquiries re referred samples	85772	99 5772	
PSU Manager – Helen Botwood	85769	99 5769	
Blood Sciences			
Blood Science Manager Grant Barker	85830	995830	
Blood Science Business Officer – Yvonne Brown	85754	99 5754	
Haematology			
Consultant Haematologist - Dr Subir Mitra	85753	99 5753	
Consultant Haematologist - Dr Moez Dungarwalla	85756	99 5756	1163
Consultant Haematologist –Dr Mags Akanni	87573	99 7573	1206
Consultant Haematologist –Dr Sarah Davis	87574	99 7574	1789
Consultant Immunologist - Dr Liz Bateman	(01865) 225991/22599		
Operational Manager – Alison McEvoy	85780	99 5780	
Secretarial Support	85814	99 5814	
Secretarial Support	85815	99 5815	
Technical Enquiries	85764	99 5764	
Out of routine hours	85824	99 5824	
Blood Transfusion	85776	99 5776	
Blood Bank Manager - Toyibat (Sewa) Joacquim-Runchi	85832	99 5832	
Specialist Practitioner of Transfusion – Caroline Lowe	85798	99 5798	
Technical Enquiries	85776	99 5776	
Out of routine hours	85824	99 85824	
Chemical Pathology			
Consultant Chemical Pathologist - Dr Farhan Ahmed	85792	99 5792	
Operational Manager – Ben Powell	85831	99 5831	
Technical Enquiries	85761	99 5791	
Out of routine hours	85783	99 5783	

Microbiology

Consultant Microbiologist - Dr Mansoor Raza	85799 99 5799
Consultant Microbiologist - Dr Poonam Kapila	85786 99 5786
Consultant Microbiologist – Dr Prithwiraj Chakrabarti	85796 99 5796
Laboratory Manager – Kalana Patabendige	85790 99 5790
Chief Biomedical Scientist – Rizalea Echaluse	85781 99 5781
Lead Infection Prevention and Control Nurse (IPCN) – Sharon Burns	85787 99 5787
Secretarial Support	85782 99 5782
Technical Enquiries	58779 99 5779

Cellular Pathology

Consultant Histopathologist - Dr Angus Molyneux	85807 99 5807
Consultant Histopathologist - Dr Sherly Mathews	85808 99 5808
Consultant Histopathologist - Dr Shital Parekh	85809 99 5809
Consultant Histopathologist - Dr Achamma John	85810 99 5810
Consultant Histopathologist – Dr Mitul Sharma	85751 99 5751
Consultant Histopathologist – Dr Shyama Mohan	85757 99 8757
Consultant Histopathologist - Dr Moyna Dyer	85763 99 5763
Laboratory Manager – Amanda Brice	85820 99 5820
Operational Manager – Marie Delaney	85820 99 5820
Secretarial Support	85802 99 5802/3/4
Technical Enquiries	85819 99 5819

Point Care of Testing

POCT Co-Ordinator – Phillip Dickson	85791
POCT Office	85797

Mortuary

Mortuary Manager – Joanne Smith	85828 99 5825/8

Normal Working Hours

Routine and urgent services are available Monday to Friday - 09:00 - 17:00.
Microbiology provides a service between 09:00-21:30 daily.
Mortuary - 08.00 - 16.00 and emergency out of hours.
PSU - 09:00-19:00 Monday to Friday and 09:00-16:30 at weekends
Cellular Pathology does not provide a weekend service.

Outside of these hours an 'Emergency Out-of-Hours' service is provided for Haematology & Blood Transfusion, Chemical Pathology and Microbiology.

Urgent, Preliminary and Telephoned Results

All Accident & Emergency, Surgical Assessment Unit, Ward 5/Neo-Natal Unit, Medical Assessment Unit, Ambulatory Emergency Care Unit and Department of Critical Care requests are treated as urgent.

During normal working hours please notify the laboratory of all urgent requests on ext. 85842.

Appropriate results will be telephoned or made available electronically as soon as possible.

During processing, results may be obtained which may affect immediate patient management. These results will either be issued as preliminary reports or telephoned to the requester. The provision of accurate, brief relevant clinical details is essential to enable workload prioritisation.

Haematology and Chemical Pathology trigger reporting levels are in line with Royal College of Pathology guidelines and can be found in Appendix 2 of this document.

Outside normal working hours urgent requests are handled by the 'out-of-hours' service.

Out of Hours Service

Biomedical Scientists (BMS) for Haematology and Chemical Pathology are always on site and may be contacted via the Switchboard.

For urgent Microbiology tests, out-of-hours coverage is provided by on-call Biomedical Scientists via the switchboard from Sunday to Friday, 21:30 to 07:30, and Saturday, 21:30 to 08:30. Consultant staff are available for advice and may be contacted via the Switchboard

To maintain a Consultant Microbiology advice service 24/7, 365 days a year,

a shared service with colleagues at The Great Western Hospital and Swindon is provided.
To maintain this arrangement responsibilities are specified, with calls only taken from GPs and Registrar grade doctors. Exceptions are in place to specify that calls will be taken from surgical SHOs in the operating theatre and from ITU medical staff. Switchboard operators are aware of this arrangement and will follow this protocol.

Haematology and Chemical Pathology

If you require investigations for **immediate** patient management or examinations that are time sensitive, please contact the relevant BMS out of hours, on the extensions below, who will analyse the sample as soon as possible upon receipt.

- Haematology and Blood Transfusion 85824
- Chemical Pathology 85783

Results will be made available electronically or telephoned if critically abnormal. The provision of accurate, brief relevant clinical details is essential to enable workload prioritisation.

Microbiology

Between 21:30 and 07:30 (08:30 on Sunday), calls for CSFs will be made directly to the BMS via the switchboard to their mobile phone. All other calls will be diverted to the Consultant Microbiologist. If it is deemed necessary for a BMS to come in, the requesting clinician will be asked to contact the on-call Microbiology BMS through the switchboard.

Samples for Microbiology, except for blood cultures, CSFs, urgent blood testing in cases of needlestick injury (NSI), and urgent antenatal screening for pregnant women arriving at delivery without prior antenatal testing, should not be sent to the laboratory after 21:30. Please refrigerate routine samples and send after 07:30 the following day. Any other samples which may need urgent testing out of hours require approval from the on-call Consultant Microbiologist before sending to the laboratory.

For all other samples

If investigations are **not** required for immediate patient management, do not contact the on-call BMS. Send the samples to Pathology and they will be processed, and results will be made available electronically. Routine enquiries made outside office hours run the risk of impeding on-call staff and delaying emergency results.

Blood cultures should be sent to the laboratory within 4 hours of sample collection. National recommendations state that there should be less than a 4-hour delay from collection to incubation for blood culture samples due to their clinical significance. If transport is delayed, store samples at room temperature; inoculated blood culture

bottles must NOT be refrigerated. Significant positive results will be telephoned by laboratory staff.

If additional tests are required on samples already sent to Pathology, an additional request card **must** be sent to verify the request.
Haematology and Chemical Pathology samples must be sent in separate bags to Microbiology samples.

Pathology Supplies

The following items may be requested:

Blood Bottles	FBC– Lavender
	Coagulation – Blue
	Transfusion – Pink
	SST (gel) – Gold
	Lithium Heparin – Green
	Plasma Glucose – Grey
	Trace Element – Dark blue
	Plain Lithium Heparin (for tb elispot) – Dark green
	Paediatric - White
	Paediatric - Pink
	Paediatric Blue
	Paediatric -Orange
	Paediatric – Red
	Paediatric -Gold
	Paediatric- Green
	Paediatric -Purple
	Paediatric Glucose – Yellow
Other Containers	Blood Culture Sets
	Blood Culture - Paediatric
	10ml Boric Acid Tube for Paediatric Urine samples
	U-bag (infant)
	White top universal container
	Blue top stool containers
	Sputum pots
	Formalin pots. State size required - 20ml,60ml,480ml, 2.5L, 5L, 10L or dry pot.
	BD Molecular Urine Transport Kit (CTGC Testing)
	BD Molecular Swab Collection Kit (CTGC Testing)

	Dermapak
	Faecal Immunochemical Test (FIT) Tube. Flat, green lid
	LBC kits (smear pot and brush)
Swabs	Black swabs (black swab, amies charcoal medium)
	Pernasal swabs (black swab, wire shaft)
	MRSA PCR swab (red top copan dual swab)
	Viral swabs- Red top (Viral PCR other than Flu/RSV)
	Flu/RSV (xpert viral transport) swabs
Forms	Pink blood forms
	Ante-natal request forms
	ICE request forms
	ICE request bags
	Blue and white manual request cards
	Blue Histopathology/ Cytology cards

Pathology supplies is not permanently staffed throughout the day and is unable to support immediate stock replenishment. Orders will not be dispatched at weekends.

Please order as below:

- **Routine** – Use the Pathology Supplies Order Form or email orders to Pathologysupplies@mkuh.nhs.uk. These orders will be dispatched within two working days.

- **Urgent** orders can be made by telephoning 01908 995793 or extension 85793 and leaving a message. Please note, this telephone is not staffed, and orders will be dispatched the next working day.

- **24-hour urine** containers are ordered by telephoning 01908 995768 or extension 85768.
  The container type must be stated, either plain or acidified. If this is unknown the test type must be given
  A patient's name **must** be given for any requested acidified container. The orders will be dispatched the next working day.

Pathology Porters will deliver supplies within the hospital. Hospital Transport will deliver to the GP Practices.

Request Cards

Request forms are only required for the Blood Transfusion department and when specified at the time of placing an order, for eCare Pathology orders.

Requests for investigations generated manually or via ICE must include a form or card.

For each patient, please use a separate request form or card for microbiology and Histopathology tests. Haematology and Chemical Pathology tests may be requested using the same form.

When using the ICE order communications system please use **all** the request forms printed by the system, ensuring that the correct specimen is attached to each form.

For requests made using the eCARE order communications system please print request cards when prompted by the system.

There are separate request cards for Cellular Pathology (blue) and Blood Transfusion (pink)- **however eCARE requesting for blood transfusion is preferred**.

A combined antenatal request form for Infectious Diseases, Sickle Cell and Thalassaemia in pregnancy is available.

Request cards for chromosomes and genetic markers are available directly from the Churchill Hospital, Oxford or can be printed from ICE.

The exact tests performed will be greatly influenced by the clinical details supplied. Request cards must be completed with:

- Patient's full name
- Hospital number or NHS number (if available)
- Date of birth
- Address of patient
- Patient's Consultant and/or GP (This information can be provided using a PID label, please ensure a label is placed on both copies of the joint request card)
- Name and contact details for the individual taking the sample.
- Destination for report
- Date and time of sample
- Clinical details including:
    - Clinical features including whether hospital or community acquired
    - Any history of infection with dangerous pathogens such as TB, Neisseria meningitidis, Brucella, Salmonella typhi

- Details of foreign travel
- Onset and duration of illness, especially for serology
- Details of recent, one week, current and intended chemotherapy
- Specify site from which samples were taken
- Details of other therapies

- For pre-op assessment samples state the surgical procedure
- GP patients – Please add a patient telephone number in the event of results produced out of hours being critically abnormal.

There are exceptions to the above:

- Blood Borne Virus Clinic: samples and cards are labelled with clinic number and date of birth only.
- Infectious diseases in pregnancy screening requests require the following information:
  - NHS number, MRN, Forename and Surname
  - Estimated Date of Delivery (EDD)
  - First line of address and Postcode
  - Date of Birth
  - GP name and/or code.
  - Name and location of requester
  - Maternity unit booked for delivery
  - Address for results and reports
  - Name and location of sample taker
  - Date and time of sample collection
  - Priority Status –
    - Initial antenatal screening sample
    - Repeat antenatal screening sample
    - Repeat sample to exclude recent infection
      Initial sample after previous decline
  - Examinations requested,
  - accept/decline for each examination
  - known positive/unknown status for each
  - Clinical indications for urgent testing if required. (NB for urgent testing please contact the laboratory by telephone).

High Risk Samples for known or suspected Hazard Group 3:

Specimens potentially infected, either known or suspected, with a Hazard Group 3 organism must be clearly marked as such, and the nature of the risk described.

The following sample types must be clearly identified:-

- Any material suspected to contain M. tuberculosis.
- Clinical specimens from known, suspect or at-risk patients to transmissible Spongiform Encephalopathy agents.
- Patients with suspected Typhoid or Brucellosis

This is not an exhaustive list please telephone Microbiology, on 58779 if you have any enquiries.

Labelling

- Label specimen and request card.
- Ensure to include any details of suspected illness/patient travel/symptoms
- Apply a **danger of infection** label to the specimen and request card, when necessary.
- Place the sample in the specimen compartment of the bag and seal.
- Samples and forms for Blood Transfusion must bear exactly the same information. If names are too long for the labels and are incomplete the remainder must be handwritten.

Sample Collection

For full sample acceptance criteria please see Appendix 1 of this document.

The minimum essential requirements for labelling samples are:

- Forename
- Surname
- Date of Birth
- NHS number or Hospital number or 1st line of address.
- Blood Transfusion samples from Acute Trust patients **must** be labelled with the Hospital number.

Additional information:

- Date and time of collection

- Identity and contact details of the sample taker.

Do not use Patient Identification (PID) labels on blood bottles.

Only labels that have been produced on demand from the Order Communication system may be used on blood bottles.

Blood Transfusion samples **must** be handwritten and signed by the person taking the sample.

It is the Sample Taker's responsibility to ensure the accuracy of information on both the sample and request card.

Samples and requests cards which are unlabelled or incorrectly labelled and cannot be identified will not be accepted for analysis.

Check expiry dates on all stock before using it and return to pathology if out of date stock discovered. Samples received in expired stock will not be processed.

All procedures carried out on a patient need the informed consent of the patient. For most routine laboratory procedures, consent can be inferred when the patient presents himself or herself at a laboratory / phlebotomy area / ward with a request form of for surgical procedure and willingly submits to the usual collecting procedure, for example, venepuncture or biopsy.

Patients in a hospital bed should normally be given the opportunity to refuse.

Each request accepted by the laboratory shall be considered an agreement. Samples and requests cards that are incorrectly or unlabelled, whereby unequivocal traceability of the sample, request and patient cannot be achieved will not be accepted for analysis.

Where necessary for patient care the laboratory will attempt communication with users to clarify the request.

Blood samples are received in containers, which may contain an anticoagulant. The purpose of an anticoagulant is to prevent the blood from clotting. Samples must be mixed after collection to avoid clotting.

The most common sample bottles are:

Bottle	Anticoagulant	Usage
Gold top (gel bottle)	No anticoagulant (clotted blood)	General Chemical Pathology requests

White top(paed)	No anticoagulant (clotted blood)	Paediatric Serum requests
Light Green top	Lithium Heparin	ITU, A&E *
Orange top	Lithium Heparin	Paediatric Plasma requests
Lavender top	Potassium EDTA	FBC, ESR, Malaria Parasites, GF screen, G6PD
Clear lavender top (paed)	Potassium EDTA	FBC, ESR, Malaria Parasites, GF screen, G6PD
Red top (neonates)	Potassium EDTA	FBC, Malaria Parasites, GF screen, G6PD (Not ESR)
Blue top	Sodium Citrate**	INR, APTT, Clotting Screen, Thrombophilia, Lupus, Factor assays.
Clear Blue top (paed)	Sodium Citrate**	INR, APTT, Clotting screen, Thrombophilia, Lupus, Factor assays.
Grey top	Sodium Fluoride/Potassium Oxalate	Lactate/Glucose
Yellow top (paed)	Sodium Fluoride	Lactate/Glucose (Paed)/Plasma Glucose
Pink top (round plastic bottom)	EDTA	Grouping/ Crossmatching
Pink top (plastic round bottom)	EDTA	Antenatal Grouping & Abs
Dark green top	Plain Lithium Heparin	IGRA tests

*These bottles are used for certain tests identified in the handbook please contact the laboratory to check procedures before commencing.

** Samples taken into citrate bottles must be filled to the frosted line, underfilled samples will be rejected.

It is essential to use the correct sample containers with the appropriate amount of blood. This ensures the correct blood-to-anticoagulant ratio and when necessary, minimises the risk of clotting.

Do not mix blood from one bottle with another. The wrong lid on the wrong bottle can also lead to contamination and erroneous results.

Gently mix the sample in the bottle after collection, using full inversions, as stated on the BD collection cards, seal the sample in the plastic bag attached to the card, or in a separated plastic bag for Cellular Pathology, and then despatch the sample as soon as possible.

Other sample containers are detailed later in the discipline-specific parts of this handbook.

Genetic Studies and Tissue Typing

Sample requirements will be found in the discipline sections of this handbook, i.e. Chromosomes - Chemical Pathology, HLA - Blood Transfusion etc.

Phlebotomy Service

A Phlebotomy service is provided to the wards by Pathology Monday to Friday 08:00 – 12:00.

One Phlebotomist is available in the afternoon to bleed patients not available in the morning.

The Phlebotomy service is reduced at weekends and on Bank Holidays, provided between 8 and 11am.

Phlebotomy is not provided to Campbell Centre or Marlborough House

When requesting Phlebotomy services please follow the below instructions

1. All tests should be ordered at once using the eCare system, this will allow all mandatory fields to be completed and ensures the correct samples are taken.
2. Select Phlebotomy List IP if you require a phlebotomist to take the sample.
3. Selecting URGENT requires the sample be taken by ward staff and brought immediately to the laboratory for processing.
4. Selecting ROUTINE requires the sample be taken by ward staff at a later point in the day and transported to the laboratory for processing.

To provide a service across the hospital Phlebotomists will only take samples where requests are generated using the Phlebotomy list.

If samples are requested before 8am they will be added to that day's round. Samples requested after 8am will be added to the next available phlebotomy round.

Phlebotomy is limited to 8 patients per ward at weekends. For tests requested on Friday the next available round may be Sunday.

Transport of samples

GP samples are collected from practices by community drivers at least once a day, some practices, at their request, have a later second collection.

Pathology porters collect routine samples from all wards mid-morning and from Outpatients twice a day as part of the ward round, when results and supplies will also be delivered.

CSF, high risk samples, samples in Formalin and Blood Gases must not be sent via the 'air tube'.

Other samples should be sent via the 'air tube' delivery system, instructions are on each station. The reliability of the 'air tube' system cannot be guaranteed so be mindful of this. If the 'air tube' is not functioning, urgent samples should be sent via the general portering system, the Pathology porters do not collect urgent samples.

Pathology samples must not be sent via post and will only be received at the samples reception point.

Pathology Reports

Pathology reports are printed centrally in Pathology and distributed only to agreed locations. All GP practices accept electronic download of Pathology results.

Computer System Enquiries

All authorised results for Haematology and Blood Transfusion, Chemical Pathology, Microbiology and Cellular Pathology are available via eCare/ ICE on the Hospital network. All Medical staff should have a password that enables them to access Pathology results. If you require further instruction on the use of eCare/ICE please contact the IT Training Department on 87000.

MICROBIOLOGY

Introduction

Please note the Microbiology service is not accredited to UKAS ISO 15189:2012

Microbiology provides services for:

1. Bacteriological and Virological diagnosis
2. Advice on antimicrobial treatment and prophylaxis
3. Advice on epidemiology and prevention of infection including control of Hospital infection

Taking samples

Appropriate timing of sample taking is crucial.

1. Please put the date and time taken on all request forms
2. For antibody tests put the onset date of the illness on the request form.
3. For antibody tests on patients in contact with infectious disease, give the date and nature of the contact.

Factors affecting tests:

1. Delayed transport will have a detrimental effect on microbiological investigations. Where delay is unavoidable most samples must be refrigerated. Blood Cultures and Chlamydia/Neisseria gonorrhoeae PCR should be stored at room temperature and urine MC&S samples in Boric Acid preservative are stable for up to 96 hours at room temperature.

2. Samples for culture should when possible be collected prior to the commencement of antibiotic therapy.

Requests for additional investigations:

Some investigations may be added following despatch of samples to the laboratory. These requests must be made within 48 hours of despatch and discussed with the laboratory technical staff. Tel 01908 995799. A request form must be sent for any add on test.

Please note that Microbiology are unable to share samples with Chemical Pathology or Haematology please ensure separate samples are sent in separate transport bags.

SPECIFIC NOTES

1. Antibiotic Assays

Vancomycin and Gentamicin assays are carried out by the Chemical Pathology Department. Other antibiotic assays are sent to the Microbiology Department and then to a referral laboratory for testing. Discuss with the Consultant Microbiologist before requesting.
The Consultant Microbiologist provides pre- and post- analysis interpretation and advice on all antibiotic assays regardless of which Pathology department analyses the sample. Users are encouraged to discuss referred antibiotic assays with the Consultant Microbiologist who will advise on the correct timing for sample collection and ensure that the laboratory is aware and plan for sample transport to the reference laboratory.

Vancomycin: Refer to the Trust Antibiotic Policy, available on the intranet, for therapeutic and monitoring guidelines

Gentamicin: Refer to the Trust Antibiotic Policy, available on the intranet, for therapeutic and monitoring guidelines

Instructions and timing of Serum Gentamicin Levels are given in the Gentamicin calculator which can be found on the Trust Intranet.

Teicoplanin: Tests are referred for testing. Please discuss with the Consultant Microbiologist before sending samples.

See also Antimicrobials Guidelines on the Intranet.

Referred Antibiotic assays available:
Amikacin
Chloramphenicol
Colistin
Cycloserine
Ethambutol
Flucytosine
Itraconazole
Streptomycin
Teicoplanin
Tobramycin
Voriconazole

Assays for other antimicrobials may be available if required. Please contact the Consultant Microbiologist to discuss.

For all antimicrobial assays:
Collect blood sample (minimum 1ml) into a gold topped bottle or plain white paediatric bottle.

Antimicrobial Assay Result Enquiries:
If it is necessary to enquire for a referred antibiotic assay result outside normal laboratory hours the reference laboratory can be contacted on 0117 414 6220 or on 0117 414 8469 between 09:00 and 14:00 on a Saturday

Advice can be given out-of-hours, by contacting the reference laboratory Hospital switchboard (0117 950 5050) and asking them to contact the on-call Medical Microbiologist.

2. Biopsies for Culture and Sensitivity

Collect specimens before antimicrobial therapy where possible.
Use aseptic technique.
Collect specimens into sterile plain (white topped) universal containers and place in sealed plastic bags.

If specimen is small, place in sterile water to prevent desiccation.
Note: Specimens received in formalin are not suitable for culture.

Suspected Legionella species (lung tissue and biopsy)
If specimen is small, place it in sterile water to prevent desiccation. Do **not** use saline, as it is known to be inhibitory to Legionella species.

3. Helicobacter Pylori Culture from Gastric Biopsy

This test can only be carried out by the Gastroenterology department by prior arrangement with the Microbiology Consultant.

Ideally biopsies should be taken before antimicrobial therapy is begun, however a ‘test and treat’ strategy for the diagnosis of H. pylori is recommend by NICE and therefore most samples referred for culture will be due to treatment failure. A period of at least two weeks should have elapsed since the last dose of antimicrobial therapy before the collection of the specimen.

Gastric biopsy specimens are usually taken from the gastric antrum at endoscopy, and sometimes from the main body of the stomach depending on location of inflammation. Duodenal biopsies will be taken in cases with duodenal ulcers.

The biopsy must be collected directly into sterile saline in a universal container.

Samples must reach the Microbiology department by 4pm on Monday to Thursday only.

4. Blood Cultures

Collect specimens before antimicrobial therapy where possible.
Collect specimens as soon as possible after the onset of clinical symptoms. Although blood can be sampled at any time, drawing blood at, or as soon as possible after a fever spike is optimal, except in endocarditis where timing is less important.

- The use of iodine-based disinfectants is not recommended for disinfection of the butyl rubber septum for some commercial systems as this may affect the septum's integrity.
- The use of blood collection adapters without 'winged' blood collection sets is not recommended as it is not possible to accurately judge the sample volume and there may be the potential for backflow of blood culture media to patient veins.
- If blood for other tests such as blood gases or ESR is to be taken at the same venepuncture, the blood culture bottles should be inoculated first to avoid contamination. It is preferable to take blood for culture separately.

A blood culture set is defined as one aerobic and one anaerobic bottle. For infants and neonates, a single paediatric bottle may be requested.

Sample Volume

Blood culture sets (Aerobic and Anaerobic) 8-10ml for each bottle.

Paediatric bottles 1-3ml

Take two consecutive sets from two separate venepuncture sites during any 24 hour period for each septic episode. For neonates, take a single aerobic bottle or special low volume bottle.

Take two sets during the first hour in cases of severe sepsis prior to commencing antibiotic treatment, provided this does not significantly delay antibiotic administration.

If one set is catheter drawn, draw at least one set for a peripheral vein.

Take at least three sets during a 24hr period where the patient has suspected infective endocarditis.

Specimens should be transported and processed as soon as possible to ensure receipt in the laboratory is within 4 hours. If Pathology reception is closed the night shift Biochemistry BMS should be contacted.

Blood culture samples should **not** be refrigerated.

Procedures	Notes:
• Two sets needed to evaluate sepsis. • 8-10ml of blood in each culture bottle for adults 1-3 ml in paediatric culture bottle	
Assemble Supplies: • Bottles, • Blood culture collection pack (available from Hospital stores), • Disposable tourniquet, • Vacutainer butterfly needles, Chlorhexidine/alcohol skin cleanser (chloraprep sepp/frepp), • Sanicloth for bottle tops	
Hand hygiene: • Wash hands prior to donning gloves before drawing cultures. • Use alcohol-based hand sanitizer (allow to dry).	Hand hygiene is proven to reduce spread of infection and blood culture contamination.
Prepare Skin: Peripheral Cultures • Select site of venepuncture: cleanse with soap and water if unusually dirty. • Wear non-sterile examination gloves. • Apply tourniquet, if necessary. • Cleanse venepuncture site with Chloraprep 1.5mls (Frepp). • Cleanse skin as per Chloraprep guidance. • Allow air drying (20 seconds).	• Reduce chance of false positives by reducing potential for sample to contact organisms on patient skin, central lines, or transferred from operator. • Do not blow or fan to speed drying site, can contaminate the cleansed area. Air drying can occur while culture bottles are being prepared. • Allows times for alcohol to act and avoids stinging from alcohol at site.
Prepare Culture Bottles • Flip off plastic lid. • Cleanse each rubber top with Chloraprep Sanicloth. • Ensure chlorhexidine/alcohol has evaporated before inoculation.	• Ensure sterile access to culture medium.

Drawing/Transfer of Peripheral Site Blood Cultures (Recommended) • Apply tourniquet if not already applied. Avoid contamination of prepped area with gloves or tourniquet. After cleansing site: cleanse gloved finger thoroughly with alcohol if it is necessary to touch venepuncture site. • Use a needle and syringe only where vacutainer system is unavailable. • Use single use adaptor for each patient when using vacutainer system. • Perform phlebotomy: release tourniquet and withdraw needle. Apply pressure to site and bandage/non-allergenic tape • Inoculate blood culture bottles: (aerobic bottle first (blue top) in the case of a set). • To avoid Needlestick injury, discard used sharps immediately into a designated sharps bin which has a Device for needle removal. Transfer blood from syringe to blood culture bottles using a new sterile needle attached to sample syringe.	• Reduce chance of transfer of contamination organisms from needle or butterfly into culture bottles by removing. This alone may reduce false positives by half. • Reduce chance of transfer of organisms from gloved finger to clean site. • Inoculate aerobic bottle first to avoid air entry to the anaerobic bottle.
• Affix patient label to each bottle with patient's name, hospital number, date and time of collection and send to lab using standard protocol for specimen submittal. • Blood cultures should be taken to Microbiology department within an hour of collection or sent in the pneumatic tube system. • Blood Cultures collected outside normal hours should be delivered and placed in the incubator next to the Blood Bank collection refrigerator located in the	• Assure right patient, right test. • Samples will be rejected if incompletely labelled. • To prevent breakage of specimen and for optimal incubation.

Pathology specimen reception room.	

5. Bone Marrow Cultures

Bone Marrow cultures For Mycobacteria, Typhoid and Brucella are usually unrewarding, discuss with Consultant Microbiologist before collection.

Bone marrow specimens should be submitted in sterile white topped universal containers sealed inside plastic bags for transport. In addition, inoculate a blood culture set at patients side.' Please Discuss with Consultant Microbiology prior to collection.

Bone marrow specimens for TB culture should be inoculated into Lithium Heparin vacutainer blood bottles without gel (dark green cap). A volume of at least 2ml is required. These will be referred to the Mycobacterium reference laboratory for TB culture.

6. Bronchoscopic samples

If possible collect samples before antimicrobial therapy is started.
Biopsy samples: bring upright in 0.5 ml saline in a sterile universal container or sputum container to laboratory.
BAL samples: send in sterile universal container.
Brush samples: send brush in sterile universal container.
To ensure urgent processing please contact the laboratory before sending these samples.

7. Catheters

Do not send urinary catheters, these are unsuitable for microbiological analysis. Send Mid-stream or Catheter Urine instead (see section 20). Urinary catheters will not be tested.

8. Cerebrospinal fluid (CSF)

For microscopy, culture and examination for Xanthochromia

Collect 4 specimens into sterile plain (white topped) universal containers, numbering the containers consecutively:

- First (label **1**) 1 ml
- Second (label **2**) 1 ml
- Third (label **3**) 1 ml
- Fourth (label **4**) 1 ml

- Send samples **1** and **3** for Microbiology investigation.
- Sample **2** should be sent for Biochemical analysis (protein and glucose).

- Sample **4** should be sent to Chemical Pathology for Xanthochromia investigation and **must be protected from light.**

For *Mycobacterium* species (TB investigation), collect at least 10ml into tube 3.

Minimum sample volumes required for additional CSF tests:

TB PCR: 0.5ml

CSF PCR panel (Viral, Bacterial and Fungal): 0.2ml

16s PCR: 0.2ml

Cryptococcal antigen testing: 0.1ml

Cryptococcal PCR: 0.2ml

For paediatric samples the volumes listed above are preferred, however if the volume collected is insufficient for all tests, we will liaise with the Consultant Microbiologist and requesting Clinician to decide which tests are prioritised.

Microbiology CSF samples must reach the laboratory within an hour.
Remember to take a simultaneous serum sample to measure glucose concentration.
For cytology (malignancies) send a minimum of 0.5 ml directly to Cellular Pathology unless the patient is known to have leukaemia or lymphoma, in which case the Haematology department should be consulted.

9. Chlamydia Trachomatis, Neisseria Gonorrhoeae and Trichomonas Vaginalis testing

PCR for Neisseria gonorrhoea, Chlamydia and Trichomonas vaginalis can be carried out simultaneously on the same sample. Request the combined Chlamydia/Gonorrhoea/Trichomonas PCR test. Please note PCR detection of Trichomonas vaginalis is only routinely available on samples from females.
If requesting Neisseria gonorrhoeae PCR, please also send a cervical or urethral swab for MC&S.

In women:

i) Endocervical swabs remain the best sample type
ii) Vaginal swabs (that may be self- taken) are acceptable
iii) Throat or Rectal swabs are acceptable

The testing of first catch urine specimens from women may result in lower sensitivity and is not recommended by national or European guidelines. In women, urine is not the optimal sample for *N. gonorrhoeae*/ *C. Trachomatis* / *Trichomonas vaginalis*

In men:

i) “First void” urine is the preferred sample
ii) Urethral swabs are acceptable

iii) Throat or Rectal swabs are acceptable

Sample Stability
Once the sample is in the BD sample buffer both swabs and urines are stable at 2-30ºC for 21 days. Urines received in anything other than the BD Molecular Urine Transport Kit will be rejected as the quality of the specimen cannot be assured.

Sample Collection

Endocervical or Low Vaginal Swabs:
Handling precautions for BD Molecular Swab Collection Kit: Do **not** pre-wet collection swabs with the collection media or use lubricant to aid passage before obtaining the specimen.

- Label the BD Molecular Swab Collection Kit tube with the patient's details.
- Holding the cap of the swab, remove the swab from its sheath. Please ensure not to touch the swab tip.
- To collect the vaginal specimen, insert the provided swab into the endocervical canal or approximately 2 inches (5 cm) from the vaginal opening. With the swab in place, gently rotate the swab for 10 to 15 seconds in one direction. Do not over rotate. Carefully withdraw the swab, avoiding any contact with the vaginal mucosa.
- Place the swab back into its sheath and cap it so it is secure.

Ensure that the tube is labelled with the Patient's details, swab site and date and time of specimen

NOTE: Swab samples with frank bloodstaining will not be tested, as the presence of blood can affect the result.

First Void Urine:

The patient should not have passed urine in the hour prior to collection of the sample.

- Collect the first 20-60 ml of the stream into a sterile universal container (the label is graduated, to give a guide to collection volume). This is **not** a mid-stream urine sample.
- Label a BD Molecular Urine transport kit tube with the Patient's details.

- Use the graduated pipette provided to gently mix the sample in the universal container.

- Using the same pipette transfer approximately 2 mL of the urine specimen from the universal into the BD Molecular Urine Transport kit tube. Use the graduations on the pipette as a guide, ensuring not to overfill or underfill the tube. Discard the pipette once the urine sample has been transferred.

- Tightly recap the tube. Check that the tube is labelled with patient information plus date and time of specimen. Be careful not to obscure any bar codes on the tube.

- Mix by inverting the tube 3 – 4 times. The specimen is now ready for transport.

Instructions for urine collection appear on the sample collection pack and are available in poster format from Microbiology.

10. Drains

Send drainage fluid in a plain (white topped) sterile universal container rather than drain tips. Transport to the laboratory as soon as possible.

11. Faeces

Collect into a sterile blue capped universal container. Minimum required for routine culture is 1-2g (approx. 1-2ml); but please note that for *C. difficile* testing samples less than 4ml will not be tested.

Please ensure that all details are on both the specimen and accompanying request form.

The following methods can be used to collect a specimen:

Contamination with urine should be avoided and the patient or carer should wear disposable gloves.

- Toilet paper can be crumpled into the toilet bowl or suspended across the toilet bowl in a cross to make a sling.

- A clean plastic container can be positioned in the toilet bowl.

- Cling film can be stretched across the top of the toilet bowl.

A portion of faeces can then be collected with a wooden tongue depressor or the spoon provided in the specimen pot and transferred to the specimen container. The specimen pot should then be sealed into the specimen bag.

All materials used to collect the sample should be placed in a plastic bag which is sealed before disposal in the refuse bin.

Up to three samples collected on different days may be necessary to exclude bacterial infections. Repeated sampling over longer periods may be necessary if *Giardiasis* is suspected, as intermittent excretion of cysts is not uncommon.

Routine specimens are cultured for *Salmonella spp., Shigella spp., Campylobacter spp.* and *E. coli O157*. A routine screening test is also applied for *Cryptosporidium spp*. if the sample is diarrhoeal. Other investigations will only be performed if indicated by the clinical history, erg. Rotavirus antigen, *Vibrio* culture.

For inpatients, routine culture will only be performed if the patient was admitted 3 days ago or less. For patients who have been inpatients for 4 days or more the first sample from each admission will be tested and subsequent samples will not be tested.

Microscopy for parasites: The examination for Ova, Cysts and parasites will only be performed on samples with the appropriate clinical or travel history.
Ideally three stool specimens collected over no more than a 10-day period. It is recommended that specimens are collected every other day. Unless the patient has severe diarrhoea or dysentery, no more than one specimen should be examined within a single 24-hour period, as shedding of cysts and ova tends to be intermittent. If *E. histolytica* or *G. duodenalis* are suspected and the first three specimens are negative, ideally three additional specimens should be submitted at weekly intervals. A 'sellotape preparation' using a pinworm collection device should be sent for threadworm investigations. Instructions for use are issued with each device. It is recommended that samples should be taken for at least four to six consecutive days. If the results of all these are negative the patient can be considered free from infection.

Pseudomembranous colitis/*Clostridium difficile* toxin A and B
Please ensure that you request *C. difficile* toxin where clinically indicated.
Samples will be tested a maximum of twice per episode of diarrhoea.
Samples taken less than 28 days after a positive *C. difficile* toxin test will not be processed.

A minimum of 4ml faeces must be sent for *C. difficile* testing. Smaller samples will not be tested.

Please discuss with the Consultant Microbiologist before sending samples for *C. difficile* on patients who are on NG or PEG feeds or have received laxative/aperients/enema or bowel prep in the last 24 hours.

12. Lines and shunts

Line tips e.g. CVP or Hickman lines, swabs of cannula insertion sites:

Collect specimens before starting antimicrobial therapy where possible.
Use aseptic technique.

Cannulae
Disinfect the skin around the cannula entry site, remove cannula using aseptic technique.

Cut off 4cm of the tip into a sterile white topped universal container using sterile scissors.

Place in sealed plastic bags for transport.

Cannulae should only be sent if there is evidence of infection. Swabs and blood cultures should also be submitted.

Swabs
Sample the inflamed area / exudate around the catheter insertion site using an Amies swab with charcoal medium.

Blood Cultures
At least two blood cultures should be obtained when catheter infection is suspected. One set should be collected by peripheral venepuncture and one through the vascular catheter.
Paediatric blood culture bottle - blood volume 0.5 - 5ml, ideal volume 1-3ml

13. MRSA

Sample collection: Use swabs with Amies charcoal transport medium. For sampling of skin surfaces, nose, and groin - sample collectors should moisten swabs in sterile water prior to swabbing skin surfaces. Take the moistened swab and roll it at the entrance of both sides of the nose, using the same swab for both nostrils. Return the swab to the transport tube. Send to the laboratory with a completed request form.

Patients:

- **Samples always collected:** Nose/ groin swabs (plus axilla and perineum swabs in neonates)
- **Samples collected where applicable:** Wounds, other skin lesions, insertion of IV catheters, tracheostomies, catheter urines and sputum.
- **Samples collected from patients with persistent nasal carriage:** Throat.

Staff:

- **Samples always collected:** Nose
- **Samples collected where appropriate:** Lesions, sites of abnormal skin, others as decided by the Infection Prevention and Control Team.

Follow up of new positive cases/screening of previous positives/transfers from other hospitals:

- **Samples always collected**: Nose/axilla/groin.
- **Samples collected where appropriate**: Wounds, other skin lesions, insertion sites of IV catheters, tracheostomies, catheter urines and sputum.

14. Screening for CPE (Carbapenemase producing Enterobacteriaceae)

Indications for screening are hospital treatment abroad, hospitalisation in an area known to have cases of CPE, previous CPE or close contact with a case.
For further guidance refer to the Infection Prevention and Control pages on the Trust Intranet.

- Rectal Swab- (standard bacteriological swab) should be taken with visible material identified. If it is not possible to obtain a rectal swab, a stool sample can be sent.

All specimens should be labelled on the form clearly as '**possible CPE colonisation or infection'.**

15. Screening for ESBL (Extended Spectrum Beta-Lactamase producers)

ESBL producing Enterobacteriaceae may be isolated from various specimens during routine processing.

Screening for ESBL producers is carried out for patients being repatriated to Neo-natal unit or as requested by the Consultant Microbiologist/Infection Control and Prevention team. **For further guidance refer to the Infection Prevention and Control pages on the Trust Intranet.**

16. Mycology

Mycology Tests are carried out by a reference laboratory.

Special specimen collection packs (Dermapak) are available from the laboratory.

Skin

Patients' skin and nails can be swabbed with 70% alcohol prior to collection of the specimen, this is especially important if creams, lotions or powders have been applied. The edges of skin lesions yield the greatest quantities of viable fungus. Lesions should be scraped with a blunt scalpel blade, collecting scrapings into a Dermapak. Label with the patient details and the sample site. Seal in a plastic bag for transport to the laboratory. If insufficient material can be obtained by scraping and being placed in a container, then a swab or sticky tape can be pressed on the lesion and transferred to a clean glass slide for transport to the laboratory ('stripping').

Nail

It should be specified whether the sample is from the fingernails or toenails. Material should be taken from any discoloured, dystrophic or brittle parts of the nail. The affected nail should be cut as far back as possible through the entire thickness and should include any crumbly material. Nail drills, scalpels and nail elevators may be helpful but must be sterilized between patients. When there is superficial involvement (as in white superficial onychomycosis) nail scrapings may be taken with a curette. If associated skin lesions are present samples from these are likely to be infected with the same organism and are more likely to give a positive culture. Sample from associated sites should be sent in separate packets. Label each packet clearly with the sample site. Place in sealed plastic bags for transport to the laboratory.

Hair

Samples from the scalp should include skin scales and hair stumps. Cut hairs are not suitable for direct examination as the infected area is usually close to the scalp surface. Scraping for direct examination is the preferable sample collection method, however plastic hairbrushes, scalp massage pads, swabs or plastic toothbrushes may be used to sample scalps for culture where there is little obvious scaling. If sufficiently long, hairs should be plucked with forceps and wrapped in black paper or commercial transport packs together with flakes of skin. Place the collection pack into a sealed plastic bag for transport to the laboratory.

Blood

Blood samples may be referred for Serum-Beta-Glucan or other fungal serology. See serology section.

17. Sputum

Sputa samples must be sent in sterile 60ml screw top sputum containers. Place in the bag attached to the request form with ‘DANGER OF INFECTION’ labels applied to specimen and form. The value of this specimen depends critically on the care taken to collect it. Do not send saliva. Salivary samples will not be tested. Indicate if the sample is a suction (endotracheal) sample. Make sure the lid or suction trap is firmly sealed.

Culture for TB will only be carried out if this is specifically indicated on the request form.
Early morning freshly expectorated sputum is recommended for *Mycobacterium* species.

For sputum specimens the material required is from the lower respiratory tract, expectorated by deep coughing. When the cough is dry, physiotherapy, postural drainage, or inhalation of an aerosol before expectoration may be helpful. Saliva and pernasal secretions are not suitable.

Ideally, a minimum volume of at least 1ml is required.

Sputum samples can be referred for *Pneumocystis jirovecii* (PCP) PCR if indicated. Please send a separate sample for this test.

18. Swabs

Collect specimens before antimicrobial therapy where possible.

For swabs which cannot be sent to the laboratory immediately, samples must be stored in a refrigerator.

Where possible send a specimen of pus in a sterile white topped universal container rather than a swab.

Moisten swabs before taking from dry areas of skin (if these need swabbing) with sterile water.

ENT swabs

Use Amies with Charcoal (black) swabs.

Genital tract swabs

Use Amies with Charcoal (black) swabs.

Ideally, inoculation of specimens for *N. gonorrhoeae* is made directly to culture media at the bedside and incubated without delay.

Transport time should be as short as possible.

High Vaginal Swabs (HVS)

HVS is not recommended in routine cases as it is unlikely to be of significant diagnostic value.

The situations where an HVS is indicated are:

- Postnatal infection
- Pre & post termination of pregnancy
- Pre & post-operative gynaecological surgery
- Acute presentation to emergency gynaecology or persistent/recurrent symptoms
- Symptoms not characteristic of Candida or BV

After the introduction of the speculum, the swab should be rolled firmly over the surface of the vaginal vault. The swab should then be placed in Amies transport medium with charcoal.

HVS is suitable for diagnosis of some gynaecological bacterial infections and yeasts. Microscopy is performed on all HVS samples using the Hayes Criteria to determine the presence of bacterial vaginosis morphotypes. Additional testing may be

performed if indicated by the clinical details. HVS is unsuitable for diagnosis of *Neisseria gonorrhoeae* infection.

Cervical Swabs
After introduction of the speculum to the vagina, the swab should be rotated inside the endocervix. The swab should then be placed in Amies transport medium with charcoal.

Cervical swabs will be tested for *Neisseria gonorrhoeae*. Additional testing may be performed if clinically indicated or if an HVS swab has not been received alongside the cervical swab.

Urethral Swabs
Contamination with micro-organisms from the vulva or the foreskin should be avoided.

Thin swabs are available for collection of specimens.

The patient should not have passed urine for at least one hour. For males, if a discharge is not apparent, attempts should be made to "milk" exudate from the penis. The swab is gently passed through the urethral meatus and rotated. Place the swab in Amies transport medium with charcoal.

Urethral swabs are suitable for diagnosis of *Neisseria gonorrhoeae*, and yeasts.

Rectal Swabs
Rectal swabs are taken via a proctoscope. Use swabs with Amies with charcoal transport medium.

Throat Swabs
Throat swabs should be taken from the tonsillar area and/or posterior pharynx avoiding the tongue and uvula.

Wound/Ulcer/Skin Swabs
Use swabs with Amies charcoal transport medium.
Note that all ulcers are invariably colonised by a polymicrobial flora, and swabs should only be taken if a clinical diagnosis of infection has been made.

For **Chlamydia PCR** see section 8.

19. Intrauterine Contraceptive Devices (IUCDs)
The entire device should be sent in a sterile, white topped universal container.

20. Fluids and Pus
These are taken from the fallopian tubes, tubo-ovarian and Bartholin's abscesses, etc. during surgery. Minimum volume 1ml. Collect into a sterile white topped

universal. Specimens should be transported and processed as soon as possible. If processing is delayed, refrigeration is preferable to storage at ambient temperature.

21. **Pernasal and postnasal swabs for whooping cough** – use pernasal swab with flexible ultrafine wire shaft Amies charcoal transport medium. Collect before antimicrobial therapy where possible.

A pernasal swab is inserted through a nostril and advanced along the floor of the nose until it reaches the nasopharynx. It has been suggested that the swab is held against the posterior nasopharynx for up to 30s or until the patient coughs. In practice, it is more likely that a patient will only be able to tolerate this for a few seconds.

22. Swabs for Viral investigation:

CMV PCR Swab
Saliva swab in viral transport medium

Herpes Simplex
Send swab from lesions in viral transport medium red capped tube with red liquid transport medium.

23. Nasopharyngeal swab for Respiratory Virus Detection

Nasopharyngeal swab
Using a GeneXpert nasopharyngeal virus collection kit, swab the nasopharynx.
Aseptically remove the cap from the tube of transport medium.
Insert the swab into the tube.
Break the swab shaft by bending it against the tube wall.
Replace the cap on the tube and close tightly.
Label with appropriate patient information.
Place into a plastic bag and transport to the laboratory.

A combined rapid PCR test for RSV, Flu A, Flu B and SARs-CoV-2 is performed in house.

An extended virus panel is available in selected cases. Please discuss with Consultant Microbiologist before sending samples.

24. SARs-CoV-2 PCR

SARs-CoV-2 rapid testing is available on site. This can be ordered as:

- An individual test,
- As part of a PCR test that includes RSV, Flu A, Flu B and SARs-CoV-2
- As part of the Extended Respiratory Virus PCR Panel test

Sample type is a combined nose and throat swab or Nasopharyngeal swab in virus transport medium, in a grip bag with absorbent pad, inside a Biohazard bag.

Use the swab provided to sample the site/area, then use the same swab to sample the nose. Full instructions for collecting samples are available on the Trust Intranet.

25. Urines

Collect specimens before antimicrobial therapy where possible.

Numbers and frequency of specimen collection are dependent on clinical condition of patient.

Urine samples requested for urine culture should be collected using a boric acid container. Fill the container to the line marked with the boric acid preservative, following the manufacturer's instructions. An underfilled boric acid container may result in increased inhibition of the sample, so caution should be exercised when interpreting results in these cases.

Paediatric urine samples received in plain, white-topped universal containers must have a minimum volume of 3ml to be accepted. Adult urine samples received in plain white topped universal containers will be rejected.

Containers and Kits:

All routine urine samples for Microscopy Culture and Susceptibility (MC&S) testing from patients over 5 years old should be collected into 10ml containers with boric acid, CE marked leak proof containers, filled to the line on the container and transported as soon as possible to the laboratory, in sealed plastic bags with the request form.
These containers are issued as a kit including plastic collection cup to aid filling the tube and avoid contamination of the outside of the container. For paediatric patients, 10ml boric acid containers are available. These must be filled to the line marked on the container.

Please ensure White top universal urine samples reach the laboratory within **one hour**, to ensure they are processed within a 4-hour window from collection to processing. If it is unlikely that the sample will be received in the laboratory within one hour or if collected between 20:30 and 08:30, please ensure to refrigerate the sample. If the sample is stored at room temperature or higher for more than 4 hours, the results obtained may not be accurate. Samples can be refrigerated for no longer than 48 hours before analysis.
Note: Reports of growth obtained from specimens not containing Boric acid should be correlated clinically.

Boric acid is a preservative (white powder) that maintains the integrity of the sample, by preventing overgrowth of microbes, for up to 96 hours at room temperature. By preserving the white blood cells, reducing the numbers of mixed and false positives, which in turn improves quality of patient care by reducing unnecessary antibiotic treatment. In the long term reduced antibiotic usage, will help to minimise the development of antibiotic resistance in the bacteria population of the hospital and local community.

White top universal specimens not containing Boric acid received >48 hours after collection will be rejected. Specimens in Boric acid containers received >96 hours after collection will be rejected.

Note: Boric acid may affect the results given by some brands of urinary dip sticks.

It is important that urines are collected in a manner which minimises contamination. Within the Trust, sterile Midstream Urine (MSU) collection containers are available from HSDU, in the community urines can be collected direct into the boric acid container or white topped container, or similar sterile vessel, as appropriate to testing.

Urine Microscopy, Culture & Susceptibility
Urine samples will be cultured only if this is indicated by the microscopy result or clinical information provided, for example pregnant or paediatric samples. If culture has been omitted a report is released with a comment ‘if culture still indicated based on clinical condition, please contact the laboratory as soon as possible. Provide the sample is in boric acid and less than 96 hours old, the specimen can be cultured.

Mid-stream urine (MSU)
MSU is the recommended routine collection method. A detailed patient information leaflet is available on the Trust intranet; ‘How to Collect a Urine Sample’ or can be supplied by the laboratory.

Periurethral cleaning is recommended (water is considered sufficient).

Mid-stream urines should be collected as follows:

(a) Carefully wash the external genitalia and dry with a clean towel.
(b) Start passing urine, allowing the first part to flow into the pan.
(c) Collect the next part of the specimen into the container (women should separate the labia with the fingers of the hand which is not holding the container)
(d) Screw the lid on firmly and label.

The first part of voided urine is discarded and, then without interrupting the flow, 20ml is collected into a red topped universal container with boric acid. The remaining

urine is discarded into the toilet. If boric acid preservative is used, white powder, the container is filled up to the mark in a similar manner and the contents mixed well.

Clean-Catch Urine

A reasonable alternative to MSU.

Periurethral cleaning is recommended. The whole specimen is collected and then a 20ml aliquot sent for examination in a red topped universal container with boric acid.

Suprapubic aspirate (SPA)

Minimum volume 1ml
Urine is obtained aseptically, directly from the bladder by aspiration with a needle and syringe. The use of this invasive procedure is usually reserved for clarification of equivocal results from voided urine (e.g. in infants and small children). Ultrasound guidance should be used to show presence of urine in the bladder before carrying out SPA. Use a white topped sterile universal and transport to the laboratory within one hour, mark urgent.

Catheter urine (CSU)

Minimum sample volume 20ml (fill to the line).
The sample may be obtained either from a transient ('in and out') catheterisation or from an indwelling catheter. In the latter case, the specimen is obtained aseptically from a sample port in the catheter tubing or by aseptic aspiration of the tubing. The specimen should not be obtained from the collection bag. Transfer the sample into a red topped universal container with boric acid.

Bag Urine

Minimum volume 1ml
Used commonly for infants and young children. The sterile bags are taped over the freshly cleaned and dried genitalia, and the collected urine is transferred to a sterile universal container. There are frequent problems of contamination with this method of collection.

Pad Urine

Minimum volume 1ml
An alternative to collecting bag urine from infants and young children. After washing the nappy area thoroughly, a pad is placed inside the nappy. As soon as the pad is wet with urine (but no faecal soiling), push the tip of a syringe into the pad and draw urine into the syringe. Transfer specimen to a sterile universal container. If difficulty is experienced in withdrawing urine, the wet fibres may be inserted into the syringe barrel and the urine squeezed directly into the container with the syringe plunger.

Ileal Conduit – Urostomy Urine

Minimum sample volume 20ml (fill to the line).

Urine is obtained via a catheter passed aseptically into the stomal opening after removal of the external appliance. Results from this type of specimen may be difficult to interpret.
Collect the sample into a red topped container with boric acid.

Cystoscopy Urine
Minimum volume 1ml
Urine is obtained directly from the bladder using a cystoscope. Use a white topped sterile universal and transport to the laboratory and mark urgent.

Ureteric Urine
Minimum volume 1ml
Paired urine samples are obtained from each ureter during cystoscopy via ureteric catheters inserted from the bladder.
Urine samples may also be sent following nephrostomy, other surgical procedures, or bladder washout. Use a white topped sterile universal and transport to the laboratory within 1 hour and mark urgent

Other Specimens
Minimum volume 1ml
Other specimens obtained during or as a result of surgery include those from ileal conduit, cystoscopy, nephrostomy and urostomy, prosthetic massage/secretions. Specimens may also be taken after bladder washout. Collect into a white topped container and transport to the laboratory within 2 hours.

Urine for *Salmonella typhi* and *Salmonella paratyphi* cultures
Minimum volume 1ml

Any urine samples from suspected cases or contacts of cases. Label the sample and form with danger of infection stickers and give relevant clinical details including travel history. Collect the sample into a white topped universal container.

Early morning urine for TB culture
Three entire, first voided, early morning urine specimens are required for culture for *M. tuberculosis.* Special containers are available from Pathology Supplies upon request. Label the sample and form with a danger of infection sticker.

Legionella Antigen:
Minimum volume 1ml in sterile white topped universal container or 20ml in red topped container (fill to line).
Detection of Legionella antigen in urine can confirm the diagnosis of Legionellosis. Urine should be sent in a sterile white topped universal container. Relevant clinical information including date of onset should be provided. Collect in either a sterile white topped universal container or a boric acid container, filled to line.

The samples can be stored at room temperature (15-30°C) if assayed within 24 hours of collection.

Alternatively, specimens may be stored at 2-8°C for up to 14 days or at -10°C to -20°C for longer periods before testing.

Pneumococcal Antigen
Minimum volume 1ml in sterile white topped universal container or 20ml in red topped container (fill to line).
Relevant clinical information and date of onset must be provided. Collect in a sterile white topped universal container or boric acid filled to line
Store at room temperature (, 15-30°C) if assayed within 24 hours of collection.
Alternatively, store urine at 2-8°C or frozen for up to 14 days before testing.

Urine for *Schistosoma Haematobium* Detection
Minimum volume 10ml in sterile white topped universal container.
Total urine collected between 10am and 2pm (period of maximum activity) is the preferred specimen, alternatively a 24-hour collection of terminal urine may be obtained.

It is preferable to obtain total urine collected over the time period10am to 2pm as it has been shown that a maximum concentration of eggs is excreted at this time. Sterile containers without Boric Acid must be used. In patients with haematuria, eggs may be found trapped in the blood and mucus in the terminal portion of the urine specimen.

For terminal urine collection, collect the last 10-20ml of urine each time of urination within one 24-hour period.

26. Virus Detection

Viral (Bacterial and Fungal also) PCR can be carried out on CSF samples collected into a sterile white topped universal container.

For herpes simplex PCR send swabs from lesions in Virus transport medium (red capped tube with red liquid transport medium).

Nasopharyngeal aspirate can be submitted for respiratory virus PCR.

Nose and throat swabs may be submitted for respiratory virus PCR.

CMV PCR can be carried out on urine or virus swabs.

Salivary swabs for CMV PCR (neonates and infants only).
Use a virus transport swab. Place the swab inside the baby's mouth between the lower gum and cheek for at least a minute. Once the tip is soaked place the swab in a tube with universal or virus transport medium (red capped tube with red liquid transport medium). If the baby is breast fed, then the swab should be taken at least 1 hour after feeding.

27. In House Microbiology Tests:

TEST	SAMPLE TYPE	CONTAINER	TURNAROUND TIMES (working days)	NOTES
AFB Microscopy	Sputum/other	Sputum pot	1	Positive results will be telephoned to Ward or clinician as soon as available
*Blood Culture	Blood Culture	Blood culture	5-7	Microscopy result will be telephoned to Ward or clinician as soon as available
Clostridium difficile toxin	Faeces	Blue top universal	<24 hours	Positive results will be telephoned to Ward as soon as available
CSF MC&S	CSF	Sterile White top Universal	Microscopy within 2 hours of sample collection Culture 16-72 hours	Telephone laboratory when sending. Microscopy result will be telephoned to ward or clinician as soon as available
CSF PCR Panel, Viral Bacterial and Fungal	CSF	Sterile plain universal	4 hours	Telephone laboratory
Flu A/B, RSV and SARS-CoV-2 PCR	NP swab, CNT swab	GeneXpert collection tube	<24 hours	Telephone laboratory
Helicobacter pylori Antigen	Faeces	Blue top universal	<24 hours	If required urgently – please contact the laboratory
Legionella Antigen	Urine	White topped universal	<24 hours	
MRSA culture	Nose/Other swab	Amies charcoal swab	2-5 days	
Norovirus PCR	Faeces	Blue top universal	<24 hours	
Pneumococcal antigen	Urine	White topped universal	<24 hours	
Extended Respiratory Virus Panel	NPA or NP swab, CNT swab	Swab in Virus transport	<24 hours	Telephone laboratory

TEST	SAMPLE TYPE	CONTAINER	TURNAROUND TIMES (working days)	NOTES
Faeces culture	Faeces	Blue top universal with spoon	2-5 days	
Ova, Cysts and Parasites including cryptosporidium and Giardia microscopy	Faeces	Blue top universal with spoon	2-5 days	
Sputum culture	Sputum/BAL	Sputum pot	2-5 days	7 days if *Burkholderia cepacia* culture is indicated
Swab culture	Swab	Amies charcoal swab	5 days	Longer if actinomyces or Fusobacterium culture is indicated
TB PCR with Rifampicin Resistance	Sputum	Sterile Sputum universal container	24 hours	
Urine Culture	Urine	Boric acid (red top) white top universal or 10ml tube	2-5 days	
Urine Microscopy	Urine	Boric acid (red top) white top universal or 10ml tube	<24 hours	

*Blood cultures are incubated for 5 days before being reported as negative. When a blood culture becomes positive the laboratory will telephone the requesting location (during core laboratory hours) or the appropriate Clinician (outside of core laboratory hours) as soon as possible, with details of organisms seen.

An interim report will be issued showing the microscopy result. The culture result, detailing any isolate with appropriate sensitivities will be sent as soon as available, normally 1-2 days later. The Consultant Microbiologists can advise on appropriate therapy pending the final report.

SAMPLE TYPE CODES

BAL	Bronchioalveolar lavage
BM	Bone Marrow
CB	Clotted blood. Gold cap.
CNT	Combined nose and throat swab
CSF	Cerebrospinal fluid
EDTA	EDTA blood. Purple cap.
F	Faeces

GBX	Gastric Biopsy
JASP	Joint Aspirate
LITH	Plain lithium heparin (no gel). Dark green cap
NP	Nasopharyngeal
SA	Spleen aspirate
SKB	Skin biopsy
SPU	Sputum
SW	Swab
TIS	Tissue
U	Urine
VS	Viral Swab

28. Viral and other infectious disease serology

All antibody tests require a 5 ml clotted blood tube.

Give as much relevant clinical history as possible, including the date of onset, details of any contact with known or suspected cases.

Ante-Natal Patient with rash illness/in contact with rash illness
Sera from pregnant women with rash/in contact with rash should be tested for Parvovirus IgG and IgM, and also for Rubella IgM and IgG is there is no clear history of past infection or full immunisation.

If there is contact with measles, immunity can also be tested, ideally within 6 days of the contact.

Varicella Zoster:
ICE request: VZV Contact Antenatal
eCARE request: VZV Antenatal Serology, blood

Parvovirus:
ICE request: Parvovirus Contact Antenatal
eCARE request: Parvovirus Antenatal Ab, blood

Rubella (patient with rash):
ICE request: Rubella ?infection
eCARE request: Rubella infection, blood

Rubella (contact):
ICE request: Rubella immunity
eCARE request: Rubella immunity, blood

Measles (immunity):
ICE request Measles immunity
eCARE request: Measles immunity, blood

Where a stored sample exists, the tests will be carried out on stored booking blood to demonstrate immunity prior to the contact or onset of rash. The current sample will also be tested if indicated.

Information required from the requester:

- Gestation of pregnancy (LMP date)
- Clinical features (type and distribution of rash, joint pain, lymphadenopathy)
- Date of onset
- History of rubella immunisation/antibody testing; date, place and results of testing
- History of contact with rash illness, type and date of contact

Routine infectious diseases in pregnancy (antenatal) screening
Samples should be collected into 5ml gold topped tubes.

The sample should normally be collected at the booking appointment.

Women who book antenatal care late (over 20 weeks gestation) have a higher risk of adverse outcomes including pre-term delivery. Screening tests will be performed promptly, either on the day of receipt or next working day if received out of hours. The laboratory **must** be informed.

Manual requests use the combined request form For Infectious Diseases, Sickle Cell and Thalassaemia in Pregnancy
ICE or eCARE: request Antenatal Infectious Disease Screening

Samples will be tested for HIV, Hepatitis B surface antigen and Syphilis antibodies unless declined by the patient.

Accept/Decline response for each test is captured on the hand-written request form or on eCare/ICE, along with known positive or unknown status for each infection. Declined tests are noted on the laboratory report.

During the requesting process the sample priority status will also be captured:

- Initial antenatal screening sample
- Repeat antenatal screening sample
- Repeat sample to exclude recent infection
- Initial sample after previous decline

Positive reports are copied to the Pre-Natal Screening Co-Ordinator as well as being notified to the Pre-Natal Screening team via email.

Any declined test, inconclusive result or inadequate sample is also notified via email to the Pre-Natal Screening team, to facilitate the timely collection of a repeat sample.

Samples received from patients more than 20 weeks gestation or presenting in labour with no prior screening results will be tested urgently and results made available within 48 hours of receipt in the laboratory, however the laboratory **must** be informed by telephone when such a sample is to be sent.

HIV Antibodies

ICE Request: HIV
eCARE Request: HIV 1 & HIV 2 Ag + Ab

It is the responsibility of the requesting clinician to obtain consent from the patient. If a sample is received in the laboratory, it will be assumed that consent has been obtained and the sample will be tested. The requesting doctor must arrange to convey the result to the patient.

Samples and request forms must be clearly labelled **danger of infection**. See 'Procedure for Sending Specimens with a Special Risk of Infection'.

Requesting of Hepatitis Tests:

5 ml of clotted blood is required where Hepatitis B or C is suspected or known, samples and request forms must be clearly labelled **danger of infection**.
Information required from the requesters:

- Full clinical details
- Date of onset
- Immunisation history
- Details of any inoculation injury, including the hepatitis status of the source, if known

Please specify which tests are required:

Hepatitis A:

- To test for immunity:
  - ICE - Hepatitis A immunity
  - eCARE - Hepatitis A total antibody blood

- To test for current or recent infection:
  - ICE - Hepatitis A IgM
  - eCARE - Hepatitis A IgM screen, blood

Hepatitis B:

To test for current or past Hepatitis B infection request the following:

- ICE - Hepatitis B ?infection

- eCARE - Hepatitis B infection screen, blood

Samples testing positive for either Hepatitis B core antibody or Hepatitis B surface antigen will go on to have further tests and may be referred to a reference laboratory for a full panel of infectivity markers.

If required, Hepatitis B core antibody and Hepatitis B surface antigen can be requested individually:

- For evidence of past or present infection of Hepatitis B core antibody
  - ICE - Hepatitis B core IgG
  - eCARE - Hepatitis B core IgG, blood
- To test for infectivity of Hepatitis B surface antigen
  - ICE - Hepatitis B surface Antigen
  - eCARE - Hepatitis B surface Ag, blood
- To test for immunity against Hepatitis B
  - ICE - Hepatitis B immunity
  - eCARE - Hepatitis B immunity, blood

Hepatitis C:

- For evidence of past or present infection- Hepatitis C IgG
  - ICE - Hepatitis C IgG
  - eCARE - Hepatitis C virus IgG, blood
- To test for infectivity - Hepatitis C RNA
  - ICE - Hepatitis C RNA
  - eCARE: - Hepatitis C virus RNA, blood
- Genotyping
  - ICE - Hepatitis C genotyping
  - eCARE - Hepatitis C virus genotyping, blood

Needlestick or Body Fluid Exposure:

The full policy on management of inoculation injury is available in the Trust Policy "Managing Exposures to Blood Borne Viruses" available on the Trust Intranet.

A clotted blood sample should be collected in a gold top tube.
Ensure that clinical details clearly state that this is a Needlestick sample and whether the sample is from the donor (source) or the recipient (victim). On eCare/ICE the tests can be found by searching for Needlestick.

- ICE- Needlestick Source Hep B, Hep C, HIV
  or Needlestick Recipient (Victim) blood
- eCARE - Needlestick Source blood
  or Needlestick Recipient blood

Needlestick recipient samples are not tested but are stored for two years.
Needlestick donor (source) samples are routinely tested for HIV, Hepatitis B surface antigen and Hepatitis C IgG. If the patient declines any of these tests, please state clearly in the clinical details.
Telephone the laboratory to ensure urgent processing of Needlestick donor samples.

29. TB T spot (Elispot) IGRA test

Samples must arrive in Microbiology by 2pm Monday to Thursday only.
For adults collect a minimum of 6ml blood in plain lithium heparin sample (dark green top, available from the laboratory upon request).
For paediatric patients from 2-9 years old: Minimum 2mls of blood in 2ml plain lithium heparin (light green translucent top). These samples are referred for testing.

- ICE - TB Elispot Test
- eCARE - TB Elispot, blood

30. In House Serological Tests

The Microbiology laboratory provides critical urgent testing for the following tests:

- **Human Immunodeficiency Virus antibody/antigen (HIV ab/ag) test**
- **Hepatitis C Viral serology (HCV)**
- **Hepatitis B Surface antigen (HBsAg)**
- **Varicella Zoster Virus (VZV) IgG**

Please ensure the request for an urgent test is communicated to the Microbiology laboratory and if the result is required out of routine work hours, please ensure agreement has been obtained from the Microbiology Consultants prior to sending the sample.

The recommended sample type for testing is a **Gold top clotted blood** tube.
Positive results will be communicated by the Microbiology Consultants.
Results for urgent test can be expected within 4 hours of sample receipt.

Please note all serology tests may require referral for confirmation of in-house results, in which case the turnaround time will be extended.

31. Referred Microbiology/Serology tests:

TEST	SAMPLE TYPE	REFERRAL LAB	TURNAROUND TIMES (working days)	NOTES
16S PCR	CSF	MIC	48 hours- 7 days	
Acanthamoeba PCR	Corneal scrape, Eye swab, Contact lens solution, CSF	MIC	7 days	
Acyclovir Assay	CB	BRS	Same day result by phone	
Adenovirus PCR (Rotavirus, Adenovirus, Sapovirus and Astroviruses)	Stool	BRI	12 days	
Adenovirus PCR	EDTA Eye swab	JRH	7 days	
Adenovirus PCR	CSF NPA, nose and throat sample	LEE	5 days	
Alphavirus Serology	CB	POR	15 days	
Amikacin Assay	CB	BRS	Same day result by phone	
Amoebic F.A.T	CB	HTD	10 days	
Antenatal Infectious Disease Screen (IDPS)	CB	JRH	≤8 days excluding any referred test	Urgent in-house testing is provided for some tests in the screen.
Anthrax Investigation	Biopsy, Eschar, washings, culture	POR	10 days	Discuss with Consultant Microbiologist.
Anti-DNase B and ASO (Anti-Streptolysin)	CB	BRI	6 days	
Arbovirus Serology	CB, EDTA, CSF	POR	15 days	CSF (must be accompanied with serum) min. 600ul of serum required for geographic panel.
Aspergillus Antigen (Galactomannan)/PCR	CB/EDTA/BAL/CSF	BML	10 days	
Aspergillus Precipitin	CB	CHU	14 days	
Avian Precipitins (Budgie, Pigeon)	CB	CAR	14 days	
Bartonella RNA PCR	CB Aqueous fluid; EDTA Whole Blood; Pus; Tissue; Tissue Biopsies; Vitreous Fluid;	MIC	4 days	

TEST	SAMPLE TYPE	REFERRAL LAB	TURNAROUND TIMES (working days)	NOTES
Bartonella Serology	CB	HSL	7 days	
Bordetella PCR	Sterile site samples (Pus, Tissue, CSF, Blood)	MIC	2 days	Serology no longer performed. Request 16S rRNA gene PCR & Sequencing.
Bordetella pertussis Culture	Pernasal swab (Amies wire shaft charcoal swab)	JRH	10 days	
Bordetella pertussis Serology	CB	RSI	10 days	
Brucella Serology	CB	LIV	7 days	Specify for B. canis vs Brucella.
Campylobacter Serology	CB	PRE	7 days	
Chlamydia/Gonorrhoeae/ Trichomonas PCR	Swabs from: Cervical, Eye, High Vaginal, Low Vaginal, Rectal, Throat, Urethral in Green BD Molecular Kit and Urine (males) In BD Yellow Molecular Kit	JRH	7 days	Trichomonas testing only routinely provided for females.
Candida Precipitins	CB	BRI	14 days	
Chlamydia Serology (Genital)	CB	STB	7 days	
Chlamydia Serology and PCR (Respiratory)	CB	BRI	7 days	
Chlamydia Typing LGV	Rectal swab (chlamydia tube)	STB	7 days	
Chloramphenicol Assay	CB	BRS	Same day result by phone	Not tested on Saturday without prior arrangement. Ensure sample is protected from direct sunlight.
Creutzfeldt-Jakob Disease (CJD)	CSF	TSE	Contact laboratory	Discuss with Consultant Microbiologist before sending sample.
Clostridium perfringens Toxin	Aliquot of Stool sample	GBRU	14 days	
CMV IgG & IgM	CB	JRH	5 days	
CMV PCR	U, EDTA, CB, VS	JRH	3 days	
Colistin Assay	CB	BRS	Same day result by phone	
Coxiella (Q Fever) Serology	CB, EDTA	POR	5 days	
Cryptococcal Antigen	CSF CB	BML	7 days	
Cryptosporidium Referral	F	CRU	3 days	
Cycloserine Assay	CB	BRS	Same day result by phone	
Cysticercosis Referral	CB, CSF, F	HTD	10 days	
Dengue Fever	CB	POR	5 days	

TEST	SAMPLE TYPE	REFERRAL LAB	TURNAROUND TIMES (working days)	NOTES
Dermatophyte Culture (Mycology)	Skin Scrapings, Nail Clippings	JRH	10-30 days	
Diphtheria Serology	CB	RSI	21 days	
E. coli O157 Serology	CB	LGP	8 days	
EBV EBNA / VCG / VCM Serology	CB	JRH	5 days	
EBV PCR	EDTA	JRH	3 days	
Echovirus Serology	CB	EPS	8 days	
Enterovirus Detection	CSF, F, VS	EPS	7 days	
Ethambutol Assay	CB	BRS	Same day result by phone	
Filarial Serology	CB	HTD	10 days	
Flavivirus Serology	CB, EDTA, CSF	POR	5 days	
Flucytosine Assay	CB	BRS	Same day result by phone	
Galactomannan	CB, BAL	LRI	5 days	
Helicobacter pylori Culture	GBX (Gastric biopsy specimens)	LEP	15 days	Samples should be taken between Monday to Thursday.
Haemophilus Antibody	CB	CHU	7 days	
Hepatitis A Serology	CB	JRH	5 days	
Hepatitis B Serology	CB	JRH	5 days	
Hepatitis B Confirmation	CB	VRD	9 days	
Hepatitis B DNA – For Health Worker	CB	BIR	8 days	
Hepatitis B Genotype	EDTA	VRD	28 days	
Hepatitis B Viral Load	EDTA	JRH	14 days	
Hepatitis C Serology	CB	JRH	5 days	
Hepatitis C Genotyping	EDTA or CB	VRD	21 days	
Hepatitis C RNA (Viral Load) Qualitative/Quantitative	CB	JRH	8 days	
Hepatitis D Serology	Serum	VRD	8 days	
Hepatitis D (Delta) Referral	CB	VRD	15 days	
Hepatitis D RNA	EDTA	VRD	Contact lab	
Hepatitis E Serology	CB, EDTA	VRD	8 days	
Hepatitis E RNA	EDTA, F	VRD	Contact laboratory	
Herpes IgG Serology	CB	JRH	7 days	
Herpes Simplex PCR	VS, CSF	LEE	14 days	
Herpes Type Specific Serology	CB	MAN	7 days	
Histoplasmosis Serology	CB	BRI	7 days	
HIV Screen (1/2/p24)	CB	JRH	5 days	
HIV Genotypic Resistance	EDTA	BIR	5-20 days	
HIV Trofile Test (Tropism)	EDTA	BIR	5-20 days	

TEST	SAMPLE TYPE	REFERRAL LAB	TURNAROUND TIMES (working days)	NOTES
HIV Viral Load	EDTA	JRH	10 days	
HIV-2 Viral Load	EDTA	BART	14 days	
HTLV	CB, EDTA (Serology/PCR)	VRD	8 days	
Human Herpes Virus 6 PCR and Typing	CSF, CB, EDTA (Paediatrics only)	VRD	Contact laboratory	
Human Herpes Virus 8 PCR	CB, EDTA	VRD	15 days	
Hydatid Serology	CB, CSF, Cyst Fluid	HTD	10 days	Cyst fluid must be kept at room temp. and arrive to HTD within 24hrs.
Itraconazole Assay	CB	BRS	Same day result by phone	Only if advanced warning given.
Isavuconazole Assay	CB	BRS	Same day result by phone	Only if advanced warning given.
JC Virus PCR	CSF	LEE	10 days	
Legionella Serology	CB	RSI	8 days	
Legionella Culture	SP, BAL	JRH	14 days	
Leishmania PCR and Culture	EDTA	HTD	20 days	
Leptospira PCR	CB, EDTA, Urine, CSF	POR	4 days	
Lyme Disease Serology	CB	POR	5 days	
Lyme Disease PCR	EDTA, Joint fluid, Tissue biopsy, CSF	POR	7 days	
Measles IgG Serology Immunity	CB	JRH	5 days	
Measles Viral PCR	VS	CAM	7 days	
Meningococcal PCR	CB, Plasms, CSF, Sterile Fluid	MAN	7 days	
MERS CoV	Discuss with Consultant Microbiologist.	BIR	Contact laboratory	Contact lab prior to collection.
Monkeypox PCR (Clade II)	VS only	JRH	Contact laboratory	
Monkey Pox Clade I (HCID)	VS only	RIPL	Contact laboratory	must be discussed with the Imported Fever service on 0844 7788990 prior to sending the sample.
Mumps IgG Immunity	CB	JRH	5 days	
Mycoplasma Genitalium PCR	Urine, Dry swab ONLY	JRH	5 days	
Norovirus PCR Community	F	CAM	2 days	
Parasite Serology	CB	HTD	7-15 days	Specify which parasite required: E. histolytica, Acanthamoeba, Cysticercosis, E. granulosus, F. hepatica, Filaria, Giardia,

TEST	SAMPLE TYPE	REFERRAL LAB	TURNAROUND TIMES (working days)	NOTES
				Leishmania, Schistosoma, Strongyloides, Toxocara, Toxoplasma, Trichinella, nematodes VLM
Parvovirus Antenatal	CB	JRH	5 days	
Parvovirus Serology	CB	JRH	7 days	
Parvovirus PCR	EDTA, CB, Amniotic fluid, placenta, foetal tissue (frozen)	JRH	10 days	
Phlebovirus Serology	CB	POR	2-5 days	
Pneumococcal Antibodies	CB	CHU	7 days	
Pneumococcal PCR	CB, Plasms, CSF, Sterile Fluid	MAN	2 days	
Pneumocystic carinii/jiroveci PCR	Sputum, BAL	MIC	3 days	
Polyomavirus JC Virus	CSF	JRH	10 days	Please specify if patient is immunocompromised and has PML.
Proviral HIV	EDTA	VRD	14 days	
Rabies immunity	CB, EDTA	VET	Contact laboratory	
Rickettsia Serology	CB	POR	5 days	
Rubella IgG & IgM	CB	JRH	5 days	
Rubella Referral	CB	VRD	2 days	
Schistosomiasis Serology	CB (6 weeks post exposure)	HTD	7 days	
Scrub Typhus (Orientia tsutsugamushi)	CB	POR	7 days	
SARS CoV-2 (Covid-19) Antibody	CB	JRH	7 days	
Serum Beta-Glucan	CB	LRI	7 days	
Streptomycin Assay	CB	BRS	Same day result by phone	
Strongyloides Serology	CB	HTD	7 days	
Syphilis Serology	CB	JRH	5 days	
Syphilis Referral	CB	STB	7 days	
TB Culture (Mycobacterium tuberculosis culture)	Sputum, Sterile fluid: BAL, Pleural, Ascitic, Urine, Tissues	JRH	8-12 weeks	
TB Blood or Bone marrow culture	LITH	MRU	8 weeks	
TB Elispot	LITH	ODL	3 days	Dispatch Mon –Thu by 3pm.
TB PCR	Non-pulmonary SP	MRU	1 day	
TB PCR with Rifampicin Resistance	Wax sample from Histology	LEE	7 days	
Teicoplanin Assay	CB	BRS	Same day result by phone	Only if advanced warning given.

TEST	SAMPLE TYPE	REFERRAL LAB	TURNAROUND TIMES (working days)	NOTES
Tetanus Antibodies	CB	CHU	7 days	
Thermophilic Precipitins	CB	CHU	7 days	
Tobramycin Assay	CB	BRS	Same day result by phone	
Toxocara Antibodies	CB	HTD	7 days	
Toxoplasma Serology	CB	JRH	3 days	
Toxoplasma Referral	CB	SWA	10 days	
Trichinella Referral	CB	HTD	7 days	
Trypanosoma brucei	CB, CSF if indicated	HTD	10 days	
Trypanosome Serology	CB	HTD	10 days	
Viral Haemorrhagic Fever (VHF) High Consequence infectious Diseases (HCID)	EDTA, CB, Urine (PCR) Semen (Ebola PCR), Throat swab (Lassa virus)	POR	10-15 days	Discuss with Consultant Microbiologist before sending sample.
Viral PCR	VS	LEE	14 days	
Voriconazole Assay	CB	BRS	Same day result by phone	Only if advance warning given
VZV IgG	CB	JRH	7 days	
VZV IgM	CB	EPS	5 days	
WORM ID	WORM	HTD	5 days	
Yellow Fever Serology and PCR	CB, EDTA, CSF and Tissue (For PCR only)	POR	4 days	
ZIKA Virus	CB, EDTA, Urine (min 1ml) or Semen, Amniotic Fluid, Saliva swabs (For PCR only)	POR	7 days	
? Query Outbreak Samples (Enteric and Non-enteric investigations i.e., Influenza, Norovirus)	Contact laboratory.	CAM	Contact laboratory.	

* From receipt in referral laboratory

SAMPLE TYPE CODES

BAL	Bronchioalveolar lavage
BM	Bone Marrow
CB	Clotted blood. Gold cap.
CNT	Combined Nose and Throat (Covid-19)
CSF	Cerebrospinal fluid
EDTA	EDTA blood. Purple cap.
F	Faeces
GBX	Gastric Biopsy
JASP	Joint Aspirate
LH	Plain lithium heparin (no gel). Dark green cap

SA	Spleen aspirate
SKB	Skin biopsy
SP	Sputum
SW	Swab
TIS	Tissue
U	Urine
VS	Viral Swab

32. Microbiology Referral Laboratories

WinPath Code:	Laboratory:
ANU	PHE Anaerobe Reference Unit, Public Health Wales Microbiology Cardiff, University Hospital of Wales, Heath Park, Cardiff, CF14 4XW Phone:
ARU	Antimicrobial resistance and healthcare associated infections (AMRHAI), Public Health England, 61 Colindale Avenue, London, NW9 5EQ Phone:
BAR	Public Health England National Mycobacterium Reference Services – South (NMRL), National Infection Service, 61 Colindale Avenue, London NW9 5HT
BIR	Public health laboratory Birmingham, Heart of England NHS Foundation Trust, Bordesley Green East, Birmingham, B9 5SS
BML	National Mycology Reference Laboratory, Myrtle Road, Kingsdown, Bristol, BS2 8EL
BRI	Public health laboratory Bristol, Myrtle Road, Kingsdown, Bristol, BS2 8EL
BRS	Antimicrobial Reference Laboratory Level 2, Phase 1, Pathology Sciences Building, Southmead Hospital Westbury-on-Trym Bristol, BS10 5NB, 0117 4146269 / 4146220
CAM	Clinical Microbiology and Public Health Laboratory (CMPHL), CMPHL Level 6, Box 236, Addenbrookes Hospital, Cambridge, CB2 0QW
CHU	Immunology Dept., Churchill Hospital, Old Road, Headington, Oxford. OX3 7LJ
CRU	Cryptosporidium Reference Unit, Public Health Wales Microbiology ABM, Singleton Hospital, Sgeti, Swansea, SA2 8QA
DIP	Respiratory and vaccine preventable bacteria reference unit (RVPBRU), Public Health England, 61 Colindale Avenue, London, NW9 5EQ
EPS	Virology Department, St Helier Hospital and Queen Mary's Hospital for Children, Wrythe Lane, Carshalton, Surrey, SM5 1AA
FSM	Food, Water and Environmental Microbiology Laboratory, London UK Health Security Agency 61 Colindale Avenue London NW9 5EQ
GBRU	Gastrointestinal bacteria reference unit (GBRU), Public Health England, 61 Colindale Avenue, London, NW9 5EQ

GOS	Microbiology Laboratory, Level 4, Camelia Botnar Laboratories, Great Ormond Street Hospital for Children NHS Trust, Great Ormond Street, London, WC1N 3JH
HTD	National parasitology reference laboratory (NPRL), Department of Clinical Parasitology, Hospital for Tropical Diseases, 3rd floor Mortimer Market Centre, Mortimer Market, London, WC1E 6JB
LEE	Department of Microbiology, Old Medical School, Leeds General Infirmary, Thorseby Place, Leeds, LS1 3EX
LGP	Gastrointestinal bacteria reference unit (GBRU), Public Health England, 61 Colindale Avenue, London, NW9 5EQ
LHI	Antimicrobial resistance and healthcare associated infections (AMRHAI), Public Health England, 61 Colindale Avenue, London, NW9 5EQ
LIV	Brucella reference unit, Liverpool Clinical Laboratories, Virology Department, Royal Liverpool and Broadgreen University Hospital NHS Trust, Prescott Street, Liverpool, L9 8XP
LRI	Clinical Microbiology University Hospitals of Leicester NHS Trust, Level 5 Sandringham Building, Leicester Royal Infirmary, Infirmary Square Leicester, LE1 5WW
MAN	Meningococcal reference unit (Men RU) Manchester, Clinical Sciences Building 2, Manchester Royal Infirmary, Oxford Road, Manchester, M13 9WL
MIC	Micropathology Ltd, University of Warwick Science Park, Venture Centre, Sir William Lyons Road, Coventry, CV4 7EZ,
MRU	National Mycobacterium Reference Laboratory (NMRL), Abernethy Building, Institute of Cell and Molecular Science (ICMS), 2 Newark Street, London, E1 2AT
MYC	Public Health England National Mycobacterium Reference Services – South (NMRL), National Infection Service, 61 Colindale Avenue, London NW9 5HT
NEW	PHE Newcastle Molecular Laboratory, Newcastle, Royal Victoria Infirmary, Newcastle upon Tyne, NE1 4LP
NOR	Health Protection Agency, Norfolk and Norwich University Hospital, Colney Lane, Norwich, NR4 7UY
ODL	Oxford Diagnostic Laboratories, Oxford Immunotec Ltd, 94C Innovation Drive, Milton Park, Abingdon, Oxfordshire, OX14 4RZ
POR	Rare and imported pathogens laboratory (RIPL), Public Health England, Manor Farm Road, Porton Down, Wiltshire, SP4 0JG
PRE	Food, water and environmental microbiology laboratory Preston, Royal Preston Hospital, Sharoe Green Lane, Fulwood, Preston, PR2 9HT
RSI	Respiratory and vaccine preventable bacteria reference unit (RVPBRU), Public Health England, 61 Colindale Avenue, London, NW9 5EQ
RFH	HSL Pathology, Sample Reception, Ground Floor, Halo Building, Flaxman Terrace, Royal Free London Hospital NHS FT, London, WC1H 9AJ
STB	Infections Sciences, Pathology Sciences Building, Southmead Hospital, Bristol. BS10 5NB
SWA	Toxoplasma reference laboratory (TRL), Department of Microbiology, Singleton Hospital, Sgeti, Swansea, SA2 8QA
TSE	Virus Reference Department (VRD), Public Health England, 61 Colindale Avenue, London, NW9 5HT

UCH	Chlamydia Laboratory, Clinical Microbiology and Virology, University College London Hospitals NHS Foundation Trust, 60 Whitfield Street, London, W1T 4EU
UCV	Virology Laboratory, Clinical Microbiology and Virology, University College London Hospitals NHS Foundation Trust, 60 Whitfield Street, London, W1T 4EU
VET	Sample Reception, AHVLA, Weybridge, New Haw, Addlestone, Surrey, KT15 3NB
VJR	Virology, John Radcliffe Hospital, Headley Way, Headington, Oxford, OX3 9DU
VRD	Virus Reference Department (VRD), Public Health England, 61 Colindale Avenue, London, NW9 5HT
Edinburgh	The National Creutzfeldt-Jakob Disease Research & Surveillance UnitBryan Matthews Building Western General Hospital, Crewe Road, Edinburgh EH4 2XU, Main Office +44 (0)131 537 1980/2128/3103 Neuropathology Laboratory +44 (0)131 537 3084, CSF Referrals +44 (0)131 537 1980 Email: loth.securecjd@nhslothian.scot.nhs.uk : Email: contact.cjd@ed.ac.uk (for general enquiries)

HAEMATOLOGY AND BLOOD TRANSFUSION

Introduction

Haematology offers both an analytical and clinical service. Clinical follow up is instigated when necessary. Most routine tests are performed and reported on the same day. Turnaround times for specific tests may vary and are available from the laboratory on request. Significantly abnormal results are telephoned, please see appendix 2.

The Consultant Haematologists operate out-patient clinics and admit patients to Ward 25 at Milton Keynes Hospital. A unit for day attendees is also currently based in the Macmillan Unit and Ward 25.

Consultant Immunology cover is provided by Oxford University Hospitals.

Anticoagulant Therapy

In-Patients

Prior discussion of the planned perioperative anticoagulant regime with the Haematology consultant and relevant physician and surgeon is helpful. A protocol is available in the Haematology Department for patients with atrial fibrillation, artificial heart valve or recurrent DVT requiring surgery. Please contact ext. 85814 or 85815 for a copy.

Discuss increased risk of bleeding/thrombosis with the patient.

Many surgical procedures (but not closed biopsies) can be performed with an INR of around 1.5 - 2.0.

If surgery is planned and continued anticoagulant cover is necessary, aim to gradually reduce the INR to cover the operation. Some patients will require the Warfarin to be stopped and intravenous Heparin instituted to cover the perioperative period.

If urgent surgery is required, and the INR is greater than 2.0 the Warfarin can be temporarily reversed with Prothrombin Complex. In all cases contact the duty Consultant Haematologist via switchboard.

Anticoagulant Clinic

To arrange outpatient anticoagulation control please phone the Haematology secretaries on extension 85814 or 85815. An Anticoagulation Clinic referral form (i.e. Anticoagulation chart) will need to be completed and the following information given:

1) The patient's name
2) Patient's address (is hospital transport required?)
3) Hospital number
4) Indication for anticoagulation
5) Desired INR
6) Duration of anticoagulation
7) Recent Warfarin doses and INR results.
8) GP
9) Other medication

Generally, patients will only be seen in the anti-coagulant clinic if the GP has been asked and is unwilling to anti-coagulate the patient. Patients can only be seen if they are stable and require not more than weekly INRs.

Investigation of Patients with Thrombophilia

If a thrombophilia screen is required, please arrange referral by writing to the Haematology Department with the personal and family history and whether VTE (venous thrombo-embolism) was spontaneous or precipitated (please give details).

Note: Samples sent for thrombophilia screening from sources other than the Haematology Clinic will not be processed by the laboratory unless previously agreed.

Thrombophilia Screening Guidelines:

Ia) Unprovoked, recurrent or hormone related venous thrombo-embolism (VTE) **plus** a positive family history **or** in a patient less than 50 years old with children or siblings – **Full screen**. (If no positive family history and not less than 50 years with children or siblings, just do lupus anticoagulant (L.I) and anticardiolipin antibody testing (ACA).

Ib) Provoked VTE in a woman planning to be or currently pregnant – **Full screen**.

Ic) Family history of unprovoked, recurrent or hormone related VTE in a relative with a known thrombophilic abnormality identified – **Partial screen** (no lupus inhibitor screen or anticardiolipin studies).

IIa) Stroke in a patient younger than 50 years old – lupus inhibitor screen and anticardiolipin antibody screen

IIb) Three or more pregnancy losses **or** late (> 20 weeks) unexplained foetal loss – **Full screen**

Full Screen	Partial Screen
Full Blood Count	Full Blood Count
Activated Partial Thromboplastin Time	Activated Partial Thromboplastin Time
Prothrombin Time + Thrombin Time	Prothrombin Time + Thrombin Time
Protein C, Free Protein S	Protein C, Free Protein S
Anti-thrombin III	Anti-thrombin III
Factor V Leiden + PT G20201A Mutation	Factor V Leiden + PT G20201A Mutation
Lupus Inhibitor Screen	
Anticardiolipin antibody	

References:

1. *Walker ID, Greaves M, Preston FE. Guideline: investigation and management of heritable thrombophilia. Br J Haematol, 2001 114: 512-28.*
2. *Personal Communication. David Keeling, Churchill Hospital, Oxford, May 2004)*

Guidelines for D-Dimer Testing in Suspected Deep Vein Thrombosis (DVT)

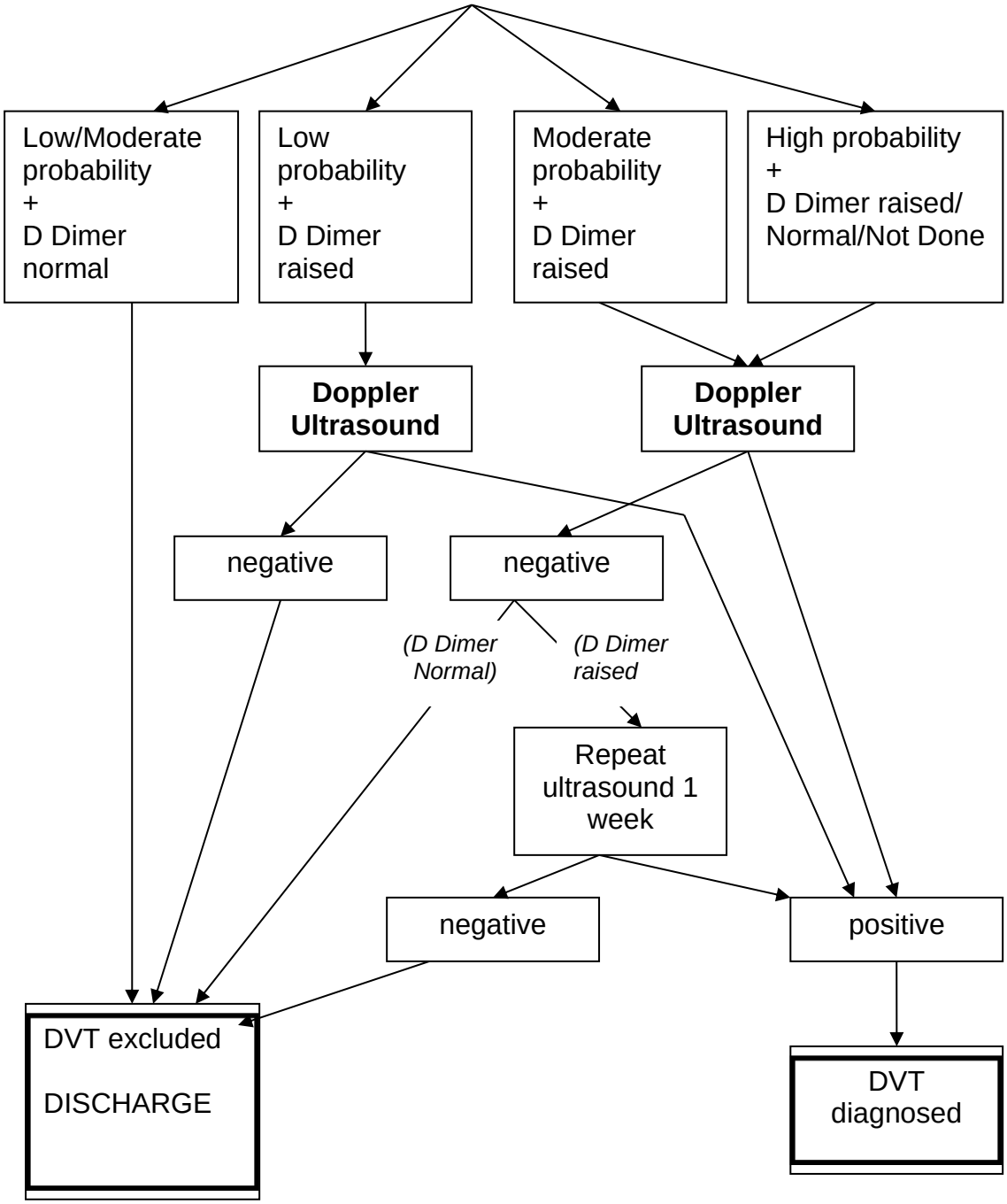
D-Dimer testing currently should only be conducted in patients at low or moderate risk of DVT. All patients who have had a previous DVT or PE are immediately classified as high risk. Pregnant women or women in the post-natal period should be managed outside this protocol and currently D-Dimer testing is not appropriate. In suspected pulmonary embolus (PE) patients are currently managed outside this protocol.

Samples taken for D-Dimer must be received and processed within the laboratory within 4 hours of venepuncture.

Active cancer (patient receiving treatment for cancer within the previous 6 months or currently receiving palliative treatment)	1
Paralysis, paresis, or recent plaster immobilisation of the lower extremities	1
Recently bedridden for 3 days or more, or major surgery within previous 12 weeks	1
Localised tenderness along the distribution of the deep venous system Entire leg swollen	1
Calf swelling at least 3 cm larger than the asymptomatic leg (measured 10 cm below tibial tuberosity)	1
Pitting oedema confined to the symptomatic leg	1
Collateral superficial veins (nonvaricose)	1
Alternative diagnosis at least as likely as deep vein thrombosis	-2

In cases in which it is unclear whether there is an alternative diagnosis, the assumption of no alternative diagnosis will ensure highest level of safety.

Score	Probability
<1	Low
1 – 2	Moderate
>2	High



The clinical score must be written on the venogram and D-Dimer request cards and clearly written in the notes. In general D-Dimer testing should not be carried out in high risk patients/pregnant women.

Pulmonary Embolus and D-Dimers

Guidelines for D Dimer testing are available as a Clinical Guideline on the intranet

Tests, bottle types and expected TAT of Routine Tests

The viability of the sample indicates the time limit the sample will be valid for additional tests if requested. If additional tests are required, please check with the laboratory on availability and sample volume. It is assumed that samples will be filled correctly using the vacutainer system. eCARE will instruct the phlebotomist on how many samples are required for each test. In most cases only one vial is sufficient. Exceptions will include thrombotic and factor assay tests.

Test	Bottle	Analysis	Sample Viability	Expected Turnaround time from receipt of sample
General				
Blood count	Lavender	Daily	24 hours	1 hour – urgent 2 hours - routine
Malaria	Lavender	Daily	12 hours	1 hour – urgent for preliminary results. 2 hours - routine
ESR	Lavender	Daily	12 hours	2hours
Glandular fever test	Lavender	Daily	24 hours	1 hour – urgent 24 hours - routine
G6PD	Lavender	Weekly	1 week	7 days If urgent discuss with lab
Coagulation				
APTT	Blue	Daily	4 hours	1 hour – urgent 2 hours - routine
PT, INR	Blue	Daily	12 hours	1 hour – urgent 2 hours - routine
Full clotting screen	Blue	Daily	4 hours	1 hour – urgent 2 hours - routine
Platelet Function Testing (PFA)	By appointment	By arrangement	4 hours	Variable**

Thrombotic screen	By appointment	By arrangement	4 hours	14 days
Factor assays	By appointment	By arrangement	4 hours	14 days
D-Dimers	Blue	Daily	4 hours	1 hour – urgent 2 hours - routine
Anti Xa (heparin) assays	Blue	Daily	4 hours	<72 hours. If urgent discuss with lab
DOAC (Apixaban, Rivaroxaban, Edoxaban)	Blue	Daily	4 hours	7 days. If urgent, discuss with lab
Haemoglobinopathies				
Sickle test	Lavender	Daily	72 hours	1 hour urgent
HbA2+F	Lavender	Three times per week	72 hours	7 days*
Haemoglobin Variants	Lavender	Three times per week	72 hours	7-14 days
Immunology				
Autoantibodies	Gold	Referral lab	1 week	4 weeks (referral)
tTG	Gold	Referral lab	1 week	4 weeks (referral)
Complement* **	Gold/Green	Daily	48 hours	3 days
Cardiolipin	Gold	Referral lab	1 week	4 weeks (referral)
DNA/ENA	Gold	Referral lab	1 week	4 weeks (referral)
Rheumatoid Factor ***	Gold/Green	Daily	24 hours	3 days
Haematinics				
B12 & folate	Gold/green	Daily	5 days	24 hours

Red cell folate	Lavender	Weekly	24 hours	7 days
Ferritin	Gold/green	Daily	5 days	24 hours
Intrinsic Factor Antibodies	Gold/green	Daily	48 hours	24 hours
Blood Transfusion				
Blood group & antibody screen	Pink 6 ml	Daily	7 days	24 hours
Crossmatch	Pink 6 ml	Daily	See request card	24 hours Urgent – discuss with laboratory
Direct Antiglobulin Test	Pink 6ml	Daily	See request card	24 hours Urgent – discuss with laboratory
Kleihauer	2 x Pink 6 ml	Daily	48 hours	48 hours
Ante-natal serology	Pink 6 ml	Daily	48 hours	48 hours
HIT screens	Referred tests – please discuss with laboratory			
HLA testing for platelet refractoriness				
Neutrophil Antibodies				
FMH flow cytometry				

* Pre-natal samples 3 routine working days
** if urgent, results available on the same day by telephone. If not urgent results available within 7 days.
*** Tests that are not accredited to UKAS ISO 15189:2012

Haematology Normal Ranges

Reference ranges or 'Normal values' in Haematology may vary with age, sex and situation. Some variation from the stated range will occur for paediatric patients.

	Male	**Female**	**Unit**
Haemoglobin	130 – 170	110 – 150	g/L
Haematocrit	0.4 – 0.5	0.36 – 0.46	l/l
Red cell count	4.6 – 6.2	3.8 – 4.9	$x10^{12}$/L
Mean cell volume (MCV)	80 – 101	80 – 101	Fl
Mean cell haemoglobin (MCH)	27 – 32	27 - 32	Pg
MCHC	290 – 360	290 – 360	g/L
White cell count	3.7 – 11.1	3.7 - 11.1	$x10^{9}$/L
Differential white cell count			
Neutrophils	1.7 – 7.5	1.7-7.5	$x10^{9}$/L
Lymphocytes	0.9 – 3.2	0.9-3.2	$x10^{9}$/L
Monocytes	0.2 – 1.0	0.2-1.0	$x10^{9}$/L
Eosinophils	0 – 0.5	0-0.5	$x10^{9}$/L
Basophils	0 – 0.1	0-0.1	$x10^{9}$/L
Platelet count	150 – 450	150 - 450	$x10^{9}$/L
Erythrocyte Sedimentation Rate (ESR) <50yrs	1 – 10	1 - 12	Mm/hr
50 - 60yrs	1 – 12	1 - 19	Mm/hr
60-70yrs	1 – 14	1 – 20	Mm/hr
>70yrs	1 – 30	1 – 35	Mm/hr
Reticulocyte count	0.2 – 2.0	0.2-2.0	%
Red cell folate	140-836	140-836	ng/ml
Serum B12	145 – 914 (Indeterminate Range 145-180)	145 – 914 (Indeterminate Range 145-180)	ng/ml

Serum folate	3.1 – 19.9	3.1 -19.9	Ug/L
Hb F	<1.0	<1.0	%
Hb A2	2.2 – 3.4	2.2 – 3.4	%
Ferritin			
Male	23.9 – 336.2		ng/ml
Female	11.0 – 306.8		ng/ml
Prothrombin	10.1 – 12.3	10.1 -12.3	seconds
Activated partial thromboplastin time (APTT)	26.8 – 38.8	26.8 – 38.8	seconds
Thrombin Time (TT)	12.5 – 16.5	12.5- 16.5	seconds
Fibrinogen Assay	1.8 – 4.5	1.8- 4.5	g/L
D Dimer (Negative Predictive Range)	0-243	0-243	ng/ml
Fibrinogen Degradation Products	0-500	0-500	Ug/L
Immunology			
C1 esterase inhibitor	0.22 – 0.38	0.22-0.38	g/l
C3	0.9 – 1.8	0.9-1.8	g/l
C4	0.1 – 0.4	0.1-0.4	g/l

Haematology Critical Alert Ranges

Refer to appendix 2

Key Factors Affecting Results

Test	Key factors Affecting Results		
General			
Blood count	Haemolysis Bacterial Contamination	Lipaemic Pre-analysis storage temperature	Clotted Cold Agglutinins Sample age
	Haemolysis	Pre-analysis storage temperature	Sample age

Note that there is no commercially available Rapid Diagnostic Test (RDT) that can specifically detect Plasmodium Knowlesi.			
ESR	Haemolysis	Lipaemic Pre-analysis storage temperature	Clotted Cold Agglutinins Sample age
Glandular Fever test	Haemolysis	Lipaemic	Sample age **See Note 1**
G6PD	Post transfusion sample	Haemolysis	Clotted Sample age
Coagulation			
PT, APTT	Underfilled/overfilled sample bottles Haematocrit >50 Patients on anticoagulation	Lipaemic Pre-analysis storage temperature	Clotted Sample age
INR	Underfilled/overfilled sample bottles Haematocrit >50 Patients on anticoagulation	Lipaemic Pre analysis storage temperature	Clotted Sample age
Full clotting screen	Underfilled/overfilled sample bottles Haematocrit >50 Patients on anticoagulation (including DOACs)	Lipaemic Pre analysis storage temperature	Clotted Sample age
Platelet Aggregation	Aspirin and other drugs	Lipaemic Pre analysis storage temperature	Clotted Sample age
Thrombotic screen	Underfilled/overfilled sample bottles Haematocrit >50 Patients on anticoagulation Patients on Oral contraception, Pregnant patients	Lipaemic Pre analysis storage temperature	Clotted Sample age

Factor assays	Underfilled/overfilled sample bottles Haematocrit >50 Patients on anticoagulation	Lipaemic Pre analysis storage temperature	Clotted Sample age
D-Dimers	Underfilled/overfilled sample bottles Haematocrit >50	Lipaemic Pre analysis storage temperature	Clotted Sample age **See Note 2**
Anti Xa assay and DOACs	Underfilled/overfilled sample bottles Haematocrit >50	Lipaemic Pre analysis storage temperature	Clotted Sample age
Haemoglobinopathies			
Sickle test	Post transfusion sample	Hb level	**See Note 3**
HbA2+F	Post transfusion sample	Hb level	**See Note 3**
Haemoglobin Variants	Post transfusion sample	Other Hb variants	**See Note 3**

Test	Key Factors Affecting Results		
Immunology			
Autoantibodies	Only gel/gold top suitable	Bacterial Contamination	
Anti DNA	Only gel/gold top suitable		
Complement	Gold or Green top suitable	Grossly lipaemic samples should be avoided	
Cardiolipin	Only gel/gold top suitable		
ENA	Only gel/gold top suitable		
Rheumatoid factor	Only gel/gold top suitable	Bacterial contamination	
Haematinics			
B12 & folate	Post transfusion sample	Haemolysis	**See Note 2**
Red cell folate	Post transfusion sample	Haemolysis	**See Note 2**

Ferritin	Post transfusion sample	Haemolysis Acute phase protein	**See Note 2**
Intrinsic Factor Antibody	High levels of vitamin B12		**See Note 2**
Blood Transfusion			
Blood group & antibody screen	Post transfusion sample	Haemolysis	
Direct AntiglobulinTest	Cold Haemagglutinins may cause false positive		
Red Cell Phenotyping	Recent transfusion may cause mixed field results		
Crossmatch	Post transfusion sample	Haemolysis	
Kleihauer	Post transfusion sample HPFH	Haemolysis	
Ante-natal serology	Post transfusion sample	Haemolysis	

Note 1 Glandular Fever Screening

Glandular Fever tests
Occasionally detectable levels of Heterophile antibodies are late in developing in patients symptomatic for Infectious Mononucleosis. If symptoms persist it is recommended to repeat the test after several days. Some patients may remain persistently negative, especially children and adolescent. It has been reported that only 80 to 90% of adults and less than 50% of young children develop Heterophile antibodies.
False positive reactions when have been reported in serum samples collected from patients with recent cytomegalovirus, Hepatitis A virus, Parvovirus and leptospira infections.
Detectable levels of Heterophile antibodies may persist for months, and more rarely for years, in some individuals.

Note 2 HAMA antibodies on serum B12, serum Folate and Ferritin assays.

HAMA antibodies seen in Haematinic Assays and D Dimer results

For assays employing antibodies, the possibility exists for interference by heterophilic antibodies in the patient sample. Patients who have been regularly exposed to animals or have received immunotherapy utilising immunoglobulins may produce antibodies e.g. HAMA, that interfere with immunoassays. Such antibodies may cause erroneous results.
HAMA (Human anti-mouse antibodies) could be seen in the following assays:
Serum B12
Serum Folate
Ferritin
Red Cell Folate
Intrinsic Factor antibodies
D Dimer
It is well documented as a phenomenon of possible interference and results should be interpreted in light of the total clinical presentation of the patient, including symptoms, clinical history, data from additional tests and other appropriate information.

Note 3 UK National Screening Programme for Infectious Diseases, Sickle Cell &Thalassemia in Pregnancy

A Family Origin Questionnaire (FOQ) **must** be completed and sent with all requests for Antenatal booking bloods. This requester **must** provide the gestation date, the EDD and complete the ethnic origin of both mother and father. In low prevalence areas the FOQ is used as a tool to identify women who are at highest risk of having a baby with a Haemoglobin variant or disorder.
In addition, the joint paper request/FOQ form will require details of consent. If declined, the reason for decline must be given. The FOQ should be completed and returned with the booking bloods at <10 weeks of gestation.

For clinical advice regarding Antenatal screening please contact:

Infectious Diseases Antenatal Screening Programme Advice – Consultant Microbiologist - **Dr Poonam Kapila 85786 99 5786**

Sickle Cell and Thalassaemia Antenatal Screening Programme Advice - Consultant Haematologist – **Dr Mags Akanni 87573 99 7573**

BLOOD GROUPING AND TRANSFUSION

A copy of the Trust Policy for Blood Transfusion, the Trust Policy for the Treatment of Patients Refusing Blood/Blood Products or their Derivatives and the Trust Policy for the Management of Massive Blood Loss can be found on every ward.

Every member of staff involved in the transfusion process must read these.
This policy can also be accessed under Clinical Policies on the Trust intranet.
PATH-GL-03 Blood Transfusion Policy

Please give 24 hours' notice for non-urgent cases. Patients with positive antibody screens or who are known to have antibodies may not have suitable blood on site and it may take 48 hours for the provision of suitable blood.

A 6 ml EDTA Transfusion bottle is required for blood grouping, cross matching and antibody screening for adult patients. 4 ml EDTA samples (if correctly labelled) will be accepted for adult patients with compromised venous access or paediatric patients.

1.3 ml EDTA samples will be accepted for paediatric requests.
The minimum sample volume for adult requests is 2 ml and 1 ml for paediatric requests.

Issue of crossmatched group specific red cells is dependent upon there being at least two blood group results being available. Where this criterion cannot be met group O RhD Positive or Negative red cells will be provided.

The sample should be clearly handwritten with patient's surname, forename, hospital number, date of birth and date sample taken and signed by the taker**.**

Samples labelled with patient Addressograph labels will be discarded, as this is contrary to hospital policy.
Full details of the sample labelling and request form documentation requirements can be found in the hospital policy **PATH-GL-03 Blood Transfusion Policy.**

The only blood collection point is the main Blood Bank refrigerator. Blood kept in theatre fridges is only to cover intra-operative blood loss, and blood kept in A&E Rhesus is for emergency haemorrhage situations.

The instructions regarding the labelling of samples for the purpose of blood transfusion, along with the guide on when new samples are required, can be found on the back of the request forms and further on in this section.

Transfusion Procedures and Practice

- An urgent blood group & antibody screen takes 45 minutes from the sample arriving in the laboratory. Should blood be required before this the laboratory will issue group O red cells until there are two blood group results available from two separate samples.

- Non urgent group & antibody screen requests shall be processed within 4 hours of receipt.

- For patients who have been previously grouped and screened, twice and require blood:

  i. Cross-match will take 30 minutes.
  ii. If criteria are met an electronic cross-match will be performed, blood will be available in 5 minutes (contact the laboratory regarding the eligibility of patient for this procedure).
  iii. Where blood group results are available for both a historical sample and a current sample (see f below) but where antibody screen results are not yet available group specific (matching the patient ABO type) un-crossmatched blood can be provided. This is as safe for patient use as group O Negative blood.
  iv. Failing the above, uncross-matched O blood can be issued immediately. This is a precious resource and should only be used in life threatening situations. Note: male patients and female patients who no longer have childbearing potential may be issued with O Positive blood.

a) For patients requiring transfusion in emergency situations before compatibility testing can be performed 4 units of O Negative and 4 units of O Positive blood are available for immediate use. They are kept within the Pathology Blood Issue Fridge. The Blood Transfusion Laboratory must be informed if these units are collected and to whom they have been transfused as soon as possible. Use of this blood may increase risk of transfusion reaction. If possible, the laboratory should be contacted prior to the use of these units as it may be possible to provide un-crossmatched blood that is more suitable for the patient. A further 4 units of adult O Rh Negative red cells and 2 units of neonatal O Rh Negative red cells are kept in Th1 and 2 units of adult O Rh Negative red cells in Th2, and 2 O Rh D Negative units are kept in A&E Rhesus.

b) Blood is reserved from the date requested for 24 hours; platelets must be ordered for named patients with at least 24 hours' notice and will be reserved for 12 hours from required time.

c) Repeat sample requirements for blood product requests.

Patients pregnant or transfused within previous 3 months or who have a history of red cell antibodies – sample must be taken less than 72 hours before the start of a new transfusion episode.

Patient not pregnant or transfused within previous 3 months and with no history of red cell antibodies – sample must be taken less than 7 days before the start of a new transfusion episode.

Samples are only stored for 7days.

d) Patients who have a valid sample and a historical blood group can have red cells requested as "add ons". Specifically, crossmatches may be added on without the need for a new sample using ECare or manually using a BT Request form. For further guidance on requesting an ‘add on’ transfusion investigation please contact the Transfusion Laboratory.

e) Appropriate prescribing of Blood Products
Guidance for appropriate prescribing of blood products including surgical blood order schedule can be found in the Trust Blood Transfusion Policy copies of which can be found on each ward but is also universally available on the hospital intranet under clinical policies:

PATH-GL-03 Blood Transfusion Policy and in associated Platelet and Plasma Product Guidelines.

Further guidance for appropriate prescribing of blood including for medical patients can be found in the Trust policy**: PATHOLOGY/GL/09 Guideline for the Use of Red Blood Cells in Adults.**

Guidance for the management of paediatric patients can be found in the below Trust policies:
PATH/GL/20 Paediatric Blood Transfusion Guideline (for the Administration of Blood & Blood Products and the Management of Transfused Patients)

PAED/GL/48 Neonatal Red Cell Transfusion Guideline:

Specific guidance on the use of Prothrombin Concentrate Complex (PCC) can be found in the Trust **PATHOLOGY/GL/22 Prescribing and Administration of Prothrombin Complex Concentrate (PCC)in Adults for Emergency Reversal of Warfarin and other Vitamin K Antagonists.**

Guidance for the management of massive blood loss or major haemorrhage is available in the Trust policy **PATH/GL/05 Haematological Management of Major Haemorrhage in Adults.**

Guidance on the management of patients that refuse transfusion of blood or blood products can be found in the Trust policy **PATH/GL/04 The Treatment of Patients who Decline Blood and Blood Components.**

f) Patients presenting with suspected transfusion reaction.
Guidance for the management of these patients is provided in the Hospital Blood Transfusion Policy (see above). In all cases the transfusion should be stopped; the laboratory and duty Haematology Consultant informed immediately; a transfusion reaction form completed and sent to the laboratory with appropriate samples; the suspected reaction must also be reported on the hospital incident reporting system (RADAR). It is the responsibility of the attending clinician to ensure these tasks are completed. Form PATH/FM/21-Blood/ Blood Components Reaction Form for **all** suspected transfusion reactions can be found in the intranet.

g) Responsibilities
Currently clinicians are responsible for the prescribing of all blood and blood products and the management of patients with suspected transfusion reactions.
Collection of blood components can only be performed by staff trained and certified as competent. Access to the Blood Issue Fridge is restricted to staff that meet this requirement. For further information about the collection and administration of blood products contact the Transfusion Specialist Practitioner Ext. 85798 Monday-Friday.

IMMUNOLOGY LABORATORY SERVICE

Principles of the Tests and Clinical Implications

ANA Screen The term Connective Tissue Disease refers to a group of disorders involving the protein-rich tissue that supports organs and other parts of the body. These disorders often involve the joints, muscles, and skin but they can also involve other organs and organ systems, including the eyes, heart, lungs, kidneys, gastrointestinal tract, and blood vessels. They are inflammatory diseases of unknown origin with humoral and cellular disturbances, systemic organ failure and chronic disease. These diseases are characterised by overlapping symptoms, thus making them difficult to diagnose.
When systemic autoimmune disease is suspected a common practice is to perform a general screening test for antinuclear antibodies. The ANA test if positive, leads to screens for the antibodies to RNP-70, RNP/Sm., Sm., SS-A, SS-B, Scl 70, Centromere and Jo-1.

Anti-dsDNA Systemic lupus erythematosus (SLE) is characterised by the presence of autoantibodies against native double stranded DNA (dsDNA). Additionally, these patients also exhibit autoantibodies against the single stranded form of DNA. Together with the determination of antinuclear antibodies (ANA) the determination of dsDNA antibodies are the most important serological criteria for diagnosing SLE. Autoantibodies against dsDNA have a diagnostic specificity of about 96% and a sensitivity of about 91% for diagnosing SLE. Anti-dsDNA antibodies can be useful in some patients to monitor therapy and to predict disease progression.

ENA Screen This test determines the IgG class autoantibodies directed against the extractable nuclear antigens SS-A, SS-B, Sm, RNP/Sm, Scl-70 Jo-1 & Centromere.

Anti SS-A(Ro)/SS-B(La) Autoantibodies against SS-A(Ro) and SS-B(La) are found in most patients suffering from primary Sjögrens syndrome. Inflammatory processes of the salivary and lachrymal glands are characteristic of this disorder. Patients with sicca syndrome also exhibit these antibodies. More importantly, anti SS-A(Ro) antibodies are present in >80% of mothers of infants with congenital heart block.

Anti RNP/Sm RNP is associated with patients suffering with systemic lupus erythematosus and undifferentiated connective tissue disease. Autoantibodies against Sm proteins are of pathognomonic importance for diagnosing SLE. A negative finding of anti-Sm does not exclude SLE.

Anti-Scl-70 Scl-70 antibodies are directed against the enzyme DNA Topoisomerase I and are highly specific for Scleroderma. Progressive Systemic Sclerosis is an autoimmune disorder of the connective tissue leading to slowly progressive fibrosis and later to sclerosis. Patients suffering from scleroderma develop often develop tight skin as the first manifestation with involvement of the heart, kidneys and lungs. Patients with Scl-70 Abs are more likely to have facial skin involvement and disease in heart, kidneys and lungs in comparison with anti-Scl-70 Ab-negative scleroderma patients. Anti centromere antibodies are found in the CREST subset of scleroderma.

Rheumatoid Factor: Rheumatoid Factor is a non-specific serological indicator included in the diagnosis of RA. A weak positive, clinically insignificant result may be found in normal elderly subjects. RF negative RA patients do exist

Anti-Cardiolipin: Autoantibodies directed against the anionic phospholipid Cardiolipin are primarily found in patients suffering from primary and secondary antiphospholipid syndrome. These patients have clinical manifestations such as thrombosis of the veins and arteries, thrombocytopaenia and recurrent foetal loss.

Anti- CCP : Antibodies to cyclic citrullated peptide are found in early Rheumatoid Arthritis and are predictive of a more severe arthropathy. Anti-CCP antibodies are more specific for RA than RF.

Anti-β2 GPI Antibodies to this co-factor for cardiolipin may be useful in early diagnosis of the anti-phospholipid syndrome.

Anti-PR3 c-ANCA: Antineutrophil antibodies were first reported in 1982 in patients with necrotizing glomerulonephritis. This led to the discovery of autoantibodies detected in systemic vasculitic disorders. Proteinase 3 is the classic autoantigen in Wegener's granulomatosis. Approximately 66% of patients in the early stages of the disease exhibit anti -PR3 and it can be detected in more than 95% of all untreated patients (may disappear after immunosuppressive treatment).

Anti-MPO p-ANCA Churg -Strauss syndrome exhibits autoantibodies against lysosomal Myeloperoxidase (MPO-ANCA). Churg-Strauss is an allergic granulomatosis and angiitis. The autoantibodies are also found in patients with microscopic polyangiitis.

Anti Thyroid Peroxidase: Anti-TPO autoantibodies are detected in cases of Hashimoto's thyroiditis, myxoedema and Graves' disease.

Anti Tissue Transglutaminase: IgA antibodies to tTG is the main screen for Coeliac Disease. IgG tTG screening is also available for those patients with IgA deficiency

Endomysial Antibody: This is also used to confirm a diagnosis of Coeliac Disease performed by IFA. Endomysial antibodies are only performed after screening by anti-Tissue Transglutaminase IgA. IgG Endomysial testing is also available for those patients with IgA deficiency.

For further information contact:

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Clinical Indications and Screening Tests

Clinical Indications	Initial Screen	Further Tests
SLE, RA, other connective Tissue diseases	Auto Immune Profile (to include ANA)	Depends on clinical symptoms
Pernicious Anaemia Primary biliary cirrhosis Chronic active hepatitis Auto Immune Hepatitis	Anti smooth muscle Anti gastric parietal Anti mitochondrial Anti Liver Kidney Microsomal	
Arthritis**/**RA/ Rheumatoid joint pain	Rheumatoid Factor , ANA	ENA, anti CCP if RF negative
SLE, lupus, UCTD	ANA, C3,C4	ENA, DNA (ENA, Cardiolipin in pregnancy)
Monitoring SLE	dsDNA	
Connective tissue Disease	ENA	
Goodpasture's Syndrome	Glomerular Basement Membrane Ab	
Drug induced lupus	ANA	DNA
Recurrent thrombosis antiphospholipid syndrome recurrent miscarriage/abortion	ANA, Cardiolipin/β2GPI	DNA, ENA, C3/ C4
Raynauds	ANA, Centromere	ENA, DNA,
Wegener's granulomatosis	cANCA IIF confirmed by anti PR3 & anti MPO	Anti PR3 & Anti MPO
Vasculitis, pauci immune Glomerulonephritis, Churg-Strauss	pANCA	DNA
Sjögren's syndrome/sicca syndrome Dry eyes, mouth	ANA, ENA	DNA

Clinical Indications	Initial Screen	Further Tests
Scleroderma.CREST Systemic sclerosis	ANA, Centromere	Scl-70,ENA,DNA
Myositis	ANA	Jo-1, ENA,DNA
Liver disease/ Hepatitis/ CAH PBC/abnormal LFT/pruritus	Mitochondrial/Smooth Muscle & LKM Ab	M2 specific mitochondrial for PBC
Pernicious anaemia/B12 deficiency	Gastric Parietal Cell	Intrinsic Factor Abs
Thyroid disease	Thyroid peroxidase antibody	TSH Receptor Ab in Graves'
Addison's Disease	Adrenal antibodies	
Infertility/Amenorrhoea	Ovarian antibodies	
Diabetes/IDDM(Stiff man Syndrome)	Islet cell Antibody, GAD antibody	
Coeliac disease/ abdominal pain Diarrhoea/FTT/Malabsorption	IgA anti tTG-Ab	Endomysial Ab to confirm Check for IgA deficiency
Renal failure Glomerulonephritis	ANCA, GBM, ANA C3/C4	DNA, ENA, MPO, PR3
Stroke, TIA (<60 yr)	Cardiolipin IgG	β2GPI Ab
Pemphigoid Pemphigus	Basement membrane Ab Intercellular cement Ab	Direct skin biopsy IF Direct skin biopsy IF
Myasthenia Gravis Thymoma in Myasthenia Other myasthenic syndromes (Lambert-Eaton etc)	Acetylcholine receptor ab VGCC Abs	 Skeletal muscle antibody

ANCA testing is limited to specific conditions and locations. Please refer to the relevant protocol on eCare/ICE or contact the laboratory for advice.

Turnaround times for specific tests may vary and are available from the laboratory on request.

CELLULAR PATHOLOGY

Introduction

The Cellular Pathology Department provides a diagnostic Histology and Non-gynae Cytology service to Milton Keynes Hospital, local GPs, Cancer Screening Programmes and other local private health care providers. This is supported by a comprehensive immunohistochemistry service and referral for Her2 testing and molecular diagnostics within the South 4 Pathology Partnership and Central and South Genomic Hub.

The department provides a comprehensive autopsy service for Milton Keynes Hospital and HM Coroner.

Requesting a Cellular Pathology Investigation

Quality and patient safety in Cellular Pathology starts from the moment the sample is taken. Please follow the instructions regarding request form and sample requirements to provide the most accurate result for the patient.

Cellular Pathology investigations can be requested either electronically with eCare/ ICE or on hand-written blue request cards. Requests for Histology and Cytology on the same patient should be made as separate requests on eCare/ ICE or each have a blue request form.
All electronic requests must be accompanied by a signed request form.
All requests must contain 3 matching legible patient identifiers between the form and each pot. The following are mandatory:

- Unique identification number (MRN or NHS number, both if available)
- Full name
- Date of birth

In addition to the mandatory information, relevant clinical and sample information is also necessary to provide the most accurate result is also necessary:

- Specimen information to include type and anatomical site of specimen. Multiple specimens from a single patient must be clearly labelled and differentiated, with corresponding information provided on the request form and the pot.
- Sender’s details (Full name) and bleep / phone number.
- Location of where the procedure took place.
- All relevant clinical information. This should be as extensive as practical and should include nature, appearance and site of the lesion, duration and nature of symptoms, results of relevant investigations including imaging, relevant past medical history and clinical differential diagnosis.

- Infection risk.
- Priority (e.g. urgent, 2WW).
- Date and time specimen was taken (essential to determine the length of time of fixation, which can affect further specialist testing).

Consent

When obtaining consent, it is the referring clinician's responsibility to ensure that the patient/carer understands the purpose of the test to be performed and that any specimens taken will be used to inform a diagnosis and may be stored for future diagnostic testing. All diagnostic material is stored according to The Royal College of Pathologist's guidelines to ensure sample integrity.

Consent for genetic testing and storage must be obtained from the patient by the referring clinician prior to referral of the sample. All genetic testing requires consent. This is not the responsibility of laboratory staff. All diagnostic material is stored according to The Royal College of Pathologist's guidelines to ensure sample integrity.

Surplus diagnostic material from all samples received by the laboratory may be retained for quality assurance purposes and may be used anonymously for the development and control of new and existing tests unless consent for this is expressly denied on the request form.

Acceptance criteria

Accurate identification details on cellular Pathology specimens are vital for patient safety.
It is the responsibility of the clinician requesting the investigation to ensure that the specimens are correctly labelled and that the request details are completed to the above standard. Specimen and request details must be compatible.

Where essential information is missing from a specimen or request form the laboratory will attempt to contact the requesting clinician and will issue a Specimen Rejection Form. The requesting clinician (or other responsible person who has been given the authority by the clinician to identify the specimen) will be required to attend the laboratory to complete or amend the details before the specimen can be processed, which will adversely affect the turnaround time.
This person must sign the form to confirm that they have agreed to take responsibility for the identification of the specimen and/or any amendments made.

Where the missing information includes the requesting clinician a printed hard copy of the report may be delayed or unavailable. In this case the report may be issued with “Unknown Sender” on the laboratory computer system.

Specimen requirements

- Except where indicated below, all specimens should be sent to the laboratory in an adequately sized pot containing formalin fixative (10% Neutral Buffered Formal Saline).
- Poor fixation can compromise the quality of the specimen and subsequent histological examination so specimen pots should be large enough to easily accommodate the specimen. The volume of formalin should be at least 10 times the volume of the specimen, so it is important not to squeeze the specimen into a container that is too small.
- Specimens should be placed into fixative as soon as possible after removal from the patient, it is very important not to let the specimen dry out, particularly small biopsies.
- Small endoscopic biopsies should be placed into a 'mini' cassette before placing into formalin. This allows safe handling of the small biopsies in the laboratory.
- Prostate needle core biopsies should be placed between moist sponges and placed into a blue processing cassette. Care should be taken not to allow the cores of tissue to overlap. The cassette should be placed into a pot of 'pink' formalin which contains a drop of eosin to colour the tissue cores making them easier to handle in the laboratory. This coloured formalin should not be used for other larger specimen types. (Cassettes, sponges and 'pink' formalin pots are available from the laboratory on request).
- Pots should be labelled as specimens are placed into them. It is an unsafe practice to label pots in advance of a procedure.
- All pot labels should include full patient identifiers, specimen details and relevant hazard indicators.
- Where possible specimens should be sent from theatres and clinics to the laboratory regularly throughout the day and should **not** be batched to be sent at the end of the day. This ensures that urgent diagnostic biopsies are processed as soon as possible and allows a more efficient and timely production of results.
- Upon receipt in the laboratory large resection specimens require immediate opening or slicing to ensure adequate fixative penetration. Large specimens that are delayed reaching the laboratory may suffer irreversible tissue damage which will compromise the quality of the final report.

The lids of containers of formalin should be securely closed before transport to the laboratory. Formaldehyde vapour is a well-recognised respiratory irritant and possible carcinogen. Inhalation of formalin vapour and skin contact should be avoided as repeated exposure may cause skin sensitisation and allergic contact dermatitis.

Spillage kits should be available in all areas that store formalin pots and on transportation trolleys.

Please refer to the Formalin Spillage information in Appendix 3.

Specimens in formalin must **not** be sent via the hospital air tube system.

High Risk/ Danger of Infection specimens:
Specimens potentially infected (known or suspected) with Hazard Group 3 organisms must be clearly marked as such, and the nature of the risk described. Laboratory staff need to be able to work safely and process the specimen appropriately.

High risk specimens for routine histology must be fixed in 10% formalin for at least 24 hours in the laboratory prior to processing. As a result, there will be a subsequent 24-hour delay in reporting for small specimens and 48 hours for large resection specimens.

Transportation and Handling of Radioactive Material (Sentinel Lymph Nodes)
There is no requirement to store specimens treated with radiation prior to transportation to the laboratory. Specimens must be transported in a dedicated, sealed box, bearing a radioactive hazard label, and containing absorbent material. Radioactive specimens must be separated from other specimens.

Radioactive specimens pose no risk to portering staff or members of the public. Levels of radiation are below those detectable with a personal dosimetry Device.

Please do not send specimens for disposal to the laboratory.

Special Sample Collection

Frozen Section for Rapid Intra-operative Diagnosis
Please note Frozen Section investigation is not a UKAS ISO 15189:2012 accredited test

Whenever possible, frozen sections should be booked in advance on Ext. 58521 Without advance arrangement the laboratory cannot guarantee that a pathologist will be available to report the biopsy.

The specimen must be sent in a labelled clean dry container. Do **not** place the specimen into formalin.

Please identify the theatre in which the procedure is being performed together with a contact number for the surgical team on the request card.
To avoid unnecessary delays in reporting, specimens for frozen section must be brought directly to the Cellular Pathology Laboratory (Level 1, Green Zone, next to IT Hub) and **not** taken to main Pathology Reception.

The turnaround time from receipt of the specimen in the laboratory to the issue of a telephoned report is 20-30 minutes. This is dependent upon the number of samples and complexity of the specimen.
Please contact the laboratory to cancel if the frozen section is no longer required or theatre time is delayed.

Direct Immunofluorescence studies on skin biopsies
All skin samples must be delivered immediately to the laboratory in a universal containing saline available from the laboratory, accompanied by an eCare/ ICE or blue request card, clearly stating that the specimen is for direct immunofluorescence studies.

These specimens are sent to John Radcliffe Hospital for testing. Results are usually available on eCare and ICE within 10 days.

Cytogenetics
All samples should be sent to the laboratory in Tissue transport medium – available from Churchill Hospital, Oxford and must be accompanied by a Churchill request form. Tissue Transport medium is stored on Labour Ward – the laboratory does not keep a stock.

Any samples taken out side of core working hours should be refrigerated overnight either at the source or taken to the main pathology reception and informing on-call staff to place into refrigerator.

Foetus's & Pregnancy Remains
These samples are regulated by The Human Tissue Authority. It is vital that the request cards that accompany specimens state the gestational age. The fate of these specimens depends on having this information. The laboratory will not process specimens that do not have this clearly stated in the clinical information.

- **Less than 14 weeks gestation**
  These samples should be sent to the laboratory in 10% Formal Saline. After reporting, the laboratory sends these specimens for cremation.

- **14 – 18 weeks gestation**
  These samples should be sent to the laboratory in 10% Formal Saline. After reporting, the laboratory will pass the specimen to the mortuary who will send these cases separately for cremation.

- **Greater than 18 weeks**
  Foetus' greater than 18 weeks are sent directly to the mortuary. All such specimens should be sent to the mortuary in a clean, dry container without fixative, together with a **completed** request card. The placenta should also be sent in a dry container and should always accompany the foetus. If

parents request no investigations, it must be clearly stated on the request form.

- If a PM / Histopathology is required then a **PM consent form** is required, **regardless of the age of the foetus.** These are then passed on to the Paediatric Pathology Unit at the John Radcliffe Hospital in Oxford. It must be ascertained from the parents of every case that is sent to the mortuary for post-mortem, whether the mother would like the return of the placental tissues, for burial or cremation with the baby or disposal via John Radcliffe's protocol.
  If the mother opts for burial or cremation, residual wet tissue will be returned from the John Radcliffe.
  The options are that the John Radcliffe will return the placental tissue, with the baby to Milton Keynes, so that disposal can be arranged (cremation or burial) or the placenta will be incinerated in line with the John Radcliffe's hospital protocol.

DIAGNOSTIC CYTOLOGY

All specimens must be sent as soon as possible to the laboratory before degeneration of the cells occurs. If this is not possible, ensure that the specimen is kept refrigerated.

Please send separate specimens and make separate requests if reports require both microbiology and cytology investigation.

Sputum Cytology

This is recognised as a specimen of limited or no clinical value. Where patients are unfit for bronchoscopy, three separate sputum samples collected on different days could be sent for cytological examination. Nebulised saline may be used to induce sputum production in appropriate clinical circumstances. Guidance should be given to the patient on producing a deep cough sample. A salivary sample is inadequate for cytology. The whole of the expectorated sample could be sent in a 60 ml pot already labelled by Pathology as **'sputum only'.** Please put the sample in the refrigerator if there is unavoidable delay.

Body Cavity and Cyst Fluid Cytology

Fluid for examination should be sent in a 20ml Universal container.
Deliver to the laboratory as soon as possible on the day of collection.

Urine Cytology

Freely voided, catheter, ileal conduit specimens or bladder/ureteric washings may be collected. It is essential that the mode of specimen collection is documented on the request form. The sample should be refrigerated if there is a short delay. A maximum of 20ml of fresh sample is required.

Early morning and midstream urines are sub optimal and should be avoided. For voided urine an aliquot of the whole voided sample should be submitted. Samples may be taken from the upper urinary tract by clinicians specialised in the technique and should be handled in the same way as the other urine specimens.

Fine Needle Aspirates (FNA) of Solid Lesions and brushings

Fine needle aspirates are generally taken by physicians, surgeons and radiologists. Palpable masses may be aspirated without image guidance. Ultrasound guided aspirates yield better samples. FNA kits, which comprise slides, slide box, fixative, normal saline, instructions, and a request card are available by contacting Pathology supplies on ext 85793. Needles and syringes are not included.

Links to educational material on how to take an FNA are available on several web sites, e.g. (www.pathlab.org)

Generally 22 to 25 gauge needles are used for aspiration of solid organs. A 25 gauge needle with a 10cc syringe can be used for thyroid aspiration. A 3/4 inch long needle

is usually sufficient; a 1.5 inch long needle can be used for large and deep lesions. A Cameco syringe pistol can be attached to the syringe to facilitate the process (Douglas P. Clark and William C. Faquin. How to Perform and Process a Thyroid FNA. Thyroid CytoPathology 2005:12). A larger bore needle is associated with increased risk of bleeding.
(www.pathlab.org)

Smear the sample directly onto a slide and label with patient's name and MRN or date of birth at the frosted end. Please label in **pencil** as ink is dissolved by subsequent staining process.

The smears must be very thinly spread and rapidly air-dried or fixed immediately as appropriate (the fixed smears must not be allowed to dry before applying the fixative). Rapid air dry is very important, and a hairdryer can be used on a cool setting for this purpose.

The type of smear required depends on the type of specimen:

Breast: Air dried smears.
Breast fluid can be submitted, if it is haemorrhagic or suspicious, in a universal container.

Thyroid: Two or three air dried smears and one fixed smear is enough.
Thyroid cyst fluid can be sent in a universal container.

Lymph node: Air dried smears are critical and should always be sent. If metastases are suspected include one or two fixed smears in addition to the air-dried smears. Needle washings can also be sent.

Bronchial/oesophageal brushings: Wet fixed.

Please mark all slides as "fixed" or "dried" as it is not always possible to identify how the smears have been prepared once received in the laboratory.

The remaining contents of the syringe and needle can be washed into a universal container containing normal saline and sent to the laboratory with the slides. The slides must be placed into the slide boxes provided for transport to the laboratory. Do not place air dried and fixed smears in the same box. The sample sides of the smears should not touch each other.

Joint Fluid Cytology.

Fluid should be taken into a 20ml universal container and sent to the laboratory as soon as possible. Minimum amount required for testing is 1ml.

CSF Cytology

Please note CSF investigation is not a UKAS ISO 15189:2012 accredited test. Fluid should be taken into a plain universal container and reach the laboratory as soon as possible as the CSF can degenerate rapidly.

Bronchial Lavage/ Washings

Lavage specimens may be sent to the laboratory in the original collection container or transferred to a plain universal.

Factors affecting tests on the above samples.

It is important to put Cytology samples in the correct containers as stated above and to transport them to the laboratory as soon as possible. This is especially important with FNA samples – slides sent in the wrong fixative or smeared too thickly may be rendered undiagnosable.

We do not routinely go back to cytology samples for any diagnostic purpose post authorisation. Appropriate samples may be pooled and used post authorisation for the preparation of control slides for quality assurance checks.

Reports

All authorised reports are available on ICE and eCare and are sent electronically to GP systems as soon as they are authorised. Please be aware that if the request was made on a handwritten blue request card the request will not be present on eCare/ICE until final authorisation of the report.

Turnaround Times

Multiple factors will influence the TAT for Histopathology specimens. Please ensure that samples are delivered to the Cellular Pathology department promptly and that the responsible clinician requiring the report is clearly identified on the request. Clear clinical details and correct sample labelling prevent unnecessary delays and allow for correct prioritisation of 2 week wait (2WW) and clinically urgent biopsies.

The department operates a workload prioritisation system, allowing for the most urgent diagnostic samples to be processed and allocated for reporting first. This supports the diagnostic key performance indicators (KPIs) to be met for the most urgent specimen types, which are 2WW and clinically urgent biopsy categories. TAT performance is monitored by means of departmental KPIs and is reported monthly at Divisional Meetings.

Current turnaround times are available from the laboratory on request.

On occasions it is necessary to operate with a backlog for the reporting of specimens. At such times the reporting turnaround times will increase. The clinical information provided on the request form is used to decide which cases will be placed into the backlog, The reporting backlog is subject to regular review and cases can be reprioritised where necessary.

The laboratory Cancer Navigator communicates with MDT Co-ordinators, Cancer Services and Patient Pathway co-ordinators to identify priority cases and to ensure that these cases are reported in time for the relevant MDT Meeting.

During particularly busy times slides from the backlog may be sent off-site to an accredited provider for reporting. This outsourcing will incur an increase in the turnaround time.

Diagnostic material may be referred to specialist centres to perform further tests to aid diagnosis and to provide information for treatment options and prognosis. These include specialist Immunohistochemical testing and molecular tests. Molecular tests are referred to the Central and South Genomic Laboratory Hub. TAT are in line with published NHS England standards and are dependent on the test.

A small number of specimen types are referred directly to specialist centres for reporting. The TAT for these varies by centre and specimen type and they are closely monitored. If you require information regarding the turnaround time for a specific referred sample type, please contact the Histopathology office.

Second Opinions

Occasional samples may require a second/expert opinion. The blocks and slides from these cases are sent, as necessary, to an agreed list of nominated specialist pathologists. The full text of the second opinion together with the name of the reporting pathologist is included in the final supplementary report. The reports of second opinions will typically be available within 14 days of issue of the initial report but may take longer than this.

Further Information

Further information may always be obtained from the laboratory (Ext.85821) during normal working hours (Mon - Fri 09:00 to 17:00). Requests for reports should be directed to the administrative team on Ext. 85804.

POST MORTEMS

When a patient dies, the **Medical Certificate of Cause of Death** should be issued as soon as possible, and the case reviewed by the Medical Examiner before the certificate is given to the family. Where a hospital postmortem is required for medical reasons, the medical certificate should be issued to relatives and their consent for the procedure obtained in writing on the appropriate consent form. The Bereavement Officer should be contacted in the first instance, ext 86155, who will ensure that the Consent Team, consisting of clinicians and pathologists amongst others, will be available to answer any questions that the bereaved may have. Trust policies and consent forms, available on the intranet, must be followed in this regard.

Cremation Certificates

Should the family opt to have the body cremated, then under the *Cremation Acts 1902 & 1952, Statutory Rules and Orders 1930 & 1952*, the doctors in charge of an in-patient will be required to sign Form 4 (first part) of the Cremation Form and the medical examiner will complete the form 5 (second part). These forms are private certificates and a fee is payable upon completion via finance. These are issued and completed in the Mortuary or the Medical Examiner's office, located in Oak House where the patient's notes will be available. The doctor will also need to examine the deceased if they have not done so already after death. These forms must be approved by the crematorium medical referee a full 48 hours before the cremation can take place. This can extend to 72 hours if the family have requested to see the form. There is often considerable urgency as a funeral cannot go ahead without the completion of the forms thus it is important that any doctor asked to fill in a form should do so as soon as conveniently possible.

Further Information

Mortuary Technicians are available during normal hours on Ext. 85828, or by Direct Dial on (01908) 995828. Out of hours, contact switchboard and ask them to contact the on-call Mortuary Technician.

Referral to the Coroner

The coroner is an officer of the Crown, whose duty it is to inquire into all violent, unnatural or sudden deaths of which the cause is doubtful or unknown. Should the death of the patient fall into any of the criteria listed below, the death should be reported through the coroners officer on 01908 254326. Not all deaths reported to the coroner will require a post-mortem.

All deaths from the following should be reported:

1. The cause of death is unknown.
2. It cannot be readily certified as being natural causes.

3. The deceased was not attended by the doctor during their last illness or was not seen within 14 days or viewed after death.
4. There are any suspicious circumstances or a history of violence.
5. The death may be linked to an accident (whenever it occurred).
6. There is a question of self-neglect or neglect by others.
7. The death has occurred, or the illness arisen during or shortly after detention in police or prison custody (including voluntary attendance at a police station).
8. The deceased was detained under the mental health act.
9. The death is linked with an abortion
10. The death might have been contributed to by the actions of the deceased (such as history of drug or solvent abuse, self-injury or overdose)
11. The death could be due to industrial disease, or related in any way to the deceased's employment
12. The death occurred during an operation or before full recovery from the effects of an anaesthetic or was in any way related to the anaesthetic (in any event a death within 24 hours should normally be referred).
13. The death may be related to a medical procedure or treatment, whether invasive or not.
14. The death may be due to a lack of medical care.
15. There are any other unusual or disturbing features to the case.
16. The death occurs within 24 hours of admission to hospital.
17. It may be wise to report any death where there is an allegation of medical mismanagement.
18. Any maternal death relating to pregnancy or childbirth.
19. Any stillbirth.
20. The deceased had *Clostridium difficile* or *Legionella.*
21. A Deprivation of Liberty is in place.

If there is any doubt, the Coroner, his officers or one of the consultant pathologists should be contacted without delay. This list may be amended occasionally so if there is any doubt, please contact the mortuary staff or bereavement office. If the case is referred to the Coroner, and he requests a post mortem, the doctor is not required to issue a Death Certificate. The post mortem report or the cause of death is available from the coroner's office. Telephone number 01908 254326.

CHEMICAL PATHOLOGY

Introduction

Chemical Pathology offers both an analytical and advisory service. Most routine tests are performed and reported the same day. Critically abnormal results are telephoned. Urgent requests for the common tests are performed within one hour of receipt. Some requests are always treated as urgent requests and are processed as soon as possible, e.g. Blood gas analysis is processed within ten minutes.

Details of available tests, normal ranges, sample requirements and turnaround times are in the attached test repertoire list.

Out of Hours Emergency service

Tests routinely available 'out of hours' are: -

- Renal profiles
- Liver profiles
- Bone profiles
- Troponin
- Glucose
- CRP
- Paracetamol & Salicylate
- Serum & Urine Osmolality
- CSF Glucose & Protein
- Amylase
- BNP
- Blood Gases

Other tests may be available depending on clinical need and should be discussed with the 'on-call' BMS or the Consultant Chemical Pathologist.
Results are available from eCare/ ICE and are not routinely telephoned unless critically abnormal.

Sample Containers

1. **Routine blood samples**
   Sample requirements are detailed individually in the test repertoire. Usually one gold bottle filled to the mark is sufficient for a full range of routine tests including hormone profiles.

2. **Glucose samples**

Where the sample for glucose estimation is likely to be greater than 3 hours old before analysis, the use of a grey fluoride oxalate bottle is strongly recommended. Delay in receipt of sample for testing will produce low results unless taken into Fluoride Oxalate.

3. 'Special' containers/collection conditions

Some of the tests in the repertoire require special containers or collection conditions; these vary depending on the referral centre and are subject to change. Please contact Pathology Support Unit (Ext. 85842) who will be pleased to supply the current container and collection conditions.

4. Urine samples

(i) Random urines should be sent in a white top universal bottle.

(ii) Timed/24 hour urines - containers are available from Pathology on request. Please state which investigation is required as the preservative added will vary with investigations. An instruction sheet detailing the collection conditions is issued with each set of 24 hour urine containers.

5. Faecal Samples

Random samples in blue top universal for Calprotectin analysis
Samples for FIT analysis should use the appropriate FIT collection Device.

6. CSF Samples

In white top universals labelled **CSF only**.
Please refer to specific instructions for Xanthochromia requests

7. Sweat Samples

A specialised collection system is used by the Paediatric Department.

8. Other Fluids and Calculi

Fluids should be collected into a gold top gel tube and calculi into a white-topped universal.

9. Blood gas samples

(i) Warn the laboratory that the sample is about to be taken.

(ii) Use a special heparinised blood gas syringe.

(iii) Collect the sample - Adults at least 2.0 ml – Paediatric, less than 16 years of age at least 0.5 ml, or a capillary sample as outlined below.

(iv) Label sample syringe with patient's eCare request.

(v) Dispose of the needle into a 'sharps' box

(vi) Purge the syringe of air.

Never send a syringe with the needle attached. This is a major hazard to those transporting the sample and to those analysing the sample. Samples with needles still attached will not be analysed and will be discarded.

Do not send blood gas samples via the air tube.

(vii) Fit a blanking hub to syringe.
(vii) Mix the sample by rolling the syringe barrel between both hands.
(viii) Place the syringe in a separate plastic bag and seal.
(ix) Complete the eCare request and place the sample in a separate plastic bag in the plastic bag attached to the card and seal.
(x) Send to Pathology via the porters to arrive within 10 minutes of collection.

Capillary samples are available, which must have a mixing wire inserted and be capped at both ends, prior to inverting 2-5 times.

Antibiotic Assays

The Antibiotic assays Gentamicin and Vancomycin are analysed by Chemical Pathology; advice on times of collection and interpretation of results is available from the Consultant Microbiologist.

Down Syndrome Screening

The Down Syndrome Screening portion of the Antenatal request card **must** be fully completed for analysis and interpretation, this test is now referred to Oxford.

Dynamic Function Tests

- Investigation of Primary Aldosteronism
- Cryoglobulin collection
- Dexamethasone (overnight suppression) test (screening for Cushing's)
- Dexamethasone (high dose) test (cause of Cushing's)
- Oral Glucose Tolerance test
- Growth Hormone (GTT suppression) test
- Investigation of Unexplained Hyperkalaemia
- Porphyria - investigation and sample collection
- Synacthen (short) test
- Synacthen (long) test
- TRH test
- Water Deprivation test
- Xylose Absorption test
- Urine Metanephrines - issued with collection bottles

- Urine 5HIAA - issued with collection bottles if 24hr urine required following abnormal urine spot test.

Therapeutic Drug Monitoring

Typically, samples should be taken as trough levels i.e. pre-dose.
Digoxin should be taken 6 - 8 hours post dose, please state on card.
For Antibiotics see above.

Analytical Instruments in Clinical Areas

The Blood Gas analysers in Casualty, Chemical Pathology, DOCC, Labour Ward, Maple Centre (SDEC), Ward 2a, NNU, Ward 4, Phase 1 and 2 Theatres, Respiratory Medicine and Ward 15 may only be used by staff trained and approved by the Pathology Point of Care Testing Team.

Xanthochromia

1ml of CSF is the minimum required for this test.

CSF for Xanthochromia should be the last specimen taken – ideally it should be protected from the light and brought to the laboratory as soon as possible.
Samples must **not** be sent via the air tube transport system.
The initial processing of the specimen in Chemical Pathology needs to be done **within one hour** of collection.
The Xanthochromia service operates between 09:00 and 17:00 during the week and between 09:00 and 12.30 on Saturdays.,

Useful clinical details to aid interpretation of results:

1. Time of onset of symptoms.
2. Time LP taken. This should be no less than 12 hours after onset of symptoms, otherwise false negative results can occur.
3. Does differential diagnosis include meningitis?
4. Requests should clearly indicate the name and number of the person requiring the results.

Key Factors Which May Affect results in Chemical Pathology

Several non-analytical factors may affect the performance of individual chemistry tests, these include the type of collection bottle used, the time taken for a sample to arrive in the laboratory, interfering substances such as high levels of lipids (lipaemia) and bilirubin (icterus), haemolysis and drug interference. Some common examples of these factors are listed below:

Collection Bottle:

Serum only	Lithium Heparin Plasma	Fluoride Oxalate Plasma
Lithium Tumour Markers Digocin Protein Electrophoresis	Ammonia	Lactate Glucose

Sample Separation Delay:
Samples are unsuitable on arrival as below:

More than 30 min old	More than 3 hours old	More than 1 day old	More than 2 days old
Lactate Ammonia Blood Gases	Troponin Glucose (if not in Fluoride Oxalate)	Alcohol Downs Magnesium Phosphate Potassium	Tumour Markers

Lipaemia:
Iron, Glucose, IgM Progesterone

Icterus:
Paracetamol, Cholesterol, Cortisol, FSH, Lactate, Progesterone, Testosterone, Triglyceride, Urea

Haemolysis:
AST, Ammonia, Bile Acids, Cholesterol, CK, Iron, LDH, Magnesium, Osmolality, Phosphate, Potassium, Total Protein, Vitamin D.

Drug Interference:
Many drugs interfere with Chemical Pathology tests, either through their interaction with the analyte to be measured or through interference with the method of analysis used. Some common examples include:

Digibind interferes with Digoxin estimation; Steroid therapy will affect the Cortisol level detected. It is therefore important to consider the drug therapy when interpreting results.

Chemical Pathology Results from 'Cardiac Arrest' Patients

These samples are given absolute priority over **all** other samples, by all members of Pathology staff.
The following, if observed by all concerned, should reduce any possible delays:

1. Requests must be made for U&E, Creatinine, Calcium & Glucose **only** and sent in a **green** (Lithium Heparin Gel) bottle. This facilitates the rapid centrifugation of samples. Gold (Clotted Blood Gel) bottle **must not be used**, as the analysis of these tests cannot be performed until the sample has clotted, typically 10 - 20 minutes. Request for Blood Gases may also be made, and the appropriate sample sent. A paper copy of the request should be sent with the sample.

2. Requests for any other tests on these patients **must** be requested on a separate number accompanied by a separate sample, this again will remove any possible delay caused by longer processing time required for these additional tests. These requests will be dealt with as '**urgent**' samples and given high priority.

3. The Pathology Support Unit **must** be made aware of these very urgent samples, either by phone or directly by a person handing the sample to reception staff, i.e. giving the sample to a member of Pathology staff and identifying it as being from an 'arrest' patient, rather than leaving the sample on the reception counter or in the 'on call' box for someone to find. If laboratory staff are made aware to expect the sample, then lab staff will be waiting for it. Merely writing 'arrest' on the request form **cannot** be considered as adequate notification.

4. All 'arrest' samples are given absolute priority by reception staff; they will number the samples if necessary and take them directly to the appropriate analytical area.

5. The scientific staff will centrifuge, where appropriate, and analyse for blood gases, U&E, Creatinine, Calcium & Glucose as a priority over **all** other samples awaiting analysis.

6. The results will be relayed to the appropriate ward or department immediately.

LIST OF TESTS AND INFORMATION

The sample stability indicates the time limit the sample will be valid for the test to be added if requested at a later date. If additional tests are required, please check with the laboratory on availability and sample volume. Urgent requests for routine tests will be processed within 1 hour of receipt or less. Inpatient requests for routine testing will be processed the same day. Those tests with short sample stability such as Ammonia or Blood gas analysis will be processed within the sample stability time displayed. Expected turnaround times are valid during normal working hours 9am to 5pm Monday to Friday unless the samples is designated as urgent and agreed with the laboratory. In these cases, the turnaround time is valid regardless of sample receipt date and time.

The list below contains those tests performed on site by the Chemical Pathology department and includes the container requirements. Most tests can all be done on one 3.5 ml gold bottle if full. If in doubt, please contact the laboratory for advice.

Test	Units	Bottle / container	Analysis	Sample stability	Expected turnaround time from receipt of sample	Normal / therapeutic range		
123								
% OXYGEN SATURATION	%	BLOOD GAS SYRINGE (On ICE)	On Demand	30 mins	20 mins – always urgent	95	-	98
A								
ACTUAL BICARBONATE	mmol/L	BLOOD GAS SYRINGE (On ICE)	On Demand	30 mins	20 mins – always urgent	20.0	-	26.0
AFP-SERUM-TUMOUR MARKER*	kU/L	GOLD	Daily	48 hours	48 hours	less than 9		
ALBUMIN	g/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	35	-	50
ALK PHOSPHATASE	iU/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	– 30		– 130
ALT*	iU/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	Female <35	-	Male <50
AMMONIA	umol/L	GREEN (Lith Hep) on ICE	On Demand	30 mins	30 mins – always urgent	6	-	47
AMYLASE-SERUM*	iU/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	28	-	100
ANGIOTENSIN CONVERTING ENZYME*	u/L	GOLD	Daily	48 hours	3 hours	8	-	52

Test	Units	Bottle / container	Analysis	Sample stability	Expected turnaround time from receipt of sample	Normal / therapeutic range		
AST* (needs updating)	iU/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	Female <35		Male <50
B								
B-HCG-PREGNANCY	iU/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine			
B-HCG-SERUM-TUMOUR MARKER	iU/L	GOLD	Daily	48 hours	48 hours	less than 5		
B2MICROGLOBULIN*	g/L	GOLD / GREEN	Daily	48 hours	48 hours	0.8	-	2.4 < 60yrs <3.1 > 59yrs
BASE EXCESS	mmol/L	BLOOD GAS SYRINGE (On ICE)	On Demand	30 mins	20 mins – always urgent	-2.0	-	2.0
BICARBONATE	mmol/L	GOLD / GREEN	Daily	24 hours	1 hour – urgent 3 hours - routine	22	-	29
BILIRUBIN-CONJUGATED *	umol/l	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	0		3.4
BILIRUBIN-TOTAL	umol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	3	-	21
BILIRUBIN-UNCONJUGATED	umol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	3	-	14
BILE ACIDS*	umol/L	GOLD	Daily	48 hours	1 hour – urgent 3 hours - routine	0	-	12
BNP* (available for cardiology/medicine consultants only)	pg/ml	LAVENDER	Daily	4 hours	1 hour – urgent 3 hours - routine			<100
C								
C.S.F LACTATE	mmol/L	GREY (Fluoride)	On Demand	1 hr	1 hour	Less than 2.8		
C.S.F. GLUCOSE	mmol/L	WHITE UNIVERSAL	On Demand	1 hr	1 hour	2.5	-	4.5
C.S.F. PROTEIN	g/L	WHITE UNIVERSAL	On Demand	1 hr	1 hour	0.15	-	0.45
CA 19-9*	U/ml	GOLD	Daily	48 hours	48 hours	0	-	35
CA-125*	U/ml	GOLD	Daily	48 hours	48 hours	0	-	35
CA-153*	U/ml	GOLD	Daily	48 hours	48 hours	0	-	23
CALCIUM	mmol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent	2.20	-	2.65

Test	Units	Bottle / container	Analysis	Sample stability	Expected turnaround time from receipt of sample	Normal / therapeutic range		
					3 hours - routine			
CALCIUM CORRECTED	mmol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	2.20	-	2.60
CALCIUM OUTPUT-URINE	mmol/24hr	24HR URINE	Within 4 days	1 week	5 days	2.5	-	7.5
CALPROTECTIN (FAECAL) *[1]	ug/g	BLUE UNIVERSAL	Within 4 days	3 days before extraction, 6 days post.	5 days	Normal Equivocal Positive		<50 50 – 200 >200
CARBAMAZEPINE	mg/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	4		12
CARBOXYHAEMOGLOBIN	%	BLOOD GAS SYRINGE/EDTA	On Demand	30 mins	20 mins – always urgent	Interpretation on screen with results		
CEA*	ug/L	GOLD	Daily	48 hours	48 hours	less than 6		
CHLORIDE	mmol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	95	-	108
CHOLESTEROL-TOTAL*	mmol/L	GOLD / GREEN	Daily	48 hours	3 hours	0		5.2
CHOLESTEROL TOTAL/HDL RATIO		GOLD / GREEN	Daily	48 hours	3 hours			
CHOLESTEROL-HDL	mmol/L	GOLD / GREEN	Daily	48 hours	3 hours			
CHOLESTEROL-LDL (Calculated)	mmol/L	GOLD / GREEN	Daily	48 hours	3 hours			
CK	iU/L	GOLD / GREEN	Daily	12hours	1 hour – urgent 3 hours - routine	Female25-200	-	Male 40-320
CORTISOL-SERUM*	nmol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 48 hours - routine	185	-	624 at 09:00 am
CREATININE*	umol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	Female 49 – 90	-	Male 64 - 104
CREATININE CLEARANCE	ml/min	24HR URINE+GOLD	48 hours	1 week	5 days	Interpretation on screen		
CREATININE OUTPUT-URINE	umol/24hr	24HR URINE	48 hours	1 week	5 days	Female 7000 - 13000		Male 13000 - 18000
CRP*	mg/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine		-	<5

Test	Units	Bottle / container	Analysis	Sample stability	Expected turnaround time from receipt of sample	Normal / therapeutic range		
D								
DIGOXIN	ug/L	GOLD	Daily	48 hours	1 hour – urgent 3 hours - routine	0.5 – 1.0		if >6hours and <24hours post dose
E								
ELECTROPHORESIS-SERUM		GOLD	Within 1 week	10 days	10 days			
ELECTROPHORESIS-URINE		WHITE UNIVERSAL	Within 1 week	10 days	10 days			
ETHANOL-SERUM	mg/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	Interpretation on screen with results		
F								
F.S.H.	U/L	GOLD / GREEN	Daily	48 hours	48 hours	–Interpretation on screen		
FAECAL IMMUNOCHEMICAL TESTING (FIT)*[2]	ug/g	FIT COLLECTION DEVICE	Within 4 days	14 days	7 days			<10
FLUID PROTEIN/GLUCOSE		GOLD	Daily	48 hours	5 hours			
FREE T3*	pmol/L	GOLD / GREEN	Daily	48 hours	48 hours	3.8	-	6.0
FREE T4*	pmol/L	GOLD / GREEN	Daily	48 hours	48 hours	7.9	-	14.4
						1st trimester 6.67	-	14.12
						2nd trimester 5.79	-	12.7
						3rd trimester 6.11	-	12.2
G								
GAMMA GT*	iU/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	Female <38		Male <55
GENTAMICIN	mg/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	See Trust Antibiotic Policy on the Intranet		
GLOBULIN	g/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	20	-	42

Test	Units	Bottle / container	Analysis	Sample stability	Expected turnaround time from receipt of sample	Normal / therapeutic range		
GLUCOSE*[3]	mmol/L	GOLD / GREEN / GREY	Daily	48 hours if fluoride oxalate	1 hour – urgent 3 hours - routine	3.5	-	7.7
GROWTH HORMONE*	ug/L	GOLD / GREEN	Daily	48 hours	48 hours	Male 0	-	1.0
						Female 0	-	3.6
GLYCOSYLATED HAEMGLOBIN*	mmol/mol	LAVENDER	48 hours	1 week	4 days	20		42
H								
HAEMOGLOBIN A1c*	%	LAVENDER	48 hours	1 week	4 days	4.0	-	6.0
I, J, K								
IgA*[4]	g/L	GOLD / GREEN	Within 4 days	1 week	5 days	Aged<2wks		0.01 - 0.08
						Aged 2 - 6wks		0.02 - 0.15
						Aged 2 – 3mths		0.05 - 0.4
						Aged 3 - 6mths		0.10 - 0.5
						Aged 6 - 9mths		0.15 - 0.7
						Aged 9 - 12mths		0.2 - 0.7
						Aged 1 - 2yrs		0.3 - 1.2
						Aged 2 - 3yrs		0.3 - 1.3
						Aged 3 - 6yrs		0.4 - 2.0
						Aged 6 - 9yrs		0.5 - 2.4
						Aged 9 - 12yrs		0.7 - 2.5
						Aged 12 - 45yrs		0.8 - 2.8
						Aged >45yrs		0.8 - 4.0
IgG*[4]	g/L	GOLD / GREEN	Within 4 days	1 week	5 days	Aged <2wks		5.0 - 17.0
						Aged 2 - 6wks		3.9 - 13.0
						Aged 2 – 3mths		2.1 - 7.7
						Aged 3 - 6mths		2.4 - 8.8
						Aged 6 - 9mths		3.0 - 9.0
						Aged 9 - 12mths		3.0 - 10.9

Test	Units	Bottle / container	Analysis	Sample stability	Expected turnaround time from receipt of sample	Normal / therapeutic range		
						Aged 1 - 2yrs		3.1 - 13.8
						Aged 2 - 3yrs		3.7 - 15.8
						Aged 3 - 6yrs		4.9 - 16.1
						Aged 6 - 45yrs		5.4 - 16.1
						Aged >45yrs		6.0 - 16.0
IgM*[4]	g/L	GOLD / GREEN	Within 4 days	1 week	5 days	Aged<2wks		0.05 - 0.2
						Aged 2 - 6wks		0.08 - 0.4
						Aged 2 – 3mths		0.15 - 0.7
						Aged 3 - 6mths		0.2 - 1.0
						Aged 6 - 9mths		0.4 - 1.6
						Aged 9 - 12mths		0.6 - 2.1
						Aged 1 - 3yrs		0.5 - 2.2
						Aged 3 - 6yrs		0.5 - 2.0
						Aged 6 - 12yrs		0.5 - 1.8
						Aged 12 - 45yrs		0.5 - 1.9
						Aged >45yrs		0.5 - 2.0
IGE*[4]	kU/L	GOLD / GREEN	Within 4 days	1 week	5 days	Aged <1wks		0-5
						Aged 1 - 14wks		0-11
						Aged 14wks - 1yr		0-29
						Aged 1 - 5yrs		0-52
						Aged 5 - 10yrs		0-63
						Aged 10 -15yrs		0-75
						Adult		0-100
IMMUNOFIXATION-SERUM		GOLD	Within 1 week	2 weeks	15 days from request			
IMMUNOFIXATION-URINE		WHITE UNIVERSAL	Within 1 week	2 weeks	15 days from request			
IRON-SERUM*	umol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	Female 10.7 – 32.2	-	Male 12.5 – 32.2

Test	Units	Bottle / container	Analysis	Sample stability	Expected turnaround time from receipt of sample	Normal / therapeutic range		
L								
L.H.	U/L	GOLD / GREEN	Daily	48 hours	48 hours	Interpretation on screen	-	
LACTATE	mmol/L	GREY on ICE	On Demand	30 minutes	30 mins – always urgent	0.6	-	2.5
LDH*	iU/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	135	-	360
LITHIUM	mmol/L	GOLD	Daily	48 hours	1 hour – urgent 24 hours - routine		-	Interpretation on screen with results
M								
MAGNESIUM	mmol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	0.7	-	1.0
MET-HAEMOGLOBIN	%	BLOOD GAS SYRINGE (On ICE)	On Demand	30 mins	30 mins – always urgent	0	-	1
METHOTREXATE	umol/L	GOLD / GREEN	On Demand	48 hours	2 hours – urgent 2 days routine	**For high dose methotrexate testing 2 days prior notice is required by the laboratory. It may be possible to process samples urgently following discussion with the laboratory**		
MICROALBUMIN - URINE	mg/L	WHITE UNIVERSAL	Daily	48 hours	2 days			
MICROALBUMIN CREATININE RATIO	mg/mmol	WHITE UNIVERSAL	Daily	48 hours	2 days	Female 0 – 3.4		Male 0 – 2.4
N								
O								
OESTRADIOL	pmol/L	GOLD / GREEN	Daily	48 hours	48 hours			Interpretation on screen with results Estradiol supplements, including Estrone

Test	Units	Bottle / container	Analysis	Sample stability	Expected turnaround time from receipt of sample	Normal / therapeutic range		
								and Estrone-3-sulphate, have been shown to have an adverse effect on estradiol assay results. Please note this assay is unsuitable for patients undergoing Estradiol supplementation.
OSMOLALITY-SERUM	mosmol/kg	GOLD / GREEN	Daily	48 hours	48 hours	275	-	295
OSMOLALITY-URINE	mosmol/kg	WHITE UNIVERSAL	Daily	48 hours	48 hours	300	-	900
P, Q								
P.S.A. (Must be spun within 24 hours)*	ug/L	GOLD	Daily	48 hours	48 hours	<4.0		
p02	kPa	BLOOD GAS SYRINGE (On ICE)	On Demand	30 mins	20 mins – always urgent	10.0	-	13.0
PARACETAMOL	mg/L	GOLD / GREEN	On Demand	48 hours	1 hour – urgent 3 hours - routine	Follow national guidelines		
pC02	kPa	BLOOD GAS SYRINGE (On ICE)	On Demand	30 mins	20 mins – always urgent	4.7	-	6.0
pH - BLOOD		BLOOD GAS SYRINGE (On ICE)	On Demand	30 mins	20 mins – always urgent	7.35	-	7.45
PHENOBARBITONE	mg/L	GOLD / GREEN	Daily	24 hours	1 hour – urgent 3 hours – routine	10- 40		
PHENYTOIN	mg/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	5 - 20		
PHOSPHATE	mmol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	0.8	-	1.5
PHOSPHATE OUTPUT-URINE	mmol/24hr	24HR URINE	48 hours	1 week	5 days	16	-	48
POTASSIUM	mmol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	3.5	-	5.3

Test	Units	Bottle / container	Analysis	Sample stability	Expected turnaround time from receipt of sample	Normal / therapeutic range		
POTASSIUM OUTPUT-URINE	mmol/24hr	24HR URINE	48 hours	1 week	5 days	25	-	125
PROGESTERONE	nmol/L	GOLD / GREEN	Daily	48 hours	48 hours			
PROLACTIN	ng/ml	GOLD	On demand	48 hours	1 hour- Urgent 3 hours – Routine	<0.065 ng/ml		
PROTEIN CONCENTRATION-URINE	g/L	WHITE UNIVERSAL	Daily	48 hours	1 day	0.05	-	0.08
PROTEIN OUTPUT-URINE	g/24hr	24HR URINE	48 hours	1 week	5 days	less than 0.15		
PROTEIN- TOTAL	g/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	60	-	80
PTH*	pmol/l	GOLD/ GREEN	Daily	48 hours	48 hours	1.3	-	9.3
R								
S								
SALICYLATE	mg/L	GOLD / GREEN	On Demand	48 hours	1 hour – urgent 3 hours - routine	Interpretation on screen with results		
SEX HORMONE BINDING GLOBULIN*		GOLD / GREEN	Daily	48 hours	48 hours	Female 16.8 – 135.6	-	Male 13.3 – 89.5
SODIUM	mmol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	133	-	146
SODIUM OUTPUT-URINE	mmol/24hr	24HR URINE	48 hours	1 week	5 days	40	-	220
SWEAT CHLORIDE AND SODIUM	mmol/l	SWEAT COLLECTOR	On Demand	48 hours	2 days	Interpretation on screen		
T								
T.S.H.*	mU/L	GOLD / GREEN	Daily	48 hours	48 hours	0.38	-	5.33
						TSH Pregnancy Related Reference Ranges:		
						1st Trimester 0.05	-	3.70
						2nd Trimester 0.31	-	4.35
						3rd Trimester 0.41	-	5.18
TESTOSTERONE	nmol/L	GOLD / GREEN	Daily	48 hours	48 hours	Male (Adult) 6.1	-	27.1
						Male (18-30) 9.0	-	28.3

Test	Units	Bottle / container	Analysis	Sample stability	Expected turnaround time from receipt of sample	Normal / therapeutic range		
						Male (31-44) 6.9	-	23.6
						Male (45-66) 5.2	-	23.7
						Female 0 – 3.0		
THEOPHYLLINE	mg/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	Aged <7wks		5-10 i.e. neonatal apnoea
						Aged >7wks		10-20 i.e. asthma etc
THYROID PEROXIDASE ANTIBODIES		GOLD / GREEN	Daily	48 hours	48 hours			
TRANSFERRIN*	g/L	GOLD / GREEN	Daily	48 hours	48 hours	2.0	-	3.6
TRIGLYCERIDES	mmol/L	GOLD / GREEN	Daily	48 hours	48 hours			
TROPONIN I* (Not practical from H.C.) must be received within 3 hours	ng/L	GOLD / GREEN	On Demand	48 hours once spun	1 hour –always urgent	Female<11.7		Male <19.9
U								
UREA	mmol/L	GOLD / GREEN	Daily	48 hours	1 hour – always urgent	2.5	-	7.8
UREA OUTPUT-URINE	mmol/24hr	24HR URINE	48 hours	1 week	5 days	170	-	580
URIC ACID	umol/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	Female 140 - 360	-	Male 200 - 430
URINE ELECTROLYTES		WHITE UNIVERSAL	Daily	48 hours	2 days			
URINE GLUCOSE		WHITE UNIVERSAL	Daily	48 hours	2 days			
URINE KETONES		WHITE UNIVERSAL	Daily	48 hours	2 days			
URINE PH		WHITE UNIVERSAL	Daily	48 hours	2 days			
URINE BILIRUBIN		WHITE UNIVERSAL	Daily	48 hours	2 days			
URINE UROBILINOGEN		WHITE UNIVERSAL	Daily	48 hours	2 days			
V								
VALPROIC ACID	mg/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	50		100
VANCOMYCIN	mg/L	GOLD / GREEN	Daily	48 hours	1 hour – urgent 3 hours - routine	See Trust Antibiotic Policy on Intranet		

Test	Units	Bottle / container	Analysis	Sample stability	Expected turnaround time from receipt of sample	Normal / therapeutic range		
VITAMIN D	nmol/L	GOLD / GREEN	Daily	48 hours	48 hours	Interpretation on screen		

These tests are referred to other hospitals for analysis. They have variable turnaround times, and may take up to 4 weeks to return. Contact the laboratory if you have a specific query relating to turnaround times and please check for outstanding results before requesting. These tests are always costly - consider other in house assays if possible. Unless otherwise stated the samples are stable for 48 hours post collection. Reporting units and Normal / Therapeutic ranges are reported in accordance with referral laboratory protocols and are included in any eCare/ ICE / paper reports

TEST	BOTTLE / CONTAINER	ANALYSIS LOCATION	SAMPLE STABILITY (if applicable)
1 2 3 etc			
11-deoxycortisol	Gold	St Thomas	
17-OH progesterone	Gold	Leeds	
17-OH Progesterone - saliva	Universal	Leeds	
Saliva 17HP (pre-supper)	Universal	Leeds	
Saliva 17HP (pre-breakfast)	Universal	Leeds	
Saliva 17HP (pre-lunch)	Universal	Leeds	
17-OH Progesterone Blood spots	Blood spots card	Cardiff	
5HIAA output	24hr urine - acid container	Oxford	
A			
Acetylcholine receptor abs	Gold	Oxford	
ACTH	Lavender (on ice)	Barts	15 mins
Acylcarnitine	Blood spot	Sheffield	
Adrenal antibodies	Gold	Oxford	

Aldosterone - only done with Renin	10ml Lith Hep bottle	Charing Cross	
Alkaline Phosphatase isoenzymes	Gold	Royal Free Hospital	
Alpha-1-anti trypsin	Gold	Sheffield	
Alpha-1-anti trypsin genotype	Lavender	Sheffield	
Alpha-1-anti trypsin in faeces	Blue faeces container	St George's	3 hours
Alpha-1-acid glycoprotein	Gold	Sheffield	
Alpha amino adipic semialdehyde	White universal (urine sample)	ICH	
Aluminium	Royal blue (trace metal bottle)	Cardiff	
Amino acids - plasma	Orange (lith hep)	Sheffield	
Amino acids – urine	White universal (urine)	Sheffield	
Amniotic fluid	White universal	Oxford	
Amphetamine (urine drug screen)	White universal (urine)	Kings	
Amylase isoenzymes	Serum	GOSH	
AMA - subtype 2	Serum	Oxford	
Amyloid A	Serum	Sheffield	
ANCA	Gold	Northampton	
Androstenedione	Gold	Leeds	
Anti basal ganglia Ab	Gold	Queens square	
Anti cardiolipin Abs	Gold	Northampton	
Anti GAD Abs	Gold	Oxford	
Anti glomerular Abs	Gold	Oxford	
Anti ganglioside Ab (gq1b)	Gold	Oxford	
Anti glycine receptor Ab	Gold	Oxford	
Anti mag atox	Gold	Oxford	
Anti Mullerian Hormone	Gold	Glasgow	

ANTI NEURONAL AB (anti HU and anti RI)	GOLD	OXFORD	
Anti nuclear antibodies	Gold	NGH	7 days
Anti musk antibodies	Gold	Oxford	
Anti Purkinje CELL Ab (anti YO)	Gold	Oxford	
Anti Voltage Gated Channel (potassium and calcium)	Gold	Oxford	
Apolipoprotein A	Gold	Royal Free	
Apolipoprotein B	Gold	Royal Free	
Apolipoprotein C	Gold or lavender	Glasgow	
Apolipoprotein E -genotyping	Lavender	Edinburgh	
Apoc iii	Lavender	Glasgow	
Aqua porine antibodies (nmo)	Gold	Oxford	
Arsenic	White universal (urine) + laveder (blood)	Birmingham	
Aripiprazole	Lavender	Kings	
Ascorbic acid (vitamin C)	Green (protected from light)	St Thomas	
Atenolol	Gold	Penarth	
Atrial natriuretic peptide	Not routinely available		
Autoantibody screen	Gold	Northampton	7 days
Azathioprine sensitivity	Lavender	Birmingham	
B			
B-HCG (Molar pregnancy)	GOLD	Charing Cross	
B2 microglobulin-CSF			Not routinely available suggest serum b2m
BCR-ABL	20mls lavender	Hammersmith & Oxford	

B2 glycoprotein	Gold	Sheffield	
Beta hydroxybutyrate	Grey flu ox (paed yellow)	Sheffield	
Biopterins	Blood spots	Birmingham	
Biotinidase	Green	Sheffield	
Bone Alkaline Phosphatase	Gold	Liverpool	
Bone markers – urine	White top universal (urine)	Liverpool	
Bone markers – blood			Not routinely available
BRCA2 Oncogene	Lavender x 2	Churchill	
C			
C1 Esterase Inhibitor	Lavender	Oxford	
C3 Nephritic Factor	Gold	Sheffield	20 mins
C-Peptide	Gold	Oxford	20 mins
CH 50	Gold	Oxford	20 mins
CH 100	Gold	Oxford	20 mins
C1q	Gold	Sheffield	20 mins
CSF Oligoclonal Bands	CSF-white (uni)+blood-gold (gel)	Sheffield	
Calcitonin	Gold (on ice)	Charing Cross	15 mins
Calculi composition	White universal	UCL	
Carbohydrate Deficient Transferrin	Gold	Kings	
Cardiac Muscle Antibodies	Gold	Sheffield	7 days
Carnitines-plasma	Green	Sheffield	
Carotene (vitamin A)	Dark green gel free (protect from light)	St Thomas	
Catecholamines – plasma			Not routinely available suggest

			Plasma Metanephrines
Caspr2 antibodies	Gold	Oxford	
Cathinone (khat)			Assay withdrawn
CD Transferrin - CSF	White universal	Sheffield	
CD4/CD8	Lavender	Northampton	Monday – Thursday only. To arrive in pathology by 4pm.
Cell marker studies	Lavender	Oxford	
Ceruloplasmin	Gold	Cardiff	
circulating Epidermal Abs (Pemphigus and pemphigoid)	GOLD	Northampton	
Chloramphenicol	Gold (gel bottle)	Bristol	Pre and post wrapped in foil
Cholinesterase	Gold	Manchester	
Chromium	White (universal)/ royal blue - blood	Cardiff	
Chromosomes	Green (lith hep)	Oxford	
Chromogranin A	Gold	Sheffield	
Chromogranin B	Lavender (on ice)	Charing Cross	5 mins
Citrullinated Peptide ab	Gold	Sheffield	3 days
Clobazam	Gold	Penarth	
Clomipramine			Not routinely available
Clonazepam	Red top gel free	Chalfont St Peter	
Clozapine/Clozaril	Lavender	Penarth	
Cobalt	Royal blue	Cardiff	
Colistin	Gold	Bristol	Pre + 1hr post dose

Common α Subunits	Gold	Birmingham	
Copper	Gold	Cardiff	
Cortisone	Gold	Southampton	
Cortisol output-urine	24hr urine/ white universal for paeds	Leeds	
Cotinine	Gold	Manchester	
CSF amino acids	CSF + matching green top blood	Sheffield	
CSF Glycine	CSF sample white universal	Sheffield	
CSF B2 Microglobulin			Not available suggest serum b2m
CTX	Gold	Nottingham	
Cyclosporin	Lavender (EDTA)		Collection varies with each transplant centre
Cycloserine	Gold	Bristol	**Pre + post dose**
Cystic Fibrosis	Lavender	Oxford	
Cytokines			**Not routinely available**
Cyrfa 21-1	Gold		
		Sheffield	
D			
7 Dehydrocholesterol	Gold	ICH	
11 Deoxycortisol	Gold	St Thomas	
Dehydroepiandrosterone	Gold	Leeds	
Diazepam	Lavender	Penarth	

Dihydro Testosterone	Gold or green	Leeds	
Diltiazem	White universal (urine)	Birmingham	
DNA studies – Muscular Dystrophy	Lavender	Oxford	
DNA studies – Fragile X	Lavender	Oxford	
DNA studies - Prader Willi & Angelman's syndrome	Lavender	Oxford	
DNA studies - Myotonic Dystrophy/Mitochondrial disease/Cystic Fibrosis/Huntington's disease	Lavender	Oxford	
Down's risk	Gold (gel bottle)	Oxford	
Drug screen – Blood			**Not routinely available suggest urine drug screen**
Drug screen – urine	White universal (urine)	Kings	
DsDNA	Gold	Northampton	3 days
E			
ENA	Gold	Northampton	
Endomysial Antibody	Gold	Northampton	7 days
Engraftment studies	Lavender	GOSH	
Erythropoietin	Gold	Kings	
Ethosuxamide	Lavender	Penarth	
Etylene Glycol	Gold, grey or green	Birmingham	
F			

Faecal Elastase	Blue universal with spoon	Cardiff	10 hours
Faecal Fat Globules	Blue universal with spoon	Oxford	
Familial Mediterranean Fever	Lavender	Royal Free	
Fibroblast Growth Factor 23	Lavender	Norwich	
Flecainide	Gold	Penarth	
FLIP1L1 - pdgfrα	2X EDTA - Marrow	Salisbury	
Flucytosine	Gold	Bristol	Pre and 1hr post samples required
Fluoxetine	Lavender	Penarth	
Fragile x	Lavender	Oxford	
Free Fatty Acids	Grey/yellow (fluoride)	Sheffield	
Free Phenytoin	Gold	Chalfont St Peter St peter	
Free Serum Light Chains	Gold	Oxford	
Fructosamine	Gold	Birmingham	
G			
G6PD	Lavender (+ normal control)	Oxford	
Gabapentin	Lavender	Penarth	
A-Galactosidase - (not Friday must be in ref lab within 24hours)	Green	GOSH	
B-Galactosidase - (not Friday must be in ref lab within 24hours)	Green	GOSH	
GAL-1-PUT - (not Friday must be in ref lab within 24hours)	Green or Orange (Lith Hep)	Institute Child Health (ICH)	
Gastrin (fasting sample)	Lavender on Ice	Charing Cross	5 mins
Gene probes	Lavender	Oxford	
Gilbert's Disease	Lavender	Ninewells	

Glomerular Basement Membrane	Gold	Northampton	
Gut Hormones	Lavender (on ice)	Charing Cross	5 mins
Glutathione Peroxidase	Orange or lavender	Glasgow	
Glycosaminoglycans	White universal (urine)	Sheffield	
Glycine – blood or CSF	Green or white universal	Sheffield	
B2 Glycoprotein	Gold	Sheffield	
Gold (blood or urine)	Gold or white universal	Guildford	
H			
5HIAA	24hr urine (acid) dietary restrictions	Oxford	
Haemochromatosis gene test	Lavender	Oxford	
Haptoglobin	Gold	Sheffield	
HLA tissue typing	Lavender	Oxford	
Homocysteine - fasting	Lavender	Sheffield	1 hour
Huntington's Chorea	Lavender	Oxford	
Homovanillic acid	24 hr urine (acid)	Sheffield	
Hexosaminidase Levels (not Friday must be in ref lab within 24hours)	Dark green	Guys and St Thomas	
I, J, K			
IGD	Gold	Sheffield	
IGFBP3	Gold	Royal Surrey	
68kd Inner Ear Protein	Red top	Cambridge	
Immunoglobulin subclasses	Gold	Sheffield	

Immunophenotyping	Lavender x2 bone marrow	Oxford	Consultant request only.
Immunoreactive trypsin			No longer available
Immunoselection electrophoresis	Gold or white universal (urine)	Sheffield	
Total inhibin	Gold	Sheffield	
Insulin (Not practical from H.C.)	Gold	Charing Cross	80 mins
Insulin Antibodies	Gold	Sheffield	
Insulin-like Growth Factor 1	Gold	Oxford	
Interleukin 6			Not routinely available
Itraconazole	Gold	Bristol	
Jak - 2	Lavender	Oxford	
Kaletra			**No longer available**
L			
Lamotrigine (Lamictal)	Lavender	Penarth	
Lead	Lavender	Cardiff	
LDH Isoenzymes	Gold or Green	GOSH	
Leber's Hereditary Optic Neuropathy	Lavender	Oxford	
Leptin Assay	Gold or Green	Addenbrooke's	
Levetiracetam	2 ml EDTA	Penarth	
LGI1 Antibodies	Gold	Oxford	
Long Chain Fatty Acids	Gold or green or lavender	Sheffield	
Lymphocyte Cell Markers	2x Lavender	Oxford	
Lysosomal Enzymes	Green or orange	GOSH	
M			
Macroamylase	Gold	Kings	

Magnesium	24hr urine (plain)	Guilford	
Manganese	EDTA or dark blue	Cardiff	
Mast Cell Tryptase (mast cell syndrome)	Gold or Lavender	Sheffield	
MCAD Deficiency	Guthrie card (neonates). White universal urine (older children)	Sheffield	
Mercury	Lavender and white universal (urine)	Cardiff	
Metalloprotease	Blue (citrate)	Oxford	
Metanephrines -Plasma	Lavender on ice	Manchester	Strict protocol - contact 85768 for info
Metanephrines - Urine	24hr Urine - plain	Oxford	
Methyl malonic Acid	White universal (urine)	Sheffield	
Neutrophil Function Test	Lavender	Oxford	1hr – By prior arrangement with pathology required before sample taken.
Midazolam	Gold	Penarth	
Mirtazepine	EDTA	Penarth	
Mycophenolate Mosetil	Lavender	Kings	
Mucopolysaccharides	White universal (urine)	Sheffield	
Myocardial antibodies	Gold	Sheffield	
N			
N-Acetylglucosaminidase	White universal (urine)	GOSH	

Neoral levels	Lavender	Oxford	
Neurodegenerative Enzyme screen	Green	GOSH	2hours. Monday – Thursday only.
Neuromyelitis Optica Antibody	Gold	Oxford	
Neurone Specific Enolase	Gold	Sheffield	
Neutrophil Function Test	Lavender	Oxford	2hours. Monday - Thursday am only
Nitrazepam	Lavender – foil wrapped	Penarth	
NMDA	Gold	Oxford	
Noradrenaline	Green	Barts	Strict protocol - contact 85768 for info
NTX	White universal	Sheffield	2nd morning void
O			
Olanzapine	Lavender	Penarth	
Oligoclonal Bands	CSF and gold (blood sample)	Sheffield	
Oligosaccharides	White universal (urine)	Leeds	
Organic Acids	White universal (urine)	Sheffield	
Orosomucoid (α-1 acid glycoprotein)	Gold	Sheffield	
Orotic Acid Quantitation	White universal (urine)	Sheffield	
Osteocalcin	Lavender	Norwich	
Ovarian Antibodies	Gold	Cardiff	
Oxalate output-urine	24hr urine	UCL	
P			
P1NP	Gold	Liverpool	
P3NP	Red	Liverpool	

P50	Lavender	Birmingham	Before 12:00 Monday to Thursday
Paraneoplastic antibodies (anti HO, YU, RI)	Gold	Oxford	
Periodic Fever Syndrome	Lavender	Royal Free Hospital	
Pethidine	White universal (urine)	Birmingham	
Phencyclidine (Angle Dust) (urine drug screen)	White universal (urine)	Birmingham	
Phenylalanine	Orange or blood spot	Sheffield	
Phosphoethanolamine	White universal (urine)	GOSH	
Phytamic Acid	Green	Sheffield	
Pipecolic Acid	Green or lavender (blood)	Sheffield	
	White universal (CSF)	Sheffield	
	White universal (urine)	Sheffield	
Pituitary Polypeptides	Gold	Birmingham	
Placental Alkaline Phosphotase	Gold	Charing cross	
Plasma Metanephrines	Lavender on ice	Manchester	Strict protocol - Contact 85768 for info
Plasma Phytosterols	Green	Institute of child health (ICH)	
PNH studies	Lavender	Oxford	Mon - Thurs am only
Porphyrins –Blood	Lavender or green (in foil)	Kings College	

Porphyrins - Faeces	Blue universal (in foil)	Kings College	
Porphyrins- Urine	24 hr urine (in foil)	Kings College	
PSA (free)	Gold	Charing Cross	Arrive within 1 hr
Procollagen Type III	Red top – gel free	Sheffield	
Proinsulin	Gold or green	Guildford	15 mins
Pseudocholinesterase	Gold	Manchester	
Purine Studies	24hr urine + lavender	St Thomas	
Purkinje Cell Antibodies (anti yo)	gold	Oxford	
Pyruvate	Special bottle contact pathology	Sheffield	Only with prior arrangement with Sheffield Children's hospital and Milton Keynes pathology.
Pyruvate Kinase	Lavender + normal control	Hammersmith	
Q			
Quetiapine	EDTA	Penarth	
Quinine	EDTA	Kings College	
R			
RAST (specify individual RAST required)	Gold	Sheffield	

Red Cell Enzymes	Green	GOSH	2hr to pathology Monday – Thursday only
Renin	Green	Charing Cross	30 min
Retinol Binding Protein	White universal (freeze immediately)	GOSH	5 mins
Risperidone (blood)	Lavender	Penarth	
Risperidone (urine)	White universal (urine)	St Thomas	
S			
Sabril (vagabatrin)			No longer available
Selenium	Gold or dark blue	Cardiff	
Sialic Acid	White universal (urine)	Manchester	
Soft Tissue Transglutaminase	Gold	Sheffield	
Sotalol	Lavender	Penarth	
Steroid Profile-Urine	24 hr urine or universal	UCL	
Stones	Stone	UCL	
Striated Muscle Antibodies	Gold	Oxford	
Sulphite	White universal (urine)	GOSH	
Sulphonyl Urea	Gold	Guilford	
T			
Tay-Sachs (carrier testing)	Pregnant – 2 green + 1 lavender	St Thomas	
	Non-pregnant or male – 2 green + 1 gold	St Thomas	
Tacrolimus	Lavender	Kings College	
T-cell Rearrangement Studies	Lavender	Royal Surrey	
T-cell Subsets	Lavender	Northampton	Monday – Thursday only. To

			arrive in pathology by 4pm
Thallium	White universal (urine) + dark blue	Cardiff	
Thioguanine Nucleotide	Lavender	St Thomas	
Thiosulphate	White universal (urine)	Sheffield	
Thyroglobulin	gold		
		Sheffield	
Thyroglobulin Antibodies	Gold	Sheffield	
Thyroid hormone Binding Protein	Gold	Addenbrooke's	
Thyroid Hormone Resistance Syndrome	Lavender	Addenbrooke's	
Thyrotropin Receptor Antibodies	Gold	Sheffield	
Tiagabine Level	EDTA	Penarth	
Titanium	Royal blue	Charing Cross	
TPMT	Lavender	St Thomas	
Transferrin Glycoforms (aka isoforms + iso electric)	Gold	Queens Square	
Traxodone	Red top	Penarth	
Tricyclic Antidepressants	Red top	Birmingham	
Tryptase – Allergic reaction	Gold or lavender or green (<1hr, 3hr, 24hr post event)	Sheffield	
Tryptase – non-urgent reaction	Gold or lavender	Sheffield	
TSH Receptor Antibodies	Gold	Sheffield	
TTGS	Gold	Northampton	7 days
U			
Urate/Creatinine Ratio	White universal (urine)	Sheffield	

Urine Amino Acids	White universal (urine)	Sheffield	
Urinary Citrate	White universal (urine)	UCH	
Urinary Copper	24hr urine (plain)	Cardiff	
Urinary Cysteine/Citrate	White universal (urine)	UCH	
Urinary Iron	24hr urine (plain)	Southampton	
V			
1,25 OH Vitamin D	Gold	Glasgow	
Vigabatrin	Lavender	Penarth	
VIP	Lavender (on ice)	Charing Cross	5 mins
Viscosity – plasma	Lavender	Oxford	
Vitamin A	Dark green gel free	St Thomas	
Vitamin B1	Lavender (in foil)	St Thomas	
Vitamin B2	Lavender (in foil)	St Thomas	
Vitamin B6	Lavender (in foil)	St Thomas	
Vitamin C	Green (in foil)	St Thomas	
Vitamin E	Dark green gel free (in foil)	St Thomas	
Vitamin K	Gold (in foil)	St Thomas	
Voriconazole	Gold	Bristol	
W, x, y, z			
Warfarin	Gold or lavender	St Thomas	
White Cell Enzymes	Green	ICH	2 hours to pathology
Y deletion	Lavender	Bristol	
Zarontin (Ethosuximide)	Gold	Penarth	

Zinc	Royal blue (trace metal bottle)	Cardiff	2 hours
Zinc Protoporphyrin	Lavender	Cardiff	

Appendix 1 – Sample Acceptance

Acceptance of samples in Pathology

Samples for Chemical Pathology, Haematology or Microbiology must arrive in plastic bags with or without a request card, Blood Transfusion samples must be sent with a request card, that has been signed and dated. Dependant on the request. Samples for Haematology, Blood transfusion and Chemical Pathology must be sent in separate bags to those samples for Microbiology.

Samples for Histology with a request card and should be delivered directly to the Histology Department.

Accurate identification details of Pathology samples are vital for patient safety. It is the responsibility of the person taking the sample from the patient to ensure that the samples are correctly labelled and that the request details are completed adequately. Sample and request details must be compatible.

Sample Labelling & Documentation Requirements

Confirming that patient identity is correctly specified on all samples and requests is the prerequisite first step to ensuring the correct results are assigned to the right patient.

Samples without request forms will be accepted into the laboratory if the samples are labelled with an eCare label.

Except for blood transfusion where samples must be handwritten and match the request form exactly. Samples and forms that do not match exactly will be rejected. This includes labels with incomplete forenames due to number of characters, in these cases the remainder of the forename must be handwritten.

Samples that are received with request forms will only be accepted according to the table below, which defines the minimum information that must be present for requested tests to be processed.

Other information defined as desirable is required to ensure results are interpreted correctly or add the most value to patient care.

Please note that Blood Transfusion has a separate policy and requires further information.

PATH/GL/03 - Blood Transfusion Policy for Administration of Blood, Blood Components and Blood Products and the Management of Transfused Patients.

Essential Information	Sample	Form	Exception or Alternative
Hospital Number (MRN)	✓	✓	Community samples. First line of address may be used.

NHS number	✓	✓	Independent care providers may substitute their own unique identifier
Surname/ Family name	✓	✓	Unconscious/unresponsive patients may be substituted by UNKNOWN or RD8UNKNOWN followed by a 4-digit number
Forename	✓	✓	• Neonatal samples may be substituted by infant or baby • Unconscious/unresponsive patients may be substituted by UNKNOWN • GUM clinic identified by M/F and DOB
Date of birth	✓	✓	• Unconscious or non-responsive patients may be substituted by UNKNOWN, or automatically generated by CRS as default 29/02/1904 • Age may be substituted for Chlamydia samples
Patient Gender	✓	✓	
Location/destination for report		✓	
Requestor/Clinician		✓	
Tests required		✓	
Date and time sample was taken, where relevant		✓	When ordering in eCare it is vital that samples are recorded as collected at the point of collection to ensure results are displayed correctly.
Site of each sample, where relevant		✓	
Name and signature of requestor, where relevant (ie for Blood Transfusion/HIV)		✓	
Desirable information			
Requestor's contact number or bleep		✓	
Clinical information relevant to the requested test		✓	
Patient's address		✓	
Pregnancy status, where known and relevant		✓	

NHS or private patient		✓	

Discrepancies and Exceptions

- Under no circumstances will a sample be processed without essential information or with mismatched information.
- Under no circumstances may Pathology staff or any other individual amend PID on either sample or form after receipt in Pathology. Additional information **may** be added to a paper request, but this must be clearly identified as being added after receipt in Pathology.
- Incomplete request forms **may** be accepted, depending on the PID on the sample, and at the discretion of the Clinical Lead or Lead BMS.
- Samples where the form and sample have conflicting PID will under no circumstances be processed.

When it is not possible to accept a sample, the sample requestor will be made aware as soon as possible, depending on the nature and location of the sample this may be via test report or phone call.

Sample Containers

Samples will only be accepted when received in the appropriate container. Specific container requirements are outlined within the Pathology Handbook.

Printed labels on blood bottles

Only demand print labels containing all the essential information, which must be no bigger than 5cm long and 2.5 cm wide are acceptable on samples. However, labels are **not** acceptable on samples for the blood transfusion department (6ml EDTA pink top).
The adhesive label should be positioned directly over the top of the label on the bottles, allowing visibility of the bottle's contents.

GP Practices will be asked to complete a Trading Partner Agreement form before using labels on Pathology sample bottles and to have performed their own risk assessment.
Labels **must** be attached to the bottle over the existing label and firmly stuck down to prevent interference with laboratory instruments.

Appendix 2 – Trigger Reporting

Information taken from The Royal College of Pathology in partnership with the Royal College of General Practitioners document 'Out-of-hours reporting of markedly abnormal laboratory test results to Primary care: Advice to pathologists and those working in laboratory medicine'.

Haematology and Blood Transfusion

Parameter	Unit	Level	Action	Comment
FBC & WBC Diff				
Haemoglobin	g/L	**< 50**	Telephone	In context of microcytic or macrocytic anaemia
	g/L	**< 70**	Telephone	If normochromic/normocytic as suggestive of blood loss or bone marrow failure
	g/L	**> 190**	See comment	Or haematocrit above 55l/l. Only requires action if there appears to be compounding medical problems – this assumes complete clinical details have been given
	g/L	**↓20**	See comment	When GP patient & where ↓has occurred over ≤ 2 weeks
Neutrophils	$x10^9$/L	**< 0.5**	Telephone	Where no evidence of chemotherapy
Neutrophils	$x10^9$/L	**> 50**	Telephone	
Lymphocytes	$x10^9$/L	**> 50**	Telephone	Requires urgent but not immediate referral
Platelets	$x10^9$/L	**< 30**	Telephone	
Platelets	$x10^9$/L	**<10**	Telephone	Inform the requester and bleep Haem Dr on call
Platelets	$x10^9$/L	**>1000**		Requires urgent but not immediate referral
ESR		**>100**	Telephone	
Blood Film				
Blasts present or diagnosis suggestive of chronic myeloid leukaemia			Discuss with haematology Dr on call	
Malaria Parasites		**Positive**	Telephone	Excluding where treatment has been initiated, however this must be evident in the clinical details
Coagulation				
INR	N/A	**>4.5**	Telephone	
APTT	secs	**>50**	Telephone	When presenting on admission or in out patient
Fibrinogen	g/L	**<0.8**	Telephone	
Hb'opathy				
Sickle Screen	N/A	**Positive**	Telephone	If pre-operative bloods
Blood Transfusion	**Level**		**Action**	**Comments**
DAT	Positive		Telephone	If cord or neonate or suspected transfusion reaction
Kleihauer	Positive		Telephone	Anti-D prophylaxis dosage also required

Antibody Screen/Crossmatch	Positive		Telephone	If likely to cause delay in blood issue or following issue of uncrossmatched blood
Product Recall			Telephone	Where any implicated product is issued.
Blood Grouping	Any discrepancy with previous results		Telephone	
Immunology	**Unit**	**Level**	**Action**	**Comments**
New ANCA: Anti-PR3 Ab Anti-MPO Ab Anti-GBM Ab	IU/ml	**Positive**	Telephone	A clear positive result in a clinical context suggestive of small vessel vasculitis should be telephoned

Chemical Pathology

Parameter	**Telephone Limits**		**Age Limits**	**Comment**
	Lower	**Upper**		
Routine Analytes				
Sodium	≤ 120 ≤ 130	≥ 160	Adult <16 yrs	
Potassium	≤ 2.5	≥ 6.5		Not required for patients on the renal unit at time of sampling
Bicarbonate	≤ 10			Inpatients only
Urea		≥ 30 ≥ 10	Adult <16 yrs	Not required for patients on the renal unit at time of sampling
Creatinine		≥ 354 ≥ 200	Adult <16 yrs	Not required for patients on the renal unit at time of sampling
AKI		AKI 2/3 AKI 1		All new occurrences All new occurrences (If K >6.0 mmol/L, phone within 24hours if GP request)
Glucose	≤ 2.5	≥ 25 ≥ 30 ≥ 11	Adult Adult <16 yrs	If not known to be type 2 diabetic If known type 2 DM If not known to be diabetic
Calcium	≤ 1.8	≥ 3.5		
CRP		≥ 300 ≥ 49	Adult < 1 month	

		≥ 149	<17 yrs	
Magnesium	≤ 0.4			
Phosphate	≤ 0.3			For GP request phone within 24hours
ALT			≥ 750 ≥ 510	For Male patients For Female patients
AST			≥ 750 ≥ 510	For Male patients For Female patients
CK			≥ 5000	
Amylase			≥ 500	
Urate		≥ 340		Ante-natal patients only
Ammonia		≥ 100		
Conjugated Bilirubin		≥ 25		Neonates only
Total Bilirubin			Neonates	Use Neonatal threshold table in appendix 1 within SOP C0329 to determine which neonatal bilirubin results to phone.
Cardiac analytes				
Troponin		≥ 99 ≥ 58		For Male patients (>19.8 if GP patient) For Female patients (>11.6 if GP patient)
Drugs				
Paracetamol		≥16		
Salicylate		≥ 300		
Ethanol		≥ 4000		Phone all positive Paediatric results
Digoxin		≥ 2.5		For GP request, if K <3.0 mmol/l immediately otherwise phone within 24hours
Lithium		≥ 1.5		For GP request phone within 24hours
Phenytoin		≥ 25		For GP request phone within 24hours
Theophylline		≥ 25		For GP request phone within 24hours
Hormones				
Cortisol	≤ 50			Unless dexamethasone suppression

Appendix 3- Formalin Safety Information

Formalin

Formaldehyde and water, used as a preservative for biological specimens.

Always wear protective gloves when handling Formalin

Spill Procedures

- **Evacuate and ventilate area, isolate the area if possible.**
- **Wear appropriate PPE (gloves, apron, goggles, respirator) before handling spillage.**
- **Contain the spillage by using granules to surround the liquid from the outer edge inwards.**
- **Use enough granules to ensure liquid is entirely absorbed, this should neutralize the fumes.**
- **Scoop up the contaminated granules into a clinical waste bag, double-bag and seal.**
- **Wash the contaminated area with soapy water, continue to ventilate if possible.**
- **Dispose of bag and PPE at soonest, safe convenience; ideally with hazardous waste.**
- **If the spillage can not be contained using the kit you are carrying then isolate the area and seek advice from Cellular Pathology on 01908 995821.**
- **For large spillages and out of hours advice call the emergency services.**

First Aid

If **Ingested**: Immediately call an emergency doctor. Do NOT induce vomiting.

If **Inhaled**: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If difficulty breathing persists, seek medical advice.

If **skin contact** (or hair): Wash off immediately, take off all contaminated clothing. If skin irritation or rash occurs, seek medical advice.

If in **eyes**: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Seek medical advice.