The Dudley Group
NHS Foundation Trust

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DEPARTMENT OF PATHOLOGY

GUIDE TO PATHOLOGY SERVICES

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CONTENTS

1 INTRODUCTION

Welcome to the Russells Hall Hospital Department of Pathology, which forms part of the Directorate of Diagnostic Services. Pathology comprises of 5 functional sections which provide a comprehensive range of clinical services and diagnostic investigations:

- Clinical Biochemistry
- Haematology and Blood Transfusion
- Cellular Pathology and Mortuary Services
- Immunology
- Microbiology

The department also provides a wide range of Phlebotomy and POCT services.
This guide is designed to provide practical information and guidance to help you make the best use of the services we provide.

2 GENERAL INFORMATION

2.1 LOCATION

The Department of Pathology is located on the 1st floor of the West wing of the hospital.
All visitors should report to Pathology Reception on arrival.
The postal address is: Department of Pathology
Russells Hall Hospital
Dudley
West Midlands
DY1 2HQ

2.2 OPENING HOURS

Department	Monday – Friday	Saturday	Sunday
Pathology Reception	09:00 – 17:30	Closed	Closed
Biochemistry	OPEN 24/7		
Haematology	OPEN 24/7		
Cellular Pathology	08:00 – 17:00	Closed	Closed
Immunology	08:00 – 16:30	Closed	Closed
Microbiology	08:00 – 20:00	08:00 – 16:00	08:00 – 16:00

An out of hours system operates for some departments outside of the above hours (see Section 3.5 below).

Department	Enquiry type	External number (01384)	Internal (extension only)
Main hospital (switch board)		456111	0

2.3 CONTACT DETAILS (GENERAL ENQUIRIES)

Pathology Reception	General enquiries **(not results / not extra tests)**	244055	2055
Blood Science	Blood results	244086	2086
	Antenatal results		
	Additional / extra Biochemistry test		
	Blood bank		
	Appointment with clinical secretaries		
	To book a glucose tolerance test		
	Any other enquiry		
Blood bookings	For patients to book a blood test	244330	
Phlebotomy	Outpatient services	244091	2091
Biochemistry	Laboratory enquiries **(not results)**	244482	2482
Haematology	Laboratory enquiries **(not results)**	244487	2487
Blood Bank	Laboratory enquiries **(not results)**		2488
Cellular Pathology	All enquiries and results	244034	2034 / 2159
Immunology	All enquiries and results	456111 ext 2447	2447
Microbiology	Microbiology results	244019	2019
	General Microbiology enquiries		
	Semen analysis appointments		
	Head / Deputy Head BMS		
Point of care testing (POCT)	All enquiries (use blood sciences number and select option for Any other enquiry)	07580 857561	07580 857561
Pathology IT Support	All IT related enquiries	456111 ext 2896	2896

For other contact details, please refer to individual department and 'Key Contacts' sections in this guide.

2.4 CONCERNS, COMPLAINTS AND COMPLIMENTS

Whilst we take pride in the service we deliver and endeavor to make it the highest quality service we can, sometimes things can happen that are out of our control. We appreciate that our service users may want to inform us and the Trust of any poor service/treatment they receive, this is a useful process for us as it can enable us to identify ways to prevent recurrence of the same problem. Please be assured your care will not be affected adversely if you make a complaint. Let us know your comments as soon as possible and where necessary, we will do our best to put things right for you.

In addition, we want to know what you think of our services generally, what your suggestions are for the future and when you are pleased by the efforts of our staff. We are grateful when our service users take the time to send in compliments on good service, which we will pass onto the staff concerned who appreciate the feedback on their hard work. There are a number of ways you can do this:

2.4.1 Resolving a concern

- You can speak to a member of the laboratory staff, whose contact numbers are at the end of this document – this is usually the quickest way to resolve any problems
- You can contact the Patient Advice and Liaison Service or PALS at pals@dgh.nhs.uk or by calling 0800 073 0510. PALS is here to support patients, relatives or carers when they have concerns or queries. Click here for more information about PALS.

2.4.2 Making a complaint

If we have not been able to resolve your concerns, you can make a formal complaint by:

- Writing to either the Complaints Department or Chief Executive at: Russells Hall Hospital, Dudley West Midlands, DY1 2HQ.
- Emailing the department directly at complaints@dgh.nhs.uk
- Calling the Complaints Department on 01384 321035 where a member of the team will talk to you
- You can contact the NHS Complaints Advocacy Service by calling 0300 456 2370

PALS can give you more information about the NHS Formal Complaints Procedure.

2.4.3 Sending us a compliment

We are always very happy to receive compliments about our services and we ensure the staff in question, and their managers, receive a copy so they know how much their hard work is appreciated.

You can write to either the:
PALS Department or Chief Executive at
Russells Hall Hospital,
Dudley,
West Midlands
DY1 2HQ.

You can email your compliment to PALS at pals@dgh.nhs.uk.

This information can be found on the Trust website at http://dudleygroup.nhs.uk/patients-and-visitors/advice-complaints-and-compliments/

2.5 INFORMATION GOVERNANCE

The Trust recognises the need for an appropriate balance between openness and confidentiality in the management and use of information. The Trust fully supports the principles of corporate governance and recognises its public accountability, but equally places importance on the confidentiality of and the security arrangements to safeguard both personal information about patients, staff and commercially sensitive information. The Trust also recognises the need to share patient's information with other health organisations and other agencies in a controlled manner consistent with the interests of the patient, and in some circumstances, the public interest. Any sharing will be done lawfully within Dudley's Information Sharing Protocols.

The Trust believes that accurate, timely and relevant information is essential to deliver the highest quality health care. As such it is the responsibility of all clinicians, managers and staff to ensure and promote the quality of information and to actively use information in decision making processes.

Information will be defined as, and where appropriate kept confidential, underpinning the principles of Information Governance and the provisions of the Data Protection Act 1998 and the Human Rights Act 1998. Non-confidential information and services will be available to the public through a variety of means including the Trust's internet based Publication Scheme under the Freedom of Information Act 2000 and in line with the Trusts Freedom of Information Policy.

Patients will have access to information relating to their own health care, options for treatment and their rights as patients. There will be clear procedures and arrangements for handling queries from patients and the public. The Trust ensures compliance with the Data Protection Act 1998, Human Rights Act 1998, Access to medical records 1990 (deceased patients) and the Freedom of Information Act 2000.The Trust has in place clear procedures and arrangements for liaison with the press and broadcasting media.

Integrity of information will be developed, monitored and maintained to ensure that it is appropriate for the purposes intended. Availability of information for operational purposes will be maintained and within set parameters relating to its importance via appropriate procedures and computer system resilience. Compliance with legal and regulatory framework will be achieved, monitored and maintained through the Information Governance Toolkit and the Caldicott and Information Governance Group.

The Trust undertakes risk assessment in conjunction with overall priority planning of organisational activity will be undertaken to determine appropriate, effective and affordable information governance controls are in place.

The Trust have established policies for the controlled and appropriate sharing of patient information with other agencies, taking into account relevant legislation (e.g. Health and Social Care Act, Crime and Disorder Act, Protection of Children Act). These policies are regularly updated to take account of new guidance such as the Climbié Report.

The Trust has in place regularly updated policies and procedures to ensure compliance with the Data Protection Act 1998, Human Rights Act 1998, the common law duty of confidentiality and the Freedom of Information Act 2000.

3 USE OF THE LABORATORY

3.1 REQUESTING

We provide a wide range of tests, details of which may be found in each particular section within this document. Please contact us if you require any specific advice or guidance regarding your requests.

To avoid any unnecessary delays, please ensure that:

- Request forms are completed accurately and legibly with enough information to definitively identify the patient (name, DOB, NHS number and address) and who requested the test (the GP and / or consultant).
- Specimens are clearly and accurately labelled, packed correctly and where applicable lids securely fastened.
- Separate specimens have been collected when the same specimen type is required for different tests (see 'Specimen Collection' below for further guidance)

Please note that in some circumstances the laboratory may not be able to accept mislabelled specimens or inaccurate request forms as this can lead to errors.

The provision of relevant clinical details is also encouraged wherever possible to ensure that the most appropriate tests are performed and to aid interpretation.

N.B. The date and time of collection must be entered clearly on all request forms. Results without a time of collection are displayed in Soarian with a time of 00:00 and may not appear in chronological order. This could result in the mismanagement of the patient and has already resulted in several critical incidents.

There is an electronic requesting system called 'TQuest'. Any enquiries regarding the use of this system should be made to PathologyIt@dgh.nhs.uk

3.1.1 Request forms

It is **essential** that correct and relevant information is provided on the request form. This includes:

- Patient's full name, date of birth and NHS or hospital number
- Clinical details where appropriate
- Specimen collection time / date

- Sufficient contact details for correct reporting of results, including name and bleep number where appropriate

Requests can be made using the following request forms:

- Haematology and Clinical Biochemistry use a single, combined request form. This form is split into colour-coded sections corresponding to each particular department – red, & green respectively.
- Blood Transfusion – red and white request form with integral specimen bag
- Immunology – light blue and white form
- Microbiology – blue and white request form with integral specimen bag
- Histology – A4 white form
- Cytology (non-gynaecological) – A4 white form

The use of printed (use an addressograph label) rather than hand-written information on forms is encouraged wherever possible. Forms must be signed by the requesting GP or consultant unless previously agreed. Exceptions would include specialised screening, such as urology pre-op assessments, and MRSA screens.

3.1.2 Specimen Labelling

Specimens must be clearly labelled, with details matching those on the associated request form, after confirmation with the patient. As a minimum requirement, specimens must be labelled with:

- Patient's full name – surname & first name
- Date of birth AND Hospital / NHS number (excluding Blood Transfusion requests)

3.1.3 Blood Transfusion Requests

Pre-printed labels are now acceptable on the request form providing the patient's full name is also **handwritten** on the label to confirm the patient identity. All request forms must include the following details: full name, date of birth, registration number, address, location of patient and signed by requesting MO. Sample collector details must also be filled in, sign and print name on the request form.

Pre-printed labels **must not be used** on the specimen. Specimens must be labelled by hand with details as above plus date and time of collection.

Specimens must be signed by person taking the blood. This person must check all patient details to ensure they are correct, by questioning the patient and checking the wrist-band.

3.1.4 Electronic Requesting

The facility to electronically request pathology tests is available to local GP surgeries for all routine Haematology, Biochemistry, Immunology, Serology and Microbiology requests.
For more information please contact our IT team at pathology.IT@dgoh.nhs.uk.

3.2 SPECIMEN COLLECTION

Where more than one blood specimen is to be taken, the order of collection must be as stated - failure to do so may result in specimen contamination:

1. Blood culture bottles
2. Blood tubes – in the order stated in the table below

Table 1: Order of collection and type of tubes for blood specimens

Volume	Cap colour	Cap ring colour	Tube type	Tests	Special instructions
3.5 mL	 Blue	 Black	Sodium citrate	All routine coagulation, prothrombin time, APTT, Fibrinogen, INR, D-Dimer, lupus anticoagulant (2 tubes)	Fill to the line and mix well (Smaller volume tubes available on request. Under/over filled tubes will be rejected).
6 mL	 Red	 Black	Clotting accelerator	All routine Microbiology – including antibiotic assays, rubella, viral studies, hepatitis, HIV Biochemistry: Calcitonin, PIIINP	Please use blue Microbiology form Send separate tube for Biochemistry
4 mL	 Ochre	 Ochre	Clotting accelerator and separation gel	All routine Biochemistry (except glucose) now including PTH Haematology: B12, Folate, Ferritin, glandular fever screen and erythropoietin.	Fill to the line and mix well Send separate tube for Haematology and erythropoietin.
4 mL	 Ochre	 White	Clotting accelerator and separation gel	All routine Immunology	Send separate tube for Immunology
4 mL	 Green	 Black	Lithium heparin	High potassium study Chromosome studies (separate tube required), Microarray (also include EDTA specimen)	Fill to the line and mix
4 mL			EDTA	Haematology: FBC, ESR, Retics, HbS, G6PD, Hb electrophoresis, Malarial parasites, RBC folate (+ 4ml gel (yellow)), Factor V Leiden,	Fill to the line and mix

Volume	Cap colour	Cap ring colour	Tube type	Tests	Special instructions
	Lavender	Black		antenatal screening (+ 2 x 6ml EDTA (pink)), cord blood for Kleihauer. Biochemistry: ACTH*, ciclosporin, Genetic tests, Gut hormones* (2 x EDTA), renin*, tacrolimus, TPMT	*Plasma must be frozen within 10 minutes Send separate tube for Biochemistry
6 mL	 Pink	 Black	EDTA	All routine blood bank tests including group and antibody screen, crossmatch and maternal blood for Kleihauer Plasma viscosity (separate tube required)	Blood Bank tube must be handwritten and labelled with **Name**, **Date of birth**, **Unit number/NHS number, date & time of collection** and **signed.**
2 mL	 Grey	 White	Fluoride oxalate	Glucose, HbA1c, alcohol, lactate	Mix the tube well
6ml	 Dark Blue	 Black	Sodium Heparin	Trace elements (manganese, zinc, copper, selenium, cobalt, chromium)	Mix the tube well

All tubes must be filled to the appropriate level. Once collected, specimens should be put into appropriate specimen bags, with the specimens and form in separate pockets.
More detailed guidance on specimen collection can be found in the relevant sections below.

3.2.1 Paediatric tubes

Paediatric tubes are the tubes of choice to be used in neonates and paediatrics when only a small amount of blood has been obtained. They are not intended to be used for adults with poor venous access.
Advice is available from the laboratory on volumes required for each test.

Table 2: Paediatric tubes

Cap colour	Tube type	Tests	Special instructions
 Pink	EDTA	Haematology: FBC, retics, HbS, G6PD, Hb electrophoresis, malarial parasites. Microbiology: Meningococcal PCR Biochemistry: genetic tests	Fill the tube and mix well.
 Red	Plain	Biochemistry: Zinc, alpha-1-antiptrypsin Microbiology: all routine Microbiology including antibiotic assays, rubella, viral studies, hepatitis, HIV (not thumb prick). Immunology: all routine Immunology; for allergy testing please contact Immunology Haematology: Glandular fever screen, Haematinics (including; B12, folate and ferritin – 2 samples required)	Please use blue Microbiology request form. Fill the tube
 Green	Heparin	All routine Biochemistry (except glucose), including ammonia. Haematology: Chromosome studies.	Fill the tube and mix well.

Cap colour	Tube type	Tests	Special instructions
 Grey	Fluoride Oxalate	Biochemistry: Glucose, HbA1c, alcohol, lactate.	Fill the tube and mix well.
 Pink	EDTA	Haematology: Group, cross match, antibody screen, DCT.	Tube must be hand-written labelled with **Name**, **Date of birth**, **Unit number/NHS number and signed.**

3.2.2 Avoiding sharps injuries

- Never place any sharps in specimen bags. All sharps must be discarded into sharps containers at the site of use
- Management of needle stick injuries should include immediate first aid, washing the injury in running water and encouragement of bleeding. Exposure to HIV must be dealt with urgently with post-exposure prophylaxis.
- All needle stick injuries involving DGOH staff must be dealt with in accordance with Trust infection control policies, including immediate referral to Occupational Health for consultation.

3.3 SPECIMEN TRANSPORTATION

There are a number of transport routes available via which specimens may be delivered to Pathology.
Please note that any specimens collected out of hours will need to be delivered directly to the laboratory.

3.3.1 Within Russells Hall Hospital

Porters collect specimens from wards and deliver them to the laboratory at Russells Hall Hospital on request to the Interserve Help Desk – extension 1234.

The **Pathology Air Tube Delivery System** links directly to the main specimen reception areas within the department, each of which has a unique 3 digit address. Use of the most appropriate address will avoid any unnecessary delays:

Biochemistry
Haematology } **074**

Immunology
Cytology **051**
Microbiology **075**

Specimens must be suitably bagged and placed into a carrier, taking care that the carrier is correctly closed. **Under no circumstances** must items be placed in the funnel without a carrier. The carrier is then placed into the despatch tube, and will be automatically sent as soon as the system is free – the status of the system is indicated by a series of lights:

Green Carrier leaving your station
Yellow Carrier arriving at your station
Red System in use

Do not attempt to use the system without appropriate training, or if you are unsure of what to do. For training and help please contact the Interserve Helpdesk on extension 1234.
To ensure the safety of all staff, and in accordance with the DGOH Infection Control Policy, the air tube delivery system **must not be used for the transport of**:

- specimens from high risk patients
- blood cultures
- CSF (cerebro spinal fluid) specimens
- Histology specimens

3.3.2 From GP surgeries

Work from GP surgeries is transported to Russells Hall Hospital via the courier services (operated by Interserve and the CCG) which calls at practices once a day at an appointed time between 9.00 am and 3.15 pm.

3.3.3 From Corbett / Guest Hospitals

During normal working hours (Monday – Friday), routine work will be transported to Russells Hall Hospital by scheduled transport:

Corbett to Russells Hall		Guest to Russells Hall	
Depart	**Arrive**	**Depart**	**Arrive**
09:30	10:00	10:10	11:15
10:45	11:15	11:55	12:20
13:20	13:40	14:00	14:20
15:15	15:45	16:30	16:45
17:10	17:45		

3.3.4 General safety precautions for transporting specimens

- All specimens must be securely closed, clearly labelled and sealed into specimen bags.
- Specimens for transport to laboratory must be sealed in a separate outer bag. They must be kept separate from mail.
- All request forms and specimens from high-risk patients **MUST** be labelled with Special Precautions or Danger of Infection labels and details of the risk stated on the request form to enable appropriate tests to be performed and precautions taken. These include:
    - HIV
    - hepatitis B/C
    - iv drug user
    - Tuberculosis
    - Salmonella typhi
    - nV CJD and CJD
- Containers for tissue in formalin must be securely closed and labelled with appropriate COSHH stickers.

Unsafe specimens which have broken or leaked will not be processed.

3.4 URGENT REQUESTS

Arrangement and contact details for urgent work will vary depending on the test required and whether the request is made within normal working hours or during a period covered by an out of hours service. Please see the relevant sections below for more details.

3.5 OUT OF HOURS SERVICE

Each night and at weekends, an out of hour's service operates from Russells Hall Hospital for Biochemistry, Haematology, and Microbiology requests. This service is designed to provide results required for the immediate management and treatment of patients outside normal laboratory hours.

The Biomedical Scientist (BMS) on duty must be contacted via the Trust Switchboard and urgent requests discussed directly, giving the reasons for the degree of urgency, so that work can be prioritised.

In life-threatening situations, such as major trauma requiring blood transfusion, requests should be classed as "Immediate". The BMS on duty will then ensure priority is given to the immediate request. When making immediate requests, please provide all available details including patient's full name, date of birth and hospital or NHS number, as this can also save time. Due to the reduced staffing levels available during out of hours periods, please double-check that any immediate request is necessary prior to request to enable us to prioritise the most urgent specimens appropriately.
Please see the relevant sections below for more details.

3.6 REPORTING OF RESULTS

All results are available as paper reports and in an electronic format, either via Keystone or available on Soarian. In addition, users who request electronically also have access to a database of previous requests and results.

There are two main sources of uncertainty attached to the measurement of analytes. One area is uncertainty associated with pre-analytical processes and the second area is the variation (or imprecision) due to the analytical process in the laboratory and biological variation within and between individuals.

4 PHLEBOTOMY SERVICES

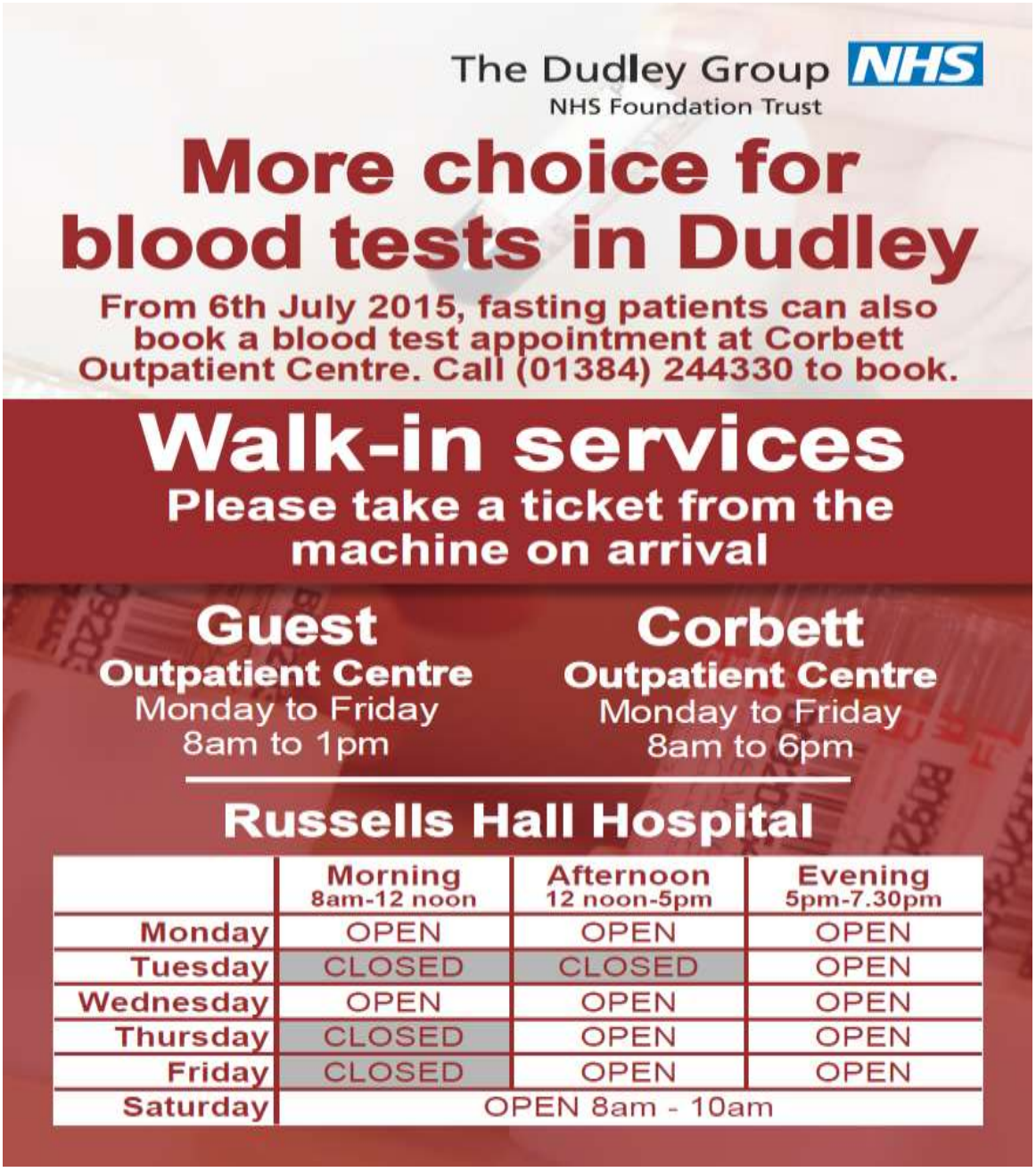
The Department of Pathology provides an extensive phlebotomy service for inpatients, outpatients, and out in the local community. This includes a limited domiciliary service.

4.1 INPATIENTS

Russells Hall Monday – Saturday
Request forms **must** be available on the ward at 07.00 hours.

Bushey Fields Tuesday & Thursday
Request forms from Bushey Fields are sent by porter to the laboratory.

4.2 OUTPATIENTS / GP PATIENTS



BOOKED APPOINTMENTS Did you know? You can book a blood test appointment at a time and location convenient to you at any of these surgeries.	
Brierley Hill Health and Social Care Centre	**01384 244330**
Cross Street Health Centre	01384 244330
Feldon Lane Surgery	**01384 244330**
Hawne Lane Surgery	01384 244330
High Oak Surgery	**01384 366155**

Kingswinford Medical Practice	01384 271241
Ladies Walk	**01384 575103**
Lion Health Medical Practice	01384 322222
Moss Grove Surgery	**01384 277377**
Netherton Health Centre	01384 244330
St. Margaret's Well Surgery	**01384 244330**
The Limes Medical Centre	01384 426929
Three Villages Wollaston Surgery	**01384 244330**
Wychbury Medical Centre	01384 322300

Please note:

- Children under the age of 10 cannot attend for a blood test after 5.30pm **and not on Saturdays**
- Oral glucose tolerance tests are **by appointment only** and undertaken only at Russells Hall. Appointments can be arranged by ringing 01384 456111 extension 2055.

4.3 LOCALLY-BASED SERVICES

We currently provide a number of practices with phlebotomy services, either to bleed patients at the surgery or to collect blood at the patient's home. Appointments are required and can be booked by contacting the appropriate practice.
Below are details of all the locally based phlebotomy services currently provided by the Department of Pathology.
For further details, or to enquire about setting up a phlebotomy service, please contact Susan Rides on 01384 244091.

Community Phlebotomy Clinic Locations
Wychbury Medical Centre (01384) 322300
Kingswinford Medical Practice (01384) 271241
Feldon Lane Surgery (01384) 244330
Hawne Lane Surgery (01384) 244330
The Limes Medical Centre (01384) 426929
Moss Grove Surgery (01384) 277377
Lion Health (01384) 322222
Three Villages Medical Practice (01384) 244330
St Margaret's Well Surgery (01384) 244330
Brierley Hill Health & Social Care Centre (01384) 244330
Cross Street Health Centre (01384) 459500
Ladies Walk Clinic (01902) 575957
Netherton Health Centre (01384) 244330

4.4 SURGERY-BASED CLINICS

We can also provide in-surgery Anticoagulant clinics to practices with sufficient patients on Warfarin. Patients can be seen, tested and dosed within the surgery.
For further details, or to enquire about setting up a clinic, please contact Susan Rides on 01384 244091.

5 POINT OF CARE TESTING (POCT)

The Department of Pathology is responsible for the co-ordination of all POCT processes across the DGNHSFT and certain outlying non-Trust locations, including staff training and technical support. POCT refers to a wide range of equipment and processes used outside the traditional laboratory setting to perform analytical testing, from simple urine dipstick tests to sophisticated desktop analysers.
Training sessions are designed to cover key issues such as Quality Control, External Quality Assessment, calibration and maintenance in addition to instructions for safe use.

We can also provide support to GPs in the use and management of POCT, from general advice to fully managed services.

6 CLINICAL BIOCHEMISTRY

6.1 SUMMARY OF SERVICE

The Department of Clinical Biochemistry offers an extensive range of tests, many of which are done in the department, and more that are referred to external laboratories.
The Consultant Chemical Pathologist, the Associate Specialist and the Clinical Scientist (Biochemists) staff provide a clinical advisory service for both in-patients and out-patients. The medical team provide clinical advice during normal and out of hours both on the telephone and at the bedside. Facilities for 'day case' dynamic function tests for endocrine and other disorders are available and require written referral to the Consultant Chemical Pathology Team.

6.1.1 Clinical Services

The Consultant Chemical Pathologist has four out-patient clinics per week for lipid, obesity and metabolic disorders. Referral to these clinics should be in writing to the Consultants or through the Choose and Book system. Referrals for dynamic function tests, other than oral glucose tolerance tests, should be in writing.

6.2 CONTACT DETAILS

	Internal extension	External (01384)
General enquiries and results	2086	244086
Dr Helen Ashby Consultant Chemical Pathologist	2079	244079
Secretary to Dr Ashby	2078	244078
Dr Angela Haddon Associate Specialist	2078	244078
Mr Pervaz Mohammed Consultant Clinical Scientist	3375	244375
Dr Anna Sanders Principal Clinical Scientist	2081	244081
Mr Gary Varndell Head Biomedical Scientist	2080	244080

6.3 REQUESTING BIOCHEMISTRY

All requests require completion of the combined Biochemistry/Haematology request form. Please provide any details of drugs and IV therapy where appropriate. Drugs may interfere with laboratory tests and failure to appreciate this may not only affect the results obtained but also have legal consequences.

For suspected acute coronary syndromes, please refer to the Front Door Chest pain Pathway (available on The Hub). **For troponin T specimens, the date and time of specimen collection must be stated on the request form**.

For therapeutic drug monitoring the dose, date/time of last dose and date/time of specimen collection must be stated.

6.3.1 Adding on tests

When all requested tests are complete, blood samples are stored refrigerated for up to 4 days. Provided the correct specimen type was collected initially, certain tests can be added on after the initial investigations are complete. Please telephone the laboratory to discuss your requirements. If you wish to add tests on, please telephone 2482 or bleep the on call biochemist out of hours.

6.3.2 Urgent Requests

During working hours and out of hours up until midnight, there is no need to notify the laboratory unless results are required in less than 1 hour. After midnight, the duty BMS must be contacted by bleep via the hospital switchboard.

6.4 AVAILABLE TESTS

6.4.1 Turnaround times

Please refer to the table below for turnaround times for individual tests. For tests sent tor referral laboratories, the external laboratory turnaround time has been given, and therefore allow an extra few days for postage of reports and entry onto the laboratory IT system.

The reproductive hormones, especially prolactin, and thyroid function tests may generate further tests depending on initial results. The turnaround time for these may then be slightly longer than stated.

6.4.2 Reference ranges

These are reported with each result - details can also be found in the table below. If further information is required, please contact the laboratory.

6.4.3 Patient information sheets

These are available upon request for the following:

- Glucose tolerance tests
- 24 hour urine collection
- Sweat tests
- 5HIAA dietary instructions

6.4.4 Uncertainty of measurement

There are two main sources of uncertainty attached to the measurement of analytes. One area is uncertainty associated with pre-analytical processes and the second area is the variation (or imprecision) due to the analytical process in the laboratory and biological variation within and between individuals.

Pre-analytical sources of uncertainty include posture of the patient, tourniquet application time, bleeding the right patient, labelling blood tubes correctly, using the right preservatives and anti-coagulants if required and minimising transport delays.

The contribution to the uncertainty of measurement associated with biological variation is determined by the physiology of the subjects observed and this uncertainty is caused by

the inherent biological variation around the homeostatic set point. Factors contributing to biological variation include biological rhythms, puberty, menopause, age and gender. Similarly, the analytical variation will be determined by a number of factors, for example the method of analysis and calibration of the analysers. Together, biological and analytical variation determines the 'critical difference' which is a measure of the value by which two consecutive measurements on the same patient of the same analyte must differ to be considered a statistically significant change in the results.

Therefore, the pre-analytical processes, biological and analytical variation together all contribute to the uncertainty of measurement. Please contact the laboratory if you require further information.

6.4.5 Available Tests

The table below details the main tests provided by the laboratory.
For any other tests not listed below, or for test specific information regarding specimen requirements, please contact the department directly on extension 2081. Whilst we attempt to ensure all of our specialist referred tests are accredited, we cannot always guarantee this. Where a test is not accredited, this will be stated on the report.

Click a letter to navigate through the test list:

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Profiles

Renal Profile	Sodium, potassium, urea, creatinine and eGFR.
Liver Profile	ALT, alkaline phosphatase, albumin and bilirubin.
Bone Profile	Calcium, adjusted calcium, phosphate, alkaline phosphatase and albumin.

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
17-Hydroxy progesterone	Serum, yellow top	Neonates (2-10 days): 0.7-12.4 Females: follicular phase: 0.7-3.1; luteal phase: 4.2-17.4 Males: 0.9-4.1 A 9 am specimen is required for late onset congenital hyperplasia	nmol/L	(7 days) New Cross Hospital, Wolverhampton		Yes
5-HIAA	Urine, 24 hour with acid	0-47	µmol/24h	8 days		Yes
ACE	Serum, yellow top	>18 years: 20-70 <18 years: 29-112	U/L	Up to 7 days		No
ACTH	EDTA plasma **To be received in the laboratory within 10 minutes of collection**	Please contact the laboratory	ng/L	Referred to St Bart's, London		Yes
Acyl carnitines	Heparin plasma (green top) Blood spots made upon receipt in laboratory			(15 days) Birmingham Children's Hospital		Yes
Adalimumab	Serum, yellow top	See individual report. Anti-adalimumab antibodies added on if required.	ug/mL	City Hospital, B'ham (5 days)		Yes
AFP	Serum, yellow top	≤5.8	IU/mL	Same day		No
Albumin	Serum, yellow top	35-50	g/L	Same day	Yes	No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Albumin/creatinine ratio (ACR)	Urine, random, plain	In diabetic nephropathy: proteinuria is defined as Females: >3.5 Males: >2.5 In CKD: proteinuria is defined as a protein excretion of >30.	mg/mmol creatinine	1 day		No
Alcohol	Fluoride oxalate		mg/dL	Same day	Yes	No
Alkaline phosphatase						
Total	Serum, yellow top	Adults: 30-130	IU/L	Same day	Yes	No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Bone alkaline phosphatase		Premenopausal females: 11-30 Male and postmenopausal females: 14-40	IU/L	8 days		Yes
Alpha-1 acid glycoprotein	Serum, yellow top	0.50-1.20	g/L	up to 7 days		No
Alpha-1 antitrypsin	Serum, yellow top Serum, red top (paediatric)	0.9-2.0	g/L	up to 7 days		No
ALT (alanine transaminase)	Serum, yellow top	Adult males: 0-50 Adult females: 0-35	IU/L	Same day	Yes	No
Amino acids	Heparin plasma (green top)	Interpretation given on each report		(15 days) Birmingham Children's Hospital		Yes
	Urine, random, plain (2 mL)					Yes
Ammonia	Heparin plasma (green top). **Take to the laboratory immediately**	Premature neonates: <150 Term neonates: <100 Infants and children: <40	µmol/L	Same day	Yes	No
Amylase	Serum, yellow top	28-100	U/L	Same day	Yes	No
	Urine, 4 hour with no preservative	Males 16-491; Females 21-447	U/L	Same day	Yes	No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Androstenedione	Serum, yellow top	Adult females: 1.0-11.5 Adult males: 2.1-10.8	nmol/L	8 days		Yes
Antenatal screening (Down's/Trisomy screening)	Serum, yellow top	Interpretation given on each report		Referred To Birmingham Women's Hospital		Yes
AST	Serum, yellow top	Males 0-40; Females 0-32	IU/L	Same day	Yes	No
Beta-2 microglobulin	Serum, yellow top	0.8-2.2	mg/L	4 days		No
Beta-hydroxy butyrate	Fluoride oxalate	Interpreted in relation to other results	mmol/L	(3-days) Birmingham Children's Hospital		Yes
Bicarbonate	Serum, yellow top	22-29	mmol/L	Same day	Yes	No
Bile acids	Serum, yellow top	0-14 µmol/L in pregnancy	µmol/L	4 days		No
<u>Bilirubin</u> Total	Serum, yellow top	>1 month: ≤21	µmol/L	Same day	Yes	No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Conjugated bilirubin		<1 month: 0-10 >1 month ≤5				
<u>Blood Gases**</u>	Heparinised gas syringe - **brought to the laboratory immediately**			1 hour	Yes	No
Base excess		±3	mmol/L			
Bicarbonate		22-28	µmol/L			
Hydrogen ion concentration		38-45	nmol/L			
pCO2		4.5-6.1	kPa			
pH		7.35-7.42				
pO2		12-15	kPa			
BNP (NT-pro brain naturetic peptide)	Serum, yellow top	<203 Should be interpreted in relation to appropriate NICE CG cut-offs (Acute heart failure/chronic heart failure)	ng/L	Same day		No
CA 15-3	Serum, yellow top	≤26.4	U/mL	4 days		No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
CA 19-9	Serum, yellow top	≤26.4	U/mL	4 days		No
Caeruloplasmin	Serum, yellow top	Male 0.15-0.3; Female 0.16-0.45	g/L	4 days		No
Calcium	Serum, yellow top	2.1-2.6	mmol/L	Same day	Yes	No
	Urine, 24 hour with acid	2.7-7.5	mmol/24h	1 day		
Calprotectin	Faeces	<50	ug/g	7 days		No
Carbamazepine	Serum, yellow top	4-12 pre-dose	mg/L	4 days	Yes, must contact lab	No
Carnitine (free)	Heparin plasma (green top)			(15 days) Birmingham Children's Hospital		Yes
Metadrenalines (Metanephrines)	Urine, 24 hour with acid (A random urine may be appropriate for paediatrics – contact laboratory for advice)			8 days		Yes
Normetadrenaline		0.89-2.88	µmol/24h			
Metadrenaline		0.33-1.53	µmol/24h			
CEA	Serum, yellow top	≤3.8	µg/L	4 days		No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Chloride	Serum, yellow top	95-108	mmol/L	Same day	Yes	No
Cholesterol	Serum, yellow top	Based on current National guidelines	mmol/L	Same day	Yes	No
Cholinesterase	Serum, yellow top	Interpretation given on individual report		Referred to North Bristol NHSFT (3 weeks)		Yes
Chromium	Sodium heparin trace element free tube (navy blue)	<40 (MHRA threshold [7ppb] = 135)	nmol/L	Heartlands Hospital, Birmingham (5-7 days)		Yes
Chromogranin A	EDTA plasma **Must be brought to laboratory immediately after collection**	Interpretation on report		Referred to Charing Cross Hospital, London		Yes
Ciclosporin	EDTA, purple top	Please contact the laboratory. Collect immediately pre-dose.	µg/L	University Hospital Birmingham (1 day)		Yes
CK (creatine kinase)	Serum, yellow top	Males <190; Females <170	IU/L	Same day	Yes	No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Complement C3	Serum, yellow top	0.9-1.8	g/L	1 day		No
C4		0.1-0.4	g/L			
Cobalt	Sodium heparin trace element free tube (navy blue)	<10 (MHRA threshold [7ppb] = 120)	nmol/L	(5-7 days) Heartlands Hospital, Birmingham		Yes
Copper	Sodium heparin trace element free tube (navy blue)	11-25 (Children older than 12 months and adults)	µmol/L	(5-7 days) Heartlands Hospital, Birmingham		Yes
	Urine, 24 hour, no preservative	0-0.9	µmol/24h	Referred to Sheffield		
Cortisol	Serum, yellow top	>16 years (9am): 133-537. >16 years (4-8pm): 68-327 30 mins post synacthen >450	nmol/L	Same day		No
	Urine, 24 hour, no preservative	<130	nmol/24h	(7 days) University Hospital B'ham		

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
C-reactive protein	Serum, yellow top	0-5	mg/L	Same day	Yes	No
Creatinine	Serum, yellow top	Adult Males 59-104 Adult Females 45-84 Paediatric reference ranges apply	µmol/L	Same day	Yes	No
	Urine, random, plain	Please contact the laboratory	mmol/L	Same day	Yes	
	Urine, 24 hour with thymol	Please contact the laboratory	mmol/24 h	1 day		
CSF glucose	Fluoride oxalate	Please contact the laboratory	mmol/L	Same day	Yes	No
CSF protein	CSF in plain universal	0.15-0.4	g/L	Same day	Yes	No
Cystic Fibrosis gene analysis	EDTA	Interpretation given on each report		Referred to West Midlands Regional Genetics Service		Yes
DHEAS	Serum, yellow top	Gender and age specific reference ranges apply	µmol/L	Same day		No
Digoxin	Serum, yellow top	0.5-2.0, 6-8 hours post dose	µg/L	Same day	Yes	No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Drugs of abuse (26 common drugs + some legal highs)	Urine, random, plain (5 mL)	Please contact the laboratory		(1-2 days) Toxicology City Hospital, Birmingam		Yes
Elastase	Faeces, random	Interpretation given on each report	µg/g	(3 days) City Hospital, Birmingham		Yes
Faecal occult blood	Hema-screen wipes (available from laboratory)	Interpretation given on each report		2 days		Yes
Free fatty acids (and beta-hydroxy butyrate)	Fluoride oxalate	Interpretation given on each report		(3 days) Birmingham Children's Hospital		Yes
Fructosamine	Serum, yellow top	200-285	umol/L	(2 days) University Hospital Birmingham		Yes
FSH	Serum, yellow top	Male: 1.5-12.4. Follicular 3.5-12.5; Ovulatory 4.7-21.5; Luteal 1.7-7.7; Post-menopausal 25.8-134.8	IU/L	Same day		No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Galactosaemia screen (galactose-1-phosphate)	Heparin whole blood (green top)(1mL) Blood spot made in the laboratory			(15 days) Birmingham Children's Hospital		Yes
Genetic testing (Molecular genetics as opposed to cytogenetics which is requested via Haematology Dept.)	EDTA	Full clinical details required. Requests preferred on West Midlands Regional Molecular Genetics request form		Dependent on genetic test requested (specimens sent to West Midlands Regional Genetics Lab., B'ham)		Yes
GGT	Serum, yellow top	Adult males <60 Adult females <40	IU/L	Same day	Yes	No
<u>Glucose</u> Glucose, fasting or random	Fluoride oxalate	If fasting glucose >= 7.0 mmol/L or random >11.0 mmol/L consider diabetes. If random between 5.5 and 11.0 repeat after fasting.	mmol/L	Same day	Yes	No
Glucose tolerance test		If standard protocol of 75g anhydrous glucose given: 2 Hour glucose 7.8-11.0 suggests impaired glucose tolerance 2 Hour glucose >11.0 suggests diabetes mellitus.				No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Growth hormone	Serum, yellow top	No normal reference range. Interpretation dependent on clinical scenario. Please contact the Biochemist on ext. 2081.	ug/L	Up to 7 days		Yes
Haemochromatosis gene analysis	EDTA	Interpretation given on each report		Referred to West Midlands Regional Genetics Service		Yes
Haptoglobin	Serum, yellow top	0.3-2.0	g/L	Same day		No
HbA1c	Fluoride oxalate	IFCC: 20-42	mmol/mol	1 day		Yes
Homocysteine (adults)	EDTA plasma (adult) **Specimens must be taken to the laboratory IMMEDIATELY after collection**	6.7-15.2	umol/L	Birmingham Heartlands Hospital		Yes
Homocysteine (paediatrics)	Heparin plasma, green top (paediatric) **Specimens must be taken to the laboratory IMMEDIATELY after collection**	<18 (male) <16 (female)	umol/L	(10 days) Birmingham Children's Hospital		Yes

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
HCG Available urgently – must contact the laboratory	Serum, yellow top	Male: 0-1.9. Female: Pre-menopausal 0-1; Post-menopausal 0-7	IU/L	Same day	Yes	No
HDL	Serum, yellow top	Based on current National guidelines	mmol/L	Same day	Yes	No
IGF-1	Serum, yellow top	Complex age and sex specific reference ranges apply. See individual reports.	nmol/L	Up to 8 days		No
Insulin (and C-peptide)	Serum, yellow top	Interpreted in relation to plasma glucose	pmol/L	Referred to Royal Surrey County Hospital		Yes
Infliximab	Serum, yellow top	See individual report. Anti-infliximab antibodies added if required	ug/mL	City Hospital, B'ham (5 days)		Yes
Iron	Serum, yellow top		µmol/L	1 day		No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Iron		5.83-34.5				
Iron saturation		Females: 15-50 Males: 20-55	%			No
TIBC		Females: 47-89 Males: 47-83	µmol/L			
Lactate	Fluoride oxalate	0.5-2.2	mmol/L	Same day	Yes	No
Lamotrigine	Serum, yellow top. Taken pre-dose	0-4	mg/L	Referred to City Hospital (Birmingham)		Yes
LDH	Serum, yellow top	≤250 (adults)	IU/L	Same day	Yes	No
Lead	EDTA, purple top	Environmental exposure <10 (<0.48) Industrial exposure <30 (<1.45)	µg/100 mL (µmol/L)	Referred to City Hospital (Birmingham)		Yes
LH	Serum, yellow top	Male: 1.7-8.6. Follicular 2.4-12.6; Ovulatory 14-95.6; Luteal 1-11.4; Post-menopausal 7.7-58.5	IU/L	Same day		No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Lithium	Serum, yellow top	0.4-1.0 at 12 hours post dose	mmol/L	Same day	Yes	No
Magnesium	Serum, yellow top	0.7-1.0	mmol/L	Same day	Yes	No
Manganese	Plasma, dark blue top	children < 1 year: 127-328 children > 1 year: adults: 73-218	nmol/L	Referred to City Hospital (Birmingham)		Yes
Oestradiol	Serum, yellow top	Male: 95-223 Follicular 45-854; Ovulatory 151-1461; Luteal 82-1251; Post-menopausal 0-505	pmol/L	Same day		No
Oligoclonal bands	CSF, plain (with serum)	Simultaneous serum specimen required. Interpretation given on each report		Immunology, University Birmingham		Yes
Oligosaccharides (mucopolysaccharidoses)	Urine, plain	Interpretation given on each report		(15 days) Birmingham Children's Hospital		Yes
Organic Acids	Urine, random, plain (min 5 mL)	Interpretation given on each report		(10 days) Birmingham Children's Hospital		Yes
Osmolality	Serum, yellow top	275-295	mmol/Kg	1 day		Yes

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
	Urine, random, plain	Please contact the laboratory for interpretation		1 day		
Ovarian tumour marker (CA 125)	Serum, yellow top	≤35	U/mL	4 days		No
Oxalate	Urine, 24 hour with acid	0.08-0.49	mmol/24 h	City Hospital, Birmingham (5 days)		Yes
Paracetamol	Serum, yellow top	Please refer to the BNF	mg/L	Same day	Yes	No
Phenobarbitone	Serum, yellow top	15-40	mg/L	City Hospital, Birmingham (2-3 days)		Yes
Phenytoin	Serum, yellow top	10-20, pre-dose	mg/L	4 days		No
Phosphate	Serum, yellow top	0.8-1.5	mmol/L	Same day	Yes	No
	Urine, 24 hour with acid	Please contact the laboratory	mmol/24 h	1 day		

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Porphyria screen	Urine, random, plain **(protect from light)** and EDTA (purple top) and faeces	**Protect from light-** give FULL clinical details. If '?' Acute Porphyria, take urine when symptomatic. Please telephone the laboratory to discuss.		Same day/referred to Porphyria Service, Cardiff	Contact lab	Yes
Potassium	Serum, yellow top Plasma, green top	3.6-5.3 3.4-4.5 (Suggest request plasma potassium if querying pseudohyperkalaemia)	mmol/L	Same day		No
	Urine, random, plain	Please contact the laboratory	mmol/L	Same day		
	Urine, 24 hour	Please contact the laboratory	mmol/24 h	1 day		
Progesterone	Serum, yellow top	Male: 0-0.5 Follicular 0.2-2.8; Luteal 5.8-76	nmol/L	Same day		No
Prolactin	Serum, yellow top	Male 86-324; Female 102-496	mU/L	Same day (High prolactins are subjected to further testing and may take up to 7 days)		No
Protein						

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Total Protein	Serum, yellow top	60-80	g/L	Same day	Yes	No
Protein/creatinine ratio (PCRR)	Urine, random, plain	In CKD, proteinuria is defined as a ratio of ≥45, on more than one occasion	mg/mmol creatinine	1 day		No
Urine Protein	Urine, 24 hour with thymol	In CKD, proteinuria is defined as a protein excretion of >0.5	g/24 h	1 day		No
PSA	Serum, yellow top	<40years 0-1.4 40-49 years 0-2 50-59 years 0-3.1 60-69 years 0-4.1 >69 years 0-4.4	µg/L	Same day		No
PTH	Serum, yellow top	1.9-6.9	pmol/L	Same day		No
Reducing substances	Urine, random, plain Faeces **Specimens must be received in the laboratory within 4 hours of collection**	Interpretation given on each report		4 days		Yes

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Renin (and aldosterone)	Plasma, purple top **Take to laboratory immediately after collection**	Interpretation given on each report. **Patients should be taken off beta-blockers and ACE inhibitors where possible as this affects results.**		Referred to Charing Cross Hospital, London		Yes
Rheumatoid factor	Serum, yellow top					No
Salicylate	Serum, yellow top	Please contact the laboratory	mg/L	Same day	Yes	No
Selenium	Sodium heparin, trace element free tube (navy-blue top)	0-30 days: 0.4-0.7 Up to 5 years: 0.6-1.1 Up to 16 years: 0.7-1.5 Adults: 0.9-1.7	µmol/L	(5-7 days) Heartlands Hospital, Birmingham		Yes
SHBG	Serum, yellow top	Male age 20-49, 18.3-54.1; Males age ≥50, 20.6-76.7; Females age 20-49, 32.4-128; Females age ≥50, 27.1-128	nmol/L	Same day		No
Sodium	Serum, yellow top	133-146	mmol/L	Same day	Yes	No
	Urine, random, plain	Please contact the laboratory	mmol/L			
	Urine, 24 hour	Please contact the laboratory	mmol/24 h	1 day		
Stone analysis	Calculus			5 days		

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Sweat test	By appointment only, please contact the laboratory	A sweat chloride of less than 40 (<30 if <5 months) is normal and there is a low probability of CF. Intermediate chloride concentrations of 40-60 (30-60 if <5 months) are suggestive but not diagnostic of CF. A sweat chloride concentration of greater than 60 supports the diagnosis of CF.	mmol/L	1 day		Yes
Tacrolimus	EDTA	Please contact the laboratory. Collect immediately pre-dose.	µg/L	University Hospital Birmingham (1 day)		Yes
Testosterone	Serum, yellow top **(9am specimen for males)**	Male age 20-50: 8.6-29.0 Males age >5: 6.7-25.7 Females: ≤2.8	nmol/L	Same day (High female testosterones are sent to New Cross Hospital for confirmation)		No
Theophylline	Serum, yellow top	0-5 years: 0-13 over 5 years: 10-20, pre-dose or 4 hour post- dose	mg/L	Same day	Yes, contact lab	No
Thioguanine nucleotides (6-TGN, 6MMPN)	EDTA, purple top			City Hospital, B'ham (2 days)		

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Thiopurine methyl transferase (TPMT)	EDTA, purple top	deficient: <10 low: 20-67 normal: 68-150 high: >150 NB recent blood transfusions may mask a deficient result.	mU/L	City Hospital, Birmingham (2 days)		Yes
Thyroid (TSH front line)	Serum, yellow top		pmol/L	Same day	Yes, contact lab	No
FT3		3.1-6.8				
FT4		12-22	pmol/L			
TSH		0.27-4.2	mIU/L			
Thyroglobulin	Serum, yellow top			Royal Victoria Hosp., Newcastle (5 days)		Yes
Thyroid Microsomal (TPO) ABS	Serum, yellow top	<34	IU/mL	3 days		No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Toxicology	Urine, plain (5 mL)	**FULL clinical details must be provided including specific drugs of interest**		Toxicology City Hospital, Birmingham (1 day)		Yes
Triglycerides	Serum, yellow top	<1.7	mmol/L	Same day	Yes	No
Troponin T	Serum, yellow top	Check Front Door Chest Pain pathway on The Hub for guidance	ng/L	1 hour (for ED/EAU)	Yes	No
TSH Receptor Antibodies (TRAb/thyrotrophin receptor antibodies)	Serum, yellow top			Royal Victoria Hosp., Newcastle (2 weeks)		Yes
Urea	Serum, yellow top	2.5-7.8	mmol/L	Same day	Yes	No
	Urine, random, plain	Please contact the laboratory	mmol/L			
	Urine, 24 hour with thymol	Please contact the laboratory	mmol/24 h	1 day		
Uric Acid	Serum, yellow top	Male 200-430; Female 140-360	µmol/L	Same day	Yes	No
	Urine, 24 hour with thymol	Please contact the laboratory	µmol/24 h	1 day		

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Valproate	Serum, yellow top	<100 Collect pre-dose. Routine monitoring of serum sodium valproate is not recommended. The only clinical indications are suspected toxicity and non-compliance in uncontrolled patients.	mg/L	(1 day) City Hospital, Birmingham		Yes
Very long chain fatty acids	Heparin plasma, green top			(15 days) Birmingham Children's Hospital		Yes
Vitamin A	Serum, yellow top	up to 7 years: 0.70-1.50 up to 13 years: 0.90-1.70 up to 20 years: 0.90-2.50 Adult females: 0.99-3.35 Adult males: 0.77-3.95	µmol/L	(2-3 days) City Hospital, Birmingham		Yes
Vitamin D (25-hydroxy vitamin D)	Serum, yellow top	Deficient <30 May be insufficient 30-50 Sufficient >50	nmol/L	Up to 3 days		No

Test	Specimen type	Reference range	Units	Turnaround time (referral lab turnaround time)	Available out of hours?	Accredited
Vitamin E	Serum, yellow top	up to 2 years: 11.5-24.4 up to 7 years: 7.0-21.0 up to 13 years: 10.0-21.0 up to 20 years: 13.0-24.0 Adults: 9.5-41.5	µmol/L	(2-3 days) City Hospital, Birmingham		Yes
Xanthochromia	CSF in plain universal, **must be protected from light**	Interpretation given on each report		Same day	Yes	Yes
Zinc	Sodium heparin, trace element free tube (navy blue top) **(Serum, red top for paediatrics)**	11-24	µmol/L	(5-7 days) Heartlands Hospital, Birmingham		Yes

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****Blood Gas Analyser (BGA) use remains under the care of Point of Care testing (POCT). Blood gas analysers are situated on acute wards throughout the Trust (ED, ITU, MHDU, OBS and NNU), and can be used by all trained personnel. An analyser is available for use in the department of Biochemistry should ones located throughout the hospital be out of use. These requests are NOT booked in through the Pathology system and no report is generated for posting to the requestor. A patient's unit number can be entered following analysis after logging onto the BGA using individual personal identification barcodes. A small till receipt type printout (with no accreditation body on the printout), is generated from the BGA with results on for clinical interpretation.**
Note: The result report is not issued by Biochemistry and is the responsibility of the trained operator of the analyser.

7 HAEMATOLOGY

7.1 SUMMARY OF SERVICE

The Department of Haematology offers a comprehensive range of tests including Coagulation and Transfusion Services.
The Consultant Haematologists provide a clinical advisory service for both in-patients and out-patients.

7.2 CONTACT DETAILS

	Internal extension	External (01384)
General enquiries & results (including antenatal results)	2086	244086
Haematology & Blood Transfusion	2487 / 2488	
Mrs B Ironmonger Head BMS Haematology	2108	244108
Mr Gregory Barber Blood Transfusion Manager	2758	
Mrs C Tuckwell /Mrs M Wheeler Transfusion Practitioners	2758	
Anticoagulant Nursing Services	2380	
Anticoagulant Clinic Booking	2048	244048
Consultants:		
Dr S Jenkins Clinical Haematology	2158	
Dr S Fernandes Clinical Haematology	2581	
Dr P Harrison Clinical Haematology	2478	
Dr J Neilson Clinical Haematology	2478	
Dr R Hipkins Clinical Haematology	2478	
Dr C Taylor Laboratory Director; Transfusion Medicine and Clinical Haematology	2144	

7.3 CLINICAL SERVICES

The Consultant Haematologists are always willing to discuss clinical problems and offer advice. In addition, the following clinical services are provided:

Anticoagulant Services	01384 244048
Anticoagulant Nursing Services	ext. 2380
Anticoagulant Clinic Booking	ext. 2048

7.3.1 In-Patient Anticoagulation services

The hospital in-patient dosing service provides comprehensive care for your patient. To refer a patient please complete an Anticoagulant In-reach Referral form, ensure the INR result is available on the day of referral and telephone 2380. This should be done as soon the patient comes into hospital or as soon as you wish to commence Warfarin treatment.

Following referral the Team will request INR tests and dose the patient accordingly. On discharge the Team will organise all anticoagulant follow up.

Any patient admitted to hospital already receiving anticoagulant therapy should be notified to the Team on ext. 2048 whether referred to In-Reach or not. Upon discharge a completed Anticoagulation Clinic Referral form should be sent to the Team and a discharge appointment booked by contacting ext 2048.
For anticoagulant therapy and advice contact the Anticoagulant Nursing Service on ext 2380.

7.3.2 Out-Patient Anticoagulation services

Hospital-based clinics are held at all 3 sites – appointments may be booked on 01384 244048.

Day	Time	Hospital
Monday	08:45 - 11:30	Corbett
Tuesday*	13:15 - 16:00	Russells Hall
Wednesday	08:45 - 11:30	Corbett
Thursday	09:30 - 11:30	Guest
Friday	09:00 - 11:30	Russells Hall
Saturday	10:30 - 12:30	Russells Hall

*An Anticoagulation Induction Clinic is available in the DVT suite at Russells Hall each Tuesday morning for patients new to Anticoagulant treatments.

Additional advice and dosage regimes for Warfarin and Heparin are available on the HUB.

Anticoagulant Clinics are currently provided for in thirteen GP surgeries throughout the district.
Non-ambulant patients only are catered for by a comprehensive domiciliary service, operated throughout the week.

For management of Anticoagulant Therapy please see full Anticoagulant Guidelines on The Hub.

We can also provide in-surgery Anticoagulant clinics to practices with sufficient patients on Warfarin. Patients can be seen, tested and dosed within the surgery.
For further details, or to enquire about setting up a clinic, please contact Susan Rides on 01384 244091.

7.4 CLINICAL HAEMATOLOGY

7.4.1 Out Patients

Patients can be referred to Drs Harrison, Hipkins, Neilson, Fernandes, Jenkins or Taylor. Clinics are held twice a week at Russells Hall:

Tuesday 13:30 – 17:30
Thursday 14:00 – 17:30

Referral is preferred through the Choose and Book system, though can also be made by referral letter.

7.4.2 In Patients

Drs Jenkins, Harrison, Hipkins, Fernandes, Neilson and Taylor are available for consultation. They should be contacted to discuss individual cases where a haematological opinion is sought. There is a rota in place available from the secretaries. In the first instance, referral should be made through the electronic (Sorian) referral system, or contact can be made with the specialist registrar or consultant via the switchboard.

7.5 REQUESTING - HAEMATOLOGY

All requests require the completion of the combined Haematology/Biochemistry request form. Please provide relevant clinical details on all requests. These will be used to prioritise requests for testing.

Add-on tests Haematology:

Any additional test requests should be made to the laboratory within the following timescales:

Citrate samples within 4 hours of venepuncture.

EDTA samples within 24 hours venepuncture (request for Haemoglobinopathy screening can be made up to 72 hours from venepuncture).

7.5.1 Urgent Requests

During working hours and out of hours up until midnight, there is no need to notify the laboratory unless results are required in less than one hour. The Biomedical Scientist (BMS) on duty must be contacted via the Trust Switchboard and urgent requests discussed directly, giving the reasons for the degree of urgency, so that work can be prioritised also if blood products are required.

7.5.2 Uncertainty of measurement

There are two main sources of uncertainty attached to the measurement of analytes. One area is uncertainty associated with pre-analytical processes and the second area is the variation (or imprecision) due to the analytical process in the laboratory and biological variation within and between individuals.

Pre-analytical sources of uncertainty include posture of the patient, tourniquet application time, bleeding the right patient, labelling blood tubes correctly, using the right preservatives and anti-coagulants if required and minimising transport delays.

The contribution to the uncertainty of measurement associated with biological variation is determined by the physiology of the subjects observed and this uncertainty is caused by the inherent biological variation around the homeostatic set point. Factors contributing to biological variation include biological rhythms, puberty, menopause, age and gender. Similarly, the analytical variation will be determined by a number of factors, for example the method of analysis and calibration of the analysers. Together, biological and analytical variation determines the ‘critical difference’ which is a measure of the value by which two consecutive measurements on the same patient of the same analyte must differ to be considered a statistically significant change in the results.

Therefore, the pre-analytical processes, biological and analytical variation together all contribute to the uncertainty of measurement. Please contact the laboratory if you require further information.

Specific values for measurement of uncertainty can be obtained by contacting the Haematology/Blood Bank Department directly.

7.5.3 Blood Bank

A separate form is required for blood-bank requests. This must be completed in full; the patient information **MUST** include full name, hospital/NHS number, date of birth and address. Even in emergency or lack of formal identification, an emergency registration number is available. Pre-printed labels are now acceptable on the request form providing the patient's full name is also **handwritten** on the label to confirm the patient identity. The same details **MUST** be completed **BY HAND** on the patient's specimen including date and time of collection and signed by the collector, after confirming both the details with the patient and the wristband. Without this information, blood or blood products cannot be provided. Both the sample requestor and the sample collector must clearly fill in their details on the form.

Add-on tests Blood Bank:

If you have already made a Blood Bank request but wish to add on additional tests or request additional products please contact the Blood Bank for advice on extension 2488 or bleep via switchboard.

7.5.4 Antenatal blood grouping and serology requests

These specimens must be clearly labelled by hand – patient labels are NOT acceptable. The details MUST include full name, hospital/NHS number, date of birth, address, date of collection and initials of the person collecting the specimen. Without this information the blood group or any serology request cannot be provided. Pre-printed labels are now acceptable on the request form providing the patient's full name is also **handwritten** on the label to confirm the patient identity.

7.5.5 Thrombophilia Screen

When requesting thrombophilia screens, please give details of:

- reason for request
- patient's history including ALL thrombotic episodes, miscarriages, etc. and age at events
- family history including thrombotic history of close family members and dates at which thromboses occurred

BCSH Clinical Guidelines for testing for Heritable Thrombophilia are followed.
www.bcshguidelines.com

7.6 AVAILABLE TESTS

The table below details the main tests provided by the laboratory. For any other tests not listed below, please contact the department to discuss availability. ***Please note the following quoted reference ranges relate to adult requests.***

Click a heading to navigate through the test list:

Blood transfusion
Haemoglobinopathy studies
Other Investigations

Please note:
* Urgent requests for these tests available within 4 hours from receipt of specimen
⬩ Urgent requests for these tests may be available within 1 hour from receipt of specimen – please discuss with the laboratory.
▫ Some tests have restricted availability

Test	Specimen type	Reference range	Units	Turnaround time	Available out of hours?
Full Blood Count*	4 ml EDTA, purple top			4 hours	Y
Haemoglobin		Male 133 - 180 Female 120 - 160	g/L	4 hours	Y
White Cell Count		4.0 - 11.00	x 10^9/L	4 hours	Y
Red Cell Count		Male 4.62 - 6.20 Female 4.20 - 5.40	x 10^{12}/L	4 hours	Y
PCV		Male 0.40 - 0.52 Female 0.35 - 0.47	L/L	4 hours	Y
MCV		78 - 98	fL	4 hours	Y
MCH		27 - 32	pg	4 hours	Y
MCHC		320 - 360	L/L	4 hours	Y
Platelets		150 - 400	x 10^9/L	4 hours	Y
RDW		11.5 – 13.9	%	4 hours	Y
Neutrophils		2.0 – 7.5	x 10^9/L	4 hours	Y

Test	Specimen type	Reference range	Units	Turnaround time	Available out of hours?
Lymphocytes		1.5 – 4.0	x 10^9/L	4 hours	Y
Monocytes		0.2 - 1.0	x 10^9/L	4 hours	Y
Eosinophils		0.04 - 0.44	x 10^9/L	4 hours	Y
Basophils		0.02 – 0.2	x 10^9/L	4 hours	Y
LUC (Large Unstained Cells)		0 - 0.6	x 10^9/l	4 hours	Y
Other Haematology Requests					
ESR*	4 ml EDTA, purple top	Male 0 -10 Female 0 - 20	mm/ 1st hour	4 hours	Y
MicroESR ***non-accredited test***	270µl EDTA	Male 0 -10 Female 0 - 20	mm/ 1st hour	4 hours	Y
Plasma viscosity	6 ml EDTA, pink top	1.5 - 1.72	M Pas	48 hours *(referred to Clinical Immunology Service, Birmingham Medical School)*	N

Test	Specimen type	Reference range	Units	Turnaround time	Available out of hours?
Reticulocyte count*	4 ml EDTA, purple top	0.2 - 2.0 (20-100)	% (x 10^9/L)	4 hours	N
Heinz bodies	4 ml EDTA, purple top	Nil		24 hours	N
Malarial parasites blood film examination*	4 ml EDTA, purple top taken when pyrexial	Nil		24 hours *N.B. Positive results will be phoned to the requesting clinician.*	Y
Haematinics					
Vitamin B12	4 ml Serum, yellow top	180 – 650	ng/l	36 hours	N
Folate	4 ml Serum, yellow top	2.8 - 15.0	µg/l	36 hours	N
RBC Folate	4 ml Serum, yellow top + 4 ml EDTA, purple top	150 - 660	µg/l	36 hours	N
Ferritin	4 ml Serum, yellow top	Male: 30 – 284 Eugonadal Female: 14 – 81 Post-menopausal Female: 14 – 186	µg/l	36 hours	N

Test	Specimen type	Reference range	Units	Turnaround time	Available out of hours?
Coagulation Studies					
Prothrombin time INR	3.5 ml citrate, blue top	INR 0.8-1.2		4 hours	Y
Partial thromboplastin time (PTTK)	3.5 ml citrate, blue top	Control +/- 7 secs (ratio 0.8-1.2)		4 hours	Y
D-Dimer (for use in cases of ?PE & ?DVT)	3.5 ml citrate, blue top	Cut off for negative predictive value = 243 *Please note; the false positive rate of the D-dimer increases with age. Please interpret positive values in those aged over 50 years in the clinical context and/or Wells score.*	ng/ml	4 hours	Y
Derived fibrinogen ***non-accredited test***	3.5 ml citrate, blue top	1.5 - 4.0 *The derived fibrinogen may be less reliable at lower levels, thus a Clauss fibrinogen will be performed for all patients with a derived fibrinogen <3g/L*	g/L	4 hours .	Y
Clauss fibrinogen	3.5 ml citrate, blue top	1.5-4.0	g/L	4 hours	Y

Test	Specimen type	Reference range	Units	Turnaround time	Available out of hours?
Factor Assays		***All paediatric special coagulation investigations are referred to Birmingham Children's Hospital; reference ranges available on report. Contact Haematology lab for specimen requirements.***			
VIII	3.5 ml citrate, blue top	50 – 150	IU/dl	28 days	N
IX	3.5 ml citrate, blue top	50 – 150			N
II	3.5 ml citrate, blue top	87-129	u/dl	28 days *(referred to University Hospitals Birmingham NHS Foundation Trust)*	N
V	3.5 ml citrate, blue top	66-135	u/dl		N
VII	3.5 ml citrate, blue top	66-170	u/dl		N
X	3.5 ml citrate, blue top	76-171	u/dl		N
XI	3.5 ml citrate, blue top	70-164	u/dl		N
XII	3.5 ml citrate, blue top	64-183	u/dl		N

Test	Specimen type	Reference range	Units	Turnaround time	Available out of hours?
Von Willebrand Screen	4 x 3.5 ml citrate, blue top	Von Willebrand factor antigen (VWF:Ag) = 48-175 Von Willebrand factor activity (VWF:RCo,RICOF) = 47-154 Von Willebrand factor collagen binding activity (vWF;CBA) = 42-259	u/dl	6-8 weeks *(referred to University Hospitals Birmingham NHS Foundation Trust)*	N
Anti-Xa activity assay	3.5 ml citrate, blue top *(Assay only performed by prior arrangement with Haematology)*	*Results only valid if sample collected 3-4 hours post dose.* Therapeutic range 0.6 – 1.0 Prophylactic range 0.1 – 0.3	IU/ml	7 days	N
Thrombophilia Screen					
Lupus anticoagulant (screen)	2 x 3.5 ml citrate, blue top	Negative		21 days	N
Antithrombin III	3.5 ml citrate, blue top	80 - 120	%	28 days *(referred to Heart of England NHS Foundation Trust)*	N
Protein C Activity	3.5 ml citrate, blue top	70 - 130	%		N

Test	Specimen type	Reference range	Units	Turnaround time	Available out of hours?
Protein S Activity	3.5 ml citrate, blue top	60 - 140	%		N
Factor V Leiden	4 ml EDTA, purple top	Normal			N
Prothombin 2020 Gene	4 ml EDTA, purple top	Normal			N
MTHFR	4 ml EDTA, purple top	Normal			N
Blood Transfusion Laboratory Estimation of Feto-maternal haemorrhage (Kleihauer)	6ml EDTA, pink top for maternal blood 4ml EDTA, purple top for cord blood (both hand-written, labelled with maternal details)	<4ml	mls	48 hours	N
		>4ml		72 hours *(Samples referred for flow cytometry at Heart of England NHS Foundation Trust if >4ml bleed identified)*	N
Baby Group, DAT and crossmatch	EDTA pink top microtainer	NA		24 hours	Y
Antenatal screening: Blood group and antibody screen, full blood count and serology	6ml EDTA, pink top x 2 6ml serum, red top x 1 - (primary bloods only) 4ml EDTA, purple top x 1	NA		7 working days	N

Test	Specimen type	Reference range	Units	Turnaround time	Available out of hours?
Blood Group, antibody screen and hold•	6ml EDTA, pink top	N/A		24 hours	Y
Red cell immunohaematology investigations•	2x 6ml EDTA, pink top will be requested by RHH Blood Bank	N/A		5 days *(referred to NHSBT, Vincent Drive, Edgbaston)*	Y
Cross Match•	6ml EDTA, pink top	N/A		24 hours	Y
Direct Coombs Test•	6ml EDTA, pink top or 4 ml EDTA, purple top	N/A		24 hours	Y
Haemoglobinopathy Studies Sickle haemoglobin screen (solubility test)	4 ml EDTA, purple top	Negative		4 hours	Y
Hb electrophoresis		A+A		72 hours	N
HbA_2 measurement		1.8 - 3.5 (3.5 – 4.0 borderline)	%	72 hours	N
HbF measurement		<1	%	72 hours	N
Confirmation of HbC/D/E by gel electophoresis		NA		7 days	N

Test	Specimen type	Reference range	Units	Turnaround time	Available out of hours?
Unknown haemoglobin variants (except HbS/C/D/E)	2x4ml EDTA, purple top *(only by prior arrangement with Haematology Consultants)*	NA		Case dependent *(referred to UK National Haemoglobinopathy Reference Laboratory, Oxford University Hospitals)*	N
HbH preparation	4 ml EDTA, purple top	Negative		72 hours	N
Other Investigations°					
Glandular Fever Screening Test	4 ml Serum, yellow top + 4 ml EDTA, purple top	Negative		24 hours	N
Cold Agglutinins Screen (includes FBC, Retics, DCT and Blood Film)	4 ml EDTA, purple top	(if approved by Haematology Consultant sent for titre if appropriate – further specimens will be required)		72 hours	N
Cerebrospinal fluid (CSF) cytospin *(for Haematology patients only)*	CSF	To d/w Consultant Haematologist		24 hours	N
Glucose-6-phosphate dehydrogenase screen	4 ml EDTA, purple top	Screen: normal activity		24 hours	N

Test	Specimen type	Reference range	Units	Turnaround time	Available out of hours?
Glucose-6-phosphate dehydrogenase assay (if screen low)	4 ml EDTA, purple top	Assay: 4.6 – 13.5	µg/Hb	7 days *(referred to Birmingham Women's and Children's NHS Foundation Trust)*	N
Pyruvate Kinase Assay	4 ml EDTA, purple top	11-19	IU/gHb	21 days *(referred to The Red Cell Centre, King's College Hospital, London)*	N
PNH screen	4 ml EDTA, purple top	Negative	NA	5 days *(referred to Heart of England NHS Foundation Trust)*	N
Leucocyte Alkaline Phosphatase	4 ml EDTA, purple top	20-120/100 neutrophils	NA	24 hours	N
Erythropoietin	4 ml Serum, yellow top	5-25	IU/L	28 days *(referred to Sandwell and West Birmingham Hospitals)*	N
JAK2 mutation	4 ml EDTA, purple top **Separate sample to FBC.**	Negative		2 months *(referred to Regional Genetics Laboratory, Birmingham Women's and Children's NHS Foundation Trust)*	N
Serum Light Chains	4 ml Serum, yellow top	Kappa/Lambda Ratio: 0.260 – 1.650	NA	21 days *(referred to Clinical Immunology Service, Birmingham Medical School)*	N
Cell Markers	4 ml EDTA, purple top **Separate sample to FBC**	Interpretation given on each report		14 days *(referred to Clinical Immunology Service, Birmingham Medical School)*	N

Test	Specimen type	Reference range	Units	Turnaround time	Available out of hours?
Cytogenetics	4ml Lithium Heparin, Green top	Interpretation given on each report		Complex up to 3 months *(referred to Regional Genetics Laboratory, Birmingham Women's and Children's NHS Foundation Trust)*	N
Urine Haemosiderin	Universal, plain white top	Negative		48 hours	N
ADAMTS13 activity ***non-accredited test***	2 x 3.5 ml citrate, blue top	38.0-110.0 *(Must be discussed with Haematology Department before sending)*	%	Dependent on clinical urgency (referred to University Hospitals, Birmingham)	N
ADAMTS13 inhibitor *(performed if activity low)* ***non-accredited test***		Negative <12 Borderline 12-15 Positive >15	U/ml		
Investigation of possible non-accidental injury (?NAI)	**Requirements MUST be discussed on individual case basis with Haematology team at Birmingham Women's and Children's NHS Foundation Trust (0121 333 9867)**			Dependent on investigations *(referred to Birmingham Women's and Children's NHS Foundation Trust)*	N
Bone Marrow Studies	Bone marrow aspirate/trephine biopsy is only performed where indicated following assessment by a Consultant Haematologist.			Non-Haematology patients: *Provisional report available within 2 weeks; final report available within 12 weeks* Haematology patients: *Full report available within 12 weeks (to include cell marker studies & cytogenetics)*	N

⇧**Return to top of table**

8 CELLULAR PATHOLOGY & MORTUARY

Histology, Non Gynae Cytology & Mortuary are accredited by UKAS and are assessed to the International Standards ISO15189:2012 for medical laboratories.
UKAS Reference 8266.

The mortuary is licensed by the Human Tissue Authority, Licence number 30009.

8.1 CONTACT DETAILS

	Internal	External (01384)
Cellular Pathology Results and General Enquiries	2159 / 2753 / 2034	244159 / 244033 / 244034
Technical Advice / Consumables orders	Non-Gynae Cytology: 2469 Histology: 2469 **Cervical Cytology (New Cross Hospital)**	456111 x2469 **01902 695288**
Mortuary / Post-Mortem Enquiries	2387 / 2199	
Bereavement Services	2198	
Consultants:		
Dr S Ghosh	1003	
Dr N Momtahan	2465	
Dr C Hanioti	2463	
Associate Specialist:		
Dr U Mohite	2319	
HTA Designated Individual PM License:		
Dr N Momtahan	2465	
Head BMS:		
Debbie Walker	2217	244217
Secretaries:		
Senior MedicalSecretary Histology Claire Whitcombe	2159	244159
Support Secretaries	2034 / 2753 / 2033 2750	244034

8.2 TURNAROUND TIMES

Turnaround times for Cellular Pathology specimens are dependent on the individual requirements of each specimen.

For histology specimens the normal technical turnaround in the laboratory is within 48 hours. Additional to this is the reporting time which is dependent upon the complexity of the case and individual specimen requirements.

Sometimes, it may be appropriate to send samples away for a specialist opinion this inevitably delays the diagnosis. Usually in these circumstances, the clinician will be made aware of the delay.
For details of expected turnaround times see the table below:

Summary of Cellular Pathology & Post Mortem Turnaround Times

Test	Sample types	Turnaround times	Special considerations	Comments
Urgent STAT Histology	Frozen Sections	Usually reported within 30 minutes of receipt of specimen	By request only. Pre-booked with laboratory and/or discussed with pathologist. Where possible 48 hours' notice should be given. **NB**:***Specimens considered as High Risk can not be processed as frozen sections.***	If there is a change to the time or of surgery or the procedure is cancelled then please notify the laboratory as soon as possible.
Urgent Histology	Various biopsies	Usually reported within 7 days of receipt	Labelled as 'Urgent' and must be discussed in advance with pathologist.	KPI 95% within 7 days **Only label cases as urgent where there is a clinical requirement for the case to be prioritised.**
Priority Histology 31/62 Cancer Target	Various diagnostic biopsies	Usually reported within 7 days of receipt	Labelled with a 31/62 Cancer target yellow sticker. NB: Some cases labelled with the 31/62 cancer target can take longer to report where additional technical work is required, these include Prostate cores, lymph nodes and large specimens.	KPI 95% within 8 days **To ensure the specimen is identified as a cancer pathway case a yellow sticker must be applied to the request form by the sender/clinician**
Routine Histology	Various	Usually reported within 21 days	Please indicate on the request form the date the	KPI 95% within 21 days

Test	Sample types	Turnaround times	Special considerations	Comments
All specimens			report is required for i.e. patient follow up date. This allows for the appropriate prioritisation of cases.	**It is helpful for the prioritisation of work to include (where possible) on the request the date when the patient has been scheduled to return to clinic for results**
Routine Histology Hospital Post Mortems	Various	Preliminary report usually available within 5 days of PM taking place Final PM reports generally available within 10 weeks of PM taking place.	As directed by consent of next of kin/nominated individual.	
Routine Histology Coroner's Post Mortems	Various	Preliminary report usually available within 3 days of PM taking place Final PM reports generally available within 10 weeks of PM taking place.	As directed by HM Coroner's Officer	
Urgent Non-gynaecological Cytology	FNAs Serous effusions CSF's	Usually reported within 48 hours of receipt of specimen. ***Please note if a cell block is required then the turnaround time will be longer.***	Discussed in advance with reporting pathologist	If there is a change to the expected time or the procedure is cancelled then please notify the laboratory
Routine Non-gynaecological Cytology	All specimen types	Usually reported within 10 days	*Please note: Those cytology cases that are on the cancer pathway will usually be reported within 8 days.*	KPI 95% within 10 days

8.3 SUBMISSION OF CELLULAR PATHOLOGY SPECIMENS

8.3.1 Completion of request forms

All sections of the request form must be completed.
When sending both Histology and Non-Gynae cytology specimens from the same patient, 2 request forms must be submitted. Information regarding both specimen types must be completed on both forms for Clinical Governance purposes. Where possible, please send the samples in the same transport package.

This must include:

- Full surname
- Full first name
- Date of Birth
- Registration Number
- Location
- Consultant
  (*Please note: that the Consultant responsible for the patients care must be included and where additional reports are to go to other relevant clinicians then these names must be included in the Additional Reports box on the request form*).
- Address & Post code
- NHS Number

Adequate and relevant clinical information must be included. Without this information, appropriate examination may not be instituted and interpretation of results may be impossible or misleading.

When sending multiple specimens from the same patient ensure that the request form lists all specimens submitted and the number of pots and each separate specimen pot is identified clearly with the specimen type and location. For example, left breast biopsy and right breast biopsy.

The mandatory High Risk section of each form **must** be completed. Samples without this information will be returned to the sender.

All products of conception sent for histological examination MUST be accompanied by a completed consent form or they will be returned to the sender.

When completing the request form if the patient is on the cancer pathway then a Yellow Cancer Pathway sticker must be applied to the request form.

It is also useful that where known any date for the patient to return to clinic for results is written on the request form.

8.3.2 Uncertainty of measurement

Histopathology differs in several ways from other types of laboratory testing and as such uncertainty of measurement cannot be measured for in the same way when formulating the descriptive results that comprise the histological/non-cervical diagnosis. This does not

mean that uncertainty does not exist in this area, just that no method exists which recognise it, yet alone measure it.
In histopathology, the essential initial step is the acquisition of visual information from all of the material submitted, a task which is easier in some cases than others because of the nature of the material. The diagnosis is then a judgment of that information in the context of all other information available to the pathologist, including clinical details interpreted against his or her knowledge and experience.
Reassurance as to the reliability of the diagnoses is provided by the following:

- All pathologists engage in internal audit of their diagnostic activities within their practice as well as participating in external quality assurance.
- Participation in External Quality Assurance schemes according to area of specialist activity.
- Cases tabled at MDTs undergo secondary review prior to presentation.
- Areas of work which are complex or pose diagnostic difficulty are double reported or assessed by a number of pathologists to reach a consensus.
- An on-going performance audit (Southampton Audit) is carried out whereby a case is selected for assessment from every MDT meeting. This includes a random selection of negative cases.
- *Ad hoc* secondary reviews.

Further information can be provided by histopathology.

8.3.3 Specimen Pots

Specimen containers must be clearly labelled and include the following information:

- Full surname
- Full first name
- Registration number / NHS number
- Location
- Consultant
- Tissue type and site of removal

In addition, ensure the following before sending specimens to the laboratory:

- All specimens and request forms are packaged correctly. If sending biopsies ensure that the request form is separated in the specimen bag from the specimen.
- All specimen lids fit securely and there is no potential for formalin/specimen to leak.
- Specimen pots and request forms are clean externally (i.e., no blood/fluid stains)

When sending multiple specimens from the same patient, ensure that each specimen pot is labelled with the specimen type and correct site of removal. For example, left breast biopsy and right breast biopsy.

Unlabelled or inadequately labelled forms or specimen containers will not be examined and will be returned to the sender.

8.3.4 Identification of high risk Cellular Pathology specimens (Mandatory Information)

If the patient/specimen is high risk, the specimen container and request form **MUST** be labelled with a "**BIOHAZARD**" label. The specimen must be transported in a plastic specimen bag which **MUST** be labelled with a "**BIOHAZARD**" label. The request form **MUST** be placed in the bag in the pocket separate to the specimen. Specimens should be segregated from other samples.

The 'mandatory' high-risk section of the request form **MUST** be completed for all cases submitted to the laboratory. Where not completed the request will be returned to source.

'High Risk' Histology specimens **MUST** be sent in 10% formalin. 'High Risk' Non-Gynaecological specimens **MUST NOT** be sent in formalin.

It is the responsibility of clinical staff to identify and label the specimen and complete the 'mandatory information' box on the request form to indicate a danger of infection to both transport / portering and laboratory staff to enable them to take the necessary precautions.

For the protection of laboratory workers the request form and any specimens collected from a patient with a known or suspected infection due to the following biological agents must be labelled as 'High Risk:

- HIV 1 & 2
- Hepatitis B Virus
- Hepatitis C Virus
- TB
- Brucella spp.
- Salmonella typhi & paratyphi
- HTLV 1 & 2

Please note: Specimens considered to be 'High Risk' can not be processed as Frozen Sections and this must be taken into account when consideration is made by the clinical team to book a frozen section.

Cases of known or suspected Creutzfeldt-Jakob disease (CJD) cannot be dissected, handled or processed at Russells Hall Hospital; such cases must be referred to a specialist centre with appropriate facilities. Contact a Consultant Histopathologist for advice where such cases are known or suspected.

For other Hazard Group 3 biological agents including:
- Anthrax,
- Rabies,
- Plague
- Yellow Fever

contact a Histopathologist or Microbiologist for advice.

8.3.4 Patient Consent

Where patient consent is required it is the responsibility of the requester to ensure the subjects of any tests have given informed consent. Unless written notice is received to the

contrary, consent for investigations and the use of any surplus sample in scheduled purposes (quality control or sample exchange schemes) will be assumed.

8.4 HISTOLOGY

8.4.1 Fixation of Specimens

The tissue fixative used routinely is formalin (10% neutral buffered formalin solution) *.

All routine tissue specimens should be placed in fixative as soon as possible after removal from the patient.
With small biopsies in particular, it is important not to let the specimen dry out as this could have an adverse effect on the quality of the tissue presented for diagnosis.

The recommended volume of fixative is at least ten times the volume of the specimen - it is therefore important not to squeeze a specimen into an inadequately sized container as the fixative will not be able to penetrate the tissue.

Poor fixation can hinder or prevent accurate histological diagnosis and will most likely result in a delay in specimen processing and reporting.

With most excised specimen types the temptation to slice open or dissect before it is sent to the Histopathology Department should be resisted. Subsequent fixation of a partly incised specimen may cause distortion and hinder anatomical orientation. In the case of excised tumours, it may then be impossible to identify surgical planes of excision.

Please contact Histology for advice regarding handling of any unusual specimen or tumour.

Containers of formalin must have tightly fitting lids and must also be labelled with appropriate COSHH labels. Specimen containers of various sizes can be collected from the laboratory. It is advisable to contact the laboratory to order the required numbers and sizes and to arrange a suitable collection time. For assistance or advice please contact the Histology laboratory (Ext. 2469).

Ensure that request forms are not put in the same compartment of the transport bag as the specimen.

COSHH information - Formaldehyde

Formaldehyde is a toxic chemical: it must be handled in accordance with COSHH regulations. Please ensure that the solution is used only as directed:

- Keep the container tightly closed in a cool, well-ventilated area
- Keep away from sources of heat and ignition
- Return unwanted or out of date containers to the laboratory
- In case of contact with eyes irrigate immediately and obtain medical advice
- Formaldehyde vapour is a well-recognised respiratory irritant. Do not breath vapour / spray
- Harmful by ingestion

- Skin contact with formalin solution should be avoided, as repeated exposure has the potential in some individuals to cause dermatitis.
- Evidence of mutagenicity and teratogenicity is documented.

A safety data sheet relating to this chemical may be obtained by contacting the histology laboratory.

First Aid Measures:
Eye contact: Irrigate thoroughly with water for at least 10 minutes
Inhalation: Remove from exposure, rest and keep warm
Skin contact: Drench the skin thoroughly with water. Remove contaminated clothing and wash before re-use.
Ingestion: Wash out mouth with plenty of water and give plenty of water to drink
Information on the Control of Substances Hazardous to Health (COSHH) guidelines can be obtained from the department.

8.4.2 Special Techniques / Instructions

Specimen type	Guidance for submission

Specimen type	Guidance for submission
Breast Resections	• Immediately after removal of the specimen it must be immersed in 10% neutral buffered formalin • **The specimen must be covered with 10x the tissue volume of formalin** • The specimen must not be placed in an inadequately sized container. The specimen container must accommodate the specimen easily and it must not be forced in. • Ensure that the specimen pot is labelled with patient details. • Ensure that a fully completed histology request form accompanies the specimen. • Deliver the specimen to the laboratory **as soon as possible** to enable the pathologist to incise the specimen on the same day. • If the operation finishes later in the day and it is not possible to deliver to the laboratory before 5:00pm then please ensure that the specimen is submerged in 10x its volume of formalin and transported to the laboratory early the following morning. • The histology laboratory opening times are as follows: ○ **07:00 to 17:00 Monday to Friday.** • A variety of specimen pot sizes can be collected from the laboratory, to order them contact 2469. **REMEMBER:** To ensure the optimal preservation of the specimen it is always best to select a larger rather than a smaller specimen pot.
Sentinel lymph node specimens	There is only a small uptake of the TC99M isotope in the sentinel node. The sentinel node must be fixed in 10% Formalin and transported to the laboratory in an appropriately labelled, designated container. Impression smears prepared from the sentinel node in theatre by the surgeon are also transported to the laboratory in an appropriately labelled, designated container. Breast specimens taken as part of the sentinel node procedure must be transported to the laboratory in an appropriately labelled metal container.
Lymph Nodes	All lymph nodes should be sent to the laboratory in formalin. They should be transported to the laboratory immediately so they can be dealt with by the lab staff on their receipt.
Products of Conception	All products of conception submitted to the laboratory must be accompanied by a POC consent form signed by the patient.
Renal Biopsy	Please contact both RHH Histology laboratory and New Cross Histology laboratory in advance. Place specimen into formalin - this can be supplied by histology on request. Inform the histology department that the specimen is on its way when the specimen is being transported to the laboratory.

Specimen type	Guidance for submission
Skin Biopsy for immunofluorescence	Please contact histology ext. 2469 in advance. Place specimen into transport medium only - this can be supplied by histology on request. Inform histology of expected arrival
Muscle Biopsy	Cases of Polymyositis can be dealt with at Russells Hall. For cases of suspected myopathy or neuro-muscular disease, please contact Dr Martyn Carey at Neuropathology Department, Queen Elizabeth Hospital, Birmingham.
Frozen Sections	At least 48 hours' notice must be given for all urgent frozen sections to ensure that a pathologist will be available and that the cryostat is in service. The pathologist may wish to discuss the case with the requesting clinician regarding indication for frozen section and the limitations of the procedure. Tissue for examination by frozen section must NOT be placed in formalin, but should be placed in a fully labelled sterile universal container. Samples must be transported to the histology laboratory immediately and handed directly to a histology technician. ***Do Not deliver to pathology reception*** Some tissues are not suitable for frozen section e.g. High Risk specimens such as potential lesions of tuberculosis or viral hepatitis and HIV positive tissues. If in doubt, please contact the laboratory in advance and ask advice of a pathologist. Full contact details for the surgeon must be provided on the request form to enable the pathologist to contact the surgeon in theatre as soon as the report is available. Frozen section material will be subsequently processed to produce paraffin sections. These will be examined and a written report issued. **Important Note:** When a frozen section is booked the reporting pathologist and laboratory staff are on standby. ***It would therefore be appreciated if surgeons could inform the laboratory on Ext. 2469 of any changes to the time the operation is scheduled or if the operation is cancelled and there is no longer a requirement for the frozen section.***

8.4.3 Referral Centres & Specialist Referrals

Sometimes it is necessary to send samples away either for:

- Additional tests that are not part of our repertoire
- Where it is necessary to seek a specialist opinion

The following are the main referral centres the Department of Cellular Pathology currently utilise:

Referral Centre	Test / Area of Specialist	Accreditation

	Opinion	
Birmingham Heartlands	ICC & FISH for HER2	UKAS 8217
Birmingham University Hospitals	Molecular testing including: KRAS, EGFR, BRAF, MMR	Application to UKAS, assessment pending
Birmingham University Hospitals	Urology, Liver, Lymphoma	Application to UKAS made
Royal Wolverhampton Hospital	Renal Biopsies & Routine Histology	UKAS 8665
Walsall Hospital	Lymphoma case, Breast Pathology, Routine histology	CPA 583
Birmingham Women's Hospital	Gynaecological Cancers	CPA 1286
National Amyloid centre, UCL, London	Amyloid cases	UKAS 9007
University Hospital, Sheffield	Head and Neck	UKAS 8093
Birmingham Royal Orthopaedic Hospital	Bone and Soft tissue	CPA 2030
London, St Thomas's Hospital (Viapath)	Skin pathology	UKAS 9323
University of Southampton	Molecular tests	UKAS 8178
Viapath LLP St Johns, London	Specialist Skin Reporting	UKAS 8126
PathoGnomics	Routine Reporting	Application to UKAS made
Sandwell & West Birmingham	Routine Reporting, Second Opinions	CPA 246

Where a biopsy has to be sent away either for additional testing then the clinician will be notified.
Turnaround times for referral centre tests are available on request.

8.4.4 Specimens for Cytogenetics

Please do not send requests to Histology as this adds an unnecessary delay to the turnaround time and could affect the quality of the sample.

To ensure a timely turnaround and prevent deterioration of the specimen, samples requiring cytogenetic analysis are sent directly from the Delivery Suite to the Cytogenetics Laboratory, at Birmingham Women's Healthcare NHS Trust, Birmingham.

All requests must be accompanied by a valid request form, supplies of which may be found in the Delivery Suite.

Please contact the Cytogenetics laboratory for advice: Cytogenetics Laboratory, Birmingham Women's Healthcare NHS Trust, Edgbaston, Birmingham, B15 2TG, Tel: 0121 627 2710, Fax 0121 627 2711.

Indications for chromosome analysis:

1. Recurrent abortions - at least 2 previous pregnancy loses or history of infertility (please also send parental blood specimens in lithium heparin).
2. Intrauterine death, unexplained stillbirth or miscarriage with one or more congenital abnormalities.
3. Previous chromosomally abnormal child.
4. Known familial chromosomal aberrations, e.g., Robertsonian translocations.
5. Abnormal ultrasound scan e.g., cystic hygroma etc.
6. Confirmation of prenatal diagnosis by CVS or amniocentesis.

Collection of specimens:

Products of conception	In transport medium or in a dry, sterile container
Whole foetus	Dry sterile container with a signed consent form
Placenta	Dry sterile container
<u>Foetal tissues</u>: Skin or muscle Placental biopsy (1 cm^3) at cord insertion site Cardiac blood or cord blood	 Transport medium or sterile saline (NOT DRY) Transport medium (NOT SALINE OR DRY) Lithium heparin

Please note:

- **DO NOT** use formalin.
- Refrigerate specimens until despatch.
- Despatch as soon as possible.
- Collect specimens as cleanly as possible; microbial contamination will compromise results.

<u>Transport</u>
Telephone Help Desk Extension: 1234 to arrange immediate collection by hospital transport.

At the weekend, prepare the specimen, place in transport media and refrigerate and arrange transport to Cytogenetics at the earliest opportunity.

8.5 CYTOLOGY

Cytology specimens are split into Diagnostic specimens (Non-Gynaecological) and Cervical Cytology specimens.

PLEASE NOTE: All cervical cytology samples are collected, processed and reported by The Royal Wolverhampton Hospitals NHS Trust.

All enquiries, result requests and requests for stock must be made to The Royal Wolverhampton Hospital NHS Trust by calling 01902 695288.

8.5.1 Diagnostic Cytology (Non-Gynaecological)

The laboratory processes a wide variety of specimens, details of the requirements for individual specimen types can be found below.

Cytology **WILL NOT** accept specimens, slides or request forms which are inadequately labelled and will return these to the sender. This will result in deterioration of the quality of the specimen and will inevitably lead to a delay in reporting.

High Risk Non-Gynaecological specimens **MUST NOT** be sent in formalin.

Diagnostic cytology specimens are in the main unfixed and need to be processed as soon as possible. Cytology specimens can be susceptible to rapid deterioration of the cells and so it is crucial that they are transported to the laboratory promptly.

If the specimen is collected after hours, store in a refrigerator at 4°C overnight and deliver to the laboratory at the earliest opportunity the following morning.

Further advice on any aspect of specimen collection, transport or suitability for examination can be obtained from the Histology laboratory on ext. 2469

Specimen type	Guidance for submission

Specimen type	Guidance for submission
FNA (Fine Needle Aspiration)	A mix of prepared air-dried and alcohol fixed smears can be sent to the lab. It is advisable to rinse out any remaining material into transport medium after the slides have been prepared. **or** Rinse the aspirated material in transport medium (contact the Cytology laboratory (Ext: 2469 for supply) and send to laboratory for preparation. Advice on FNA preparation is available from Cytology (Ext. 2469). **DO NOT** send the syringe and / or needle to the laboratory, this must be disposed of where the procedure was carried out and in accordance with the Trust Sharps Policy. Where slides are prepared please ensure each slide is labelled with patient surname, forename, hospital unit number and specimen location. Always write on slides with pencil and never use biro or a patient label. If an FNA report is requested as STAT this needs to be discussed with the Duty Histopathologist and booked in advance to ensure their availability. To book an FNA telephone one of the following extensions: 2159, 2034 or 2469 All urgent FNA requests must be discussed with the Consultant Histopathologist prior to sampling.
Sputum	Specimens of early morning 'deep cough' sputum should be submitted on 3 consecutive days. The specimens should be placed in a sterile plastic specimen container. Early morning specimens before eating are preferable to avoid contamination of specimen by food particles. Induced specimens are valuable.
Body fluids including: Pleural, Peritoneal (Ascites) and pericardial fluid.	Collect fluids in sterile white topped universal containers. ***Do not send full drain bottles / bags, decant a sample of the fluid into a sterile white topped universal container***
Urine	Collect the specimen in a sterile container. Ideally, collect the specimen after the first morning specimen has been discarded. A representative specimen of **up to** 50mL of urine should be sent to the Cytology laboratory.
CSF	Collect CSF specimens for cytology in a plastic sterile white topped universal container. **DO NOT** collect in a glass container as cells adhere to glass and can be lost in preparation. The specimen must reach the laboratory as soon as possible, preferably within 2 hours.

Specimen type	Guidance for submission
Other Cytology Specimens: Cyst Fluids, Synovial Aspirates and Hydrocele Fluids	Collect fluid in sterile white topped universal containers.

8.6 MORTUARY

8.6.1 Hospital Post Mortems

A hospital post mortem should only be requested where the cause of death is essentially known and is not in a category reportable to HM Coroner. To arrange for a hospital post mortem, the following are required:

- Medical Certificate of Cause of Death
- Signed Hospital Post Mortem Examination consent form.
- Completed autopsy request form/clinical summary.
- Case notes with cause of death as on death certificate

Consent for a hospital post mortem examination must be obtained in advance from the next of kin or nominated individual and by someone trained to take consent, usually the bereavement officer or a member of the mortuary team. For further information see the Trust Policy 'Consent for hospital Post Mortem Examination and Retention of Tissue and Use of Organs.

8.6.2 Foetal, Perinatal & Neonatal Autopsies

Abortuses up to 23 weeks

Send fresh to Russells Hall Hospital Mortuary with questionnaire/clinical summary form (available in Delivery Suite).

Stillbirths (from 24 weeks onwards)

Obtain consent for autopsy. Complete consent forms (available in Delivery Suite). Send the completed forms and the foetus with placenta, where available to the mortuary at Russells Hall Hospital for collection (even if the family are arranging the funeral with their own Funeral Director). Certification of cremation of stillbirth remains will also be required.

Perinatal & Neonatal Deaths

Obtain consent and complete questionnaire. Follow above procedure. A certificate of Cremation will be required if the baby is to be cremated after post mortem.

8.6.3 Medical Certificate of Cause of Death

It is important that the Medical Certificate of Cause of Death is completed correctly otherwise problems are created when the family attempt to register the death.
The correct format is:

1. (a) the condition directly leading to the death (not mere mode of dying).

   (b) the condition(s) that caused 1 (a)

   (c) the condition (if anything) caused 1 (b).

2. Other significant condition actually contributing to death, but not part of 1 (a).

You cannot sign a certificate unless you have seen the patient within the last 14 days or have seen the deceased outside this period **AND** seen after death. It may still be possible to issue a certificate but only after consultation with HM Coroner's Office.

You can only issue death certificate if you were in attendance during the last illness (monitoring or treating). Before you issue a certificate, ask yourself the following questions:

- Do I know the cause of death?
- Was I in attendance on last illness?
- Have I seen the patient 14 days before, or after death?
- Is the death NATURAL CAUSES? (Refer to list)
- Has the death occurred MORE than 24hours after admission?

If the answer is YES to ALL of the questions, issue the certificate.

If the answer is NO to ANY of the questions, refer the death to the Coroner's Office (see below).

8.6.4 Reporting deaths to the HM Coroner's office

The following deaths **MUST** be reported to HM Coroner's Office:

- All deaths where no doctor has been in attendance within 14 days or during the last illness
- Where the cause of death is unknown.
- Deaths within 24 hours of admission to hospital, even if the cause of death is known or suspected.
- Death following accident or injury. This includes all deaths following fracture of the femur, cases of septicaemia if originating from injury, and hypothermia (cold injury).
- Deaths during or within 24 hours of operation (anaesthetic).
- Deaths related to drugs including therapeutic mishap, drugs of addiction. Also suspected transfusion reactions.
- Poisoning including self-poisoning, food poisoning, and acute alcoholic poisoning (but **not** chronic alcoholism).
- Industrial diseases including pneumoconioses, asbestosis with or without malignant mesothelioma, Weil's disease*****.
- Deaths in legal custody e.g. prisoners transferred from H.M. Prison, Bedford for treatment. Also patients **compulsorily detained** in psychiatric units under the provisions of the Mental Health Act.
- Stillbirths **only** if there are suspicious features.
- Sudden infant deaths and infant deaths, which are in any way obscure (to include suspected non-accidental injury).
- Ill-treatment (starvation, neglect).
- War pensioners if death connected to the pensionable disability.

- Crime or suspected crime, including suspected **criminal** abortion.
- Where it is known that the body is to be moved from England or Wales for burial or disposal abroad.

Weil's disease (Leptospirosis) is also a notifiable disease

The Coroner for the Black Country is Mr Zafar Siddique and he can be contacted as follows:

Telephone 0121 569 7200

Email sandwell_coroners@sandwell.gov.uk

The coroner is based at Jack Judge House in Oldbury, where inquests also take place. The address is:
H.M. Coroner's Office Black Country Coroner's Court
Jack Judge House
Halesowen Street
Oldbury
West Midlands
B69 2AJ

The opening hours of the Coroner's Office are:
Monday to Wednesday 8am to 4pm
Thursday 9am to 4pm
Friday 8am to 3.30pm.
If you have any doubt as to whether or not to issue a death certificate, then contact the pathologist, coroner's office, the bereavement officer, or mortuary technicians for advice.

9 IMMUNOLOGY

9.1 CONTACT DETAILS

	Internal	External (01384)
General enquiries / results	2447	456111 ext 2447
Mr Mike Breese **Head BMS**	5802	244802
Dr M Bhole **Consultant Immunologist and Head of Department**	3070	
Dr C Tsakona **Locum Consultant**	1869	
Secretary	2755	244855

9.2 CLINICAL SERVICES

Both consultants are available for clinical consultations and advice on investigations and interpretation of laboratory results.

General Immunology & Allergy clinics for both adult and paediatric patients are held at the New Guest Hospital and at Russells Hall Hospital and attendance is by referral from General Practitioners or Hospital Specialists.

9.3 AVAILABLE ASSAYS AND SPECIMEN REQUIREMENTS

Daily assays

Serum immunoglobulin concentrations and electrophoresis, indirect immunofluorescence (ANA, autoantibody screen, ANCA) and cell marker assays are carried out daily and results are usually available the day following sample receipt. Some assays are used as screening tests and positive results may generate further testing which may take a few additional days.

Batched assays

Specific assays that are labour intensive, expensive or non-urgent, are batched for analysis and include autoantibodies to dsDNA, Intrinsic Factor as well as C1 inhibitor quantification by radial immunodiffusion.
Fortnightly assays include functional antibodies to *Haemophilus influenza B* and *Pneumococcus.*

Requesting Additional tests

The Immunology department keeps serum samples for approximately four weeks from the date of collection. To add tests to existing samples please contact the lab on ext 2447 for advice.

9.3.1 Requests for Urgent Results

All urgent requests must be discussed with laboratory staff. Some assays can be performed within a few hours while others are performed in batches. The department will endeavour to perform the assay as soon as possible, if clinically relevant and indicated.

Special Services

Specialised assays such as lymphocyte subset markers and neutrophil function tests require specific specimens to be collected and to reach the laboratory within a certain period after collection for the results to be valid. These assays are expensive in terms of reagents and laboratory staff time and must be discussed with laboratory staff prior to sample collection.

9.3.2 Uncertainty of measurement

There are two main sources of uncertainty attached to the measurement of analytes. One area is uncertainty associated with pre-analytical processes and the second area is the variation (or imprecision) due to the analytical process in the laboratory and biological variation within and between individuals.

Pre-analytical sources of uncertainty include posture of the patient, tourniquet application time, bleeding the right patient, labelling blood tubes correctly, using the right preservatives and anti-coagulants if required and minimising transport delays.

The contribution to the uncertainty of measurement associated with biological variation is determined by the physiology of the subjects observed and this uncertainty is caused by the inherent biological variation around the homeostatic set point. Factors contributing to biological variation include biological rhythms, puberty, menopause, age and gender. Similarly, the analytical variation will be determined by a number of factors, for example the method of analysis and calibration of the analysers. Together, biological and analytical variation determines the ‘critical difference’ which is a measure of the value by which two

consecutive measurements on the same patient of the same analyte must differ to be considered a statistically significant change in the results.

Therefore, the pre-analytical processes, biological and analytical variation together all contribute to the uncertainty of measurement. Please contact the laboratory if you require further information.

9.3.3 Specimen Collection

Unless otherwise stated below, please use 1 full 4ml YELLOW (Ochre) top tube for all Immunology requests.

No specific clinical patient preparation is needed for sample collection for Immunology testing. All materials used in sample collection should be disposed of safely following local sharps and clinical waste procedures.

Table 1

Request	Specimen required
Allergy (*paediatric specimens only*)	If using paediatric tubes, please use a red top tube and allow at least 1 full tube for every 4 allergens requested.
Cryoglobulins	Venous blood to be taken directly into a pre-warmed (37ºC) yellow top tube and kept at 37ºC until clotted and separated in a warm centrifuge.
Functional complement CH50	1 yellow top tube to reach the Immunology Department within 3 hours of collection
Functional C1 inhibitor	2mL blood in an EDTA tube to reach the Immunology department within 3-4 hours of collection.
Urine free light chain analysis	3mL random urine in preservative free container. **Specimens taken into boric or hydrochloric acid are not suitable.**
HLA-B27 Typing	3mL venous blood in EDTA to reach Immunology Department within 3-4 hours of collection
CD 4 counts / Lymphocyte subsets	3mL venous blood in EDTA, to reach the Immunology Department within 3 hours of collection. **By prior arrangement with the Department only**
NBT Test (Neutrophil function)	3mL venous blood in EDTA, to reach the Immunology Department within 3 hours collection. **By prior arrangement with the Department only**
Tryptase & Specific IgE to drugs	2 clotted blood specimens; one taken at 1-2 hours post-reaction and a further sample at 24 hours.
Serum electrophoresis	If myeloma is suspected, urine should be submitted as well

9.3.4 Request Forms

- All Immunology requests must be submitted on BLUE IMMUNOLOGY forms with integral specimen bags
- Requests must include all details specified on the form, legibly completed

The points of identification provided on the request form must match the information provided on the sample:-

- The **name, date of birth** and **hospital number**
- Gender and location of patient
- Identification of the requesting clinician and destination for the report
- Exact description of specimen type and site of origin
- Examinations requested
- Date and time of primary sample collection
- Clinically relevant information about the patient. Clinical information is essential for providing the most appropriate testing and advice. The quality of clinical advice will also depend on provision of adequate clinical information. Absence of clinical information may lead to a delay in the processing of the sample while the requester is contacted to clarify or ascertain the type of investigations required.

- Patient identification labels should be applied to both forms.

Remember to include the ward or destination for the report.

The laboratory may not accept samples with inadequately completed request forms or incomplete sample labelling or where sample and request details do not match.

9.3.5 Tests Available / Assay Frequency

The table below details the main tests provided by the laboratory. Assay frequency is denoted as follows:

Table 2 Assay frequency					
D	Daily	W	Weekly	TW	Twice a week
TRW	Three time a week	FW	Fortnightly	S	Sent away (usually 2-3 weeks for result)

Click a heading to navigate through the assay list:

Autoantibodies Immunoproteins Complement Assays Cellular Studies

9.3.6 Key Factors that May Affect Testing

Sample storage time: In general, samples should be sent to the laboratory with minimum delay and to arrive within 24 hours of sample collection.

Sample storage and transportation temperature: In general, samples should be stored and transported at ambient temperature unless otherwise specified.

It is important to collect samples into the correct tubes. Please ensure the correct anticoagulant (usually EDTA) or no anticoagulant (clot) is used. It is also important to supply adequate volumes of blood to allow completion of testing (sample types and volumes are listed in Table 3)

9.3.6 Patient Consent

Where patient consent is required it is the responsibility of the requester to ensure the subjects of any tests have given informed consent. Unless written notice is received to the contrary, consent for investigations and the use of any surplus sample in scheduled purposes (quality control or sample exchange schemes) will be assumed.

There is a requirement to disclose clinical information and family history to third parties when a sample is referred to another laboratory for testing. By requesting a test that requires referral, consent to disclose this information shall be automatically accepted.

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Antinuclear antibody (ANA, ANF)	4 ml Serum, yellow top	Positive results from the screen are titred the following day	Titre <1:80	D	4	✓
Centromere	4 ml Serum, yellow top		Negative	D	4	✓
Myositis antigens by Immunoblot	4 ml Serum, yellow top	Immunoblot includes:- Mi-2β Ku PM-Scl-100 PM-Scl-75 Jo-1 SRP PL-7 PL-12 EJ OJ Ro-52	Negative	TW	7	✓
Myositis extended panel	4 ml Serum, yellow top	Referred to Sheffield (CPA:0113)	Negative	S	10	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Systemic sclerosis antigens by Immunoblot	4 ml Serum, yellow top	Immunoblot includes:- Scl-70 CENP A CENP B RP11 RP155 Fibrillarin NOR90 Th/To PM-Scl100 PM-Scl75 Ku PDGFR Ro-52	Negative	TW	7	✓
Histone antibodies	4 ml Serum, yellow top	Referred to Sheffield Immunology (CPA:0113)	<40 U/ml	S	10	✓
Smooth muscle antibody	4 ml Serum, yellow top		Negative	TW	5	✓
Mitochondrial antibody	4 ml Serum, yellow top		Negative	TW	5	✓
Gastric parietal cell antibody (GPC)	4 ml Serum, yellow top	Intrinsic factor antibodies added to positive GPC	Negative	TW	5	✓
Liver Kidney Microsomal	4 ml Serum, yellow top		Negative	TW	5	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Antineutrophil Cytoplasmic Antibody (ANCA)	4 ml Serum, yellow top	Positive results from the screen are titred the following day. All new Positive sera are tested for antibodies to PR3 and MPO which may take a further day or two. Urgent requests for ANCA antibodies must be arranged with the laboratory.	PR3 IU/ml Negative: <2 Equivocal: 2-3 Positive: >3 MPO IU/ml Negative: <3.5 Equivocal: 3.5-5 Positive >5	D	4	✓
Antibody to ds-DNA	4 ml Serum, yellow top	All new Positive ds-DNA sera are tested on Crithidia which may take a further day or two	Negative: <10 IU/ml Equivocal: 10-15 IU/ml Positive: >15 IU/ml	TW	5	✓
Crithidia Luciliae	4 ml Serum, yellow top	Follow on test for a positive ds-DNA result	Negative	TW	5	✓
Antibodies to Extractable Nuclear Antigens (ENA)	4 ml Serum, yellow top	Positive results from the screen are run against known positives to confirm identity on the following run.	Screen only reported if negative. If positive, see individual identities	TW	5	✓
Anti Sm	4 ml Serum, yellow top		Negative			✓
Anti RNP	4 ml Serum, yellow top		Negative			✓
Anti Jo-1	4 ml Serum, yellow top		Negative			✓
Anti Ro/SSA	4 ml Serum, yellow top		Negative			✓
Anti La/SSB	4 ml Serum, yellow top		Negative			✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Anti Scl-70	4 ml Serum, yellow top		Negative			✓
Anti Cardiolipin IgG Antibodies (ACA)	4 ml Serum, yellow top	Positive results should be repeated in 12 weeks' time for confirmation.	Negative: <10 U/ml Weak Pos: 10-40 U/ml Positive >40 U/ml	TRW	4	✓
Anti Cardiolipin IgM Antibodies (ACA)	4 ml Serum, yellow top	Referred to Sheffield Immunology (CPA:0113)	Negative: <10 MPLU/ml Equivocal: 10-40 MPLU/ml Positive: >40 MPLU/ml	S	5	✓
Anti β2 glycoprotein 1 IgG Antibodies (B2GP1)	4 ml Serum, yellow top	Positive results should be repeated in 12 weeks' time for confirmation.	Negative: <7 GP/L Weak Pos: 7-10 GP/L Positive: >10 GP/L	TRW	4	✓
Anti β2 glycoprotein 1 IgM Antibodies	4 ml Serum, yellow top	Referred to Sheffield Immunology (CPA:0113)	Negative: <10 U/ml	S	5	✓
Aspergillus Fumigates IgG Abs	4 ml Serum, yellow top	Allergic bronchopulmonary aspergillosis (ABPA)	Normal: <40 mgA/L	FW	12	✓
Micropolyspora faenii IgG Abs and Thermoactinomyces vulgaris Abs	4 ml Serum, yellow top	Farmers Lung	Normal: <60 mgA/L	FW	12	✓
Avian IgG Abs – Pigeon Serum Protein	4 ml Serum, yellow top	Bird Fanciers lung	Normal: <10 mgA/L	FW	12	✓
Otoblot (Hearing Loss antibodies)	4 ml Serum, yellow top	Autoimmune Inner Ear Disease Referred to Cambridge Life Sciences (ISO13485:2003)	Negative	S	10	✓
Tissue Transglutaminase IgA Abs (tTG)	4 ml Serum, yellow top	Screening test for Coeliac Disease	Negative: <7 U/ml Equivocal: 7-10 U/ml Positive: >10 U/ml	TRW	4	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Tissue Transglutaminase IgG Abs (tTG)	4 ml Serum, yellow top	Performed if the patient is IgA deficient	Negative: <7 U/ml Equivocal: 7-10 U/ml Positive: >10 U/ml	TRW	4	✓
Endomysial abs	4 ml Serum, yellow top	Performed to confirm positive tTG abs.	Negative	TW	5	✓
HLA DQ2, HLA DQ8	4 ml **EDTA**	Referred to H&I Blood transfusion Service, Birmingham	Negative	S	5	✓
Acetylcholine Receptor (ACR)	4 ml Serum, yellow top	Referred to Churchill Hospital, Oxford (CPA: 1144)	<5 $X10^{-10}$ mole per litre	S	14	✓
MUSK abs (Muscle Specific Kinase)	4 ml Serum, yellow top	Referred to Churchill Hospital, Oxford (CPA: 1144)	Not applicable	S	21	✓
Adrenal Cortex	4 ml Serum, yellow top		Negative	TW	5	✓
Epithelial (skin) abs:- Epidermal Basement Membrane / Epidermal Intercellular Substance	4 ml Serum, yellow top		Negative	TW	5	✓
Myocardial antibodies (Skeletal muscle done at the same time.)	4 ml Serum, yellow top	Referred to Sheffield Immunology (CPA:0113)	Negative	S	20	✓
Ovary antibodies	4 ml Serum, yellow top	Referred to Sheffield Immunology (CPA:0113)	Negative	S	5	✓
Pituitary Gland antibodies	4 ml Serum, yellow top	Referred to Sheffield Immunology (CPA:0113)	Negative	S	5	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Salivary Gland antibodies	4 ml Serum, yellow top	Referred to Sheffield Immunology (CPA:0113)	Negative	S	10	✓
Glomerular Basement Membrane (GBM)	4 ml Serum, yellow top	Urgent requests for GBM antibodies must be arranged with the laboratory.	Negative: <7 U/ml Equivocal: 7-10 U/ml Positive: >10 U/ml	TRW	4	✓
Intrinsic Factor	4 ml Serum, yellow top		Negative: <7 U/ml Equivocal: 7-10 U/ml Positive: >10 U/ml	W	8	✓
Pancreatic Islet Cell	4 ml Serum, yellow top		Negative	TW	5	✓
Insulin antibodies	4 ml Serum, yellow top	Referred to Immunology St Peters Hospital (CPA:1167)	Negative	S	2	✓
IA-2 (INSULINOMA ANTIGEN 2) antibodies	4 ml Serum, yellow top	Referred to Royal Devon & Exeter Immunology (CPA:56,57,58,59,2080,2645)	Negative	S	10	✓
PLA-2 antibodies (Phospholipase A2 Receptor)	4 ml Serum, yellow top	Referred to Sheffield Immunology (CPA:0113)	<14 RU/ml	S	10	✓
Cerebellum antibodies	4 ml Serum, yellow top	Used as a screening test by indirect immunofluorescence.	Negative	W	20	✓
Cerebellum antibodies	CSF	Referred to Churchill Hospital, Immunology (CPA: 1144)	Negative	S	14	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Paraneoplastic antibodies by Immunoblot	4 ml Serum, yellow top	Used as a confirmatory test following the cerebellum screen Immunoblot includes:- Amphiphysin CV2/CRMP5 PNMA2 (ma2/Ta) Ri Yo Hu	Negative	TW	7	✓
Paraneoplastic extended brain blot	4 ml Serum, yellow top	Referred to Medical School, University Hospital Birmingham (CPA:1432)	Negative	S	14	✓
GAD antibodies (Glutamic Acid Decarboxylase)	4 ml Serum, yellow top Plasma unsuitable CSF also available	Referred to Churchill Hospital, Oxford (CPA: 1144)	0-5 U/ml	S	10	✓
Aquaporin 4 abs (NMO)	4 ml Serum, yellow top	Requires an additional form completed by the clinician. Referred to Churchill Hospital, Oxford (CPA: 1144)	Not applicable	S	14	✘

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Autoimmune/Limbic Encephalopathy screen.	4 ml Serum, yellow top For CSF samples a minimum volume of 250 microliters is required	Includes GABA receptor, AMPA 1, AMPA 2, LIGL, CASP and NMDA. Referred to Medical School, University Hospital Birmingham (CPA:1432)	Negative	S	14	✓
Ganglionic Acetylcholine Receptor abs	4 ml Serum, yellow top	Referred to Churchill Hospital, Oxford (CPA: 1144)	Not applicable	S	42	✗
Basal Ganglia Antibodies	4 ml Serum, yellow top	Referred to Queen Square, London (UCLH) (CPA: 1839 and ISO 15189:2012)	Negative	S	10	✓
Glycine Receptor antibodies	4 ml Serum, yellow top	Referred to Churchill Hospital, Oxford (CPA: 1144)	Not applicable	S	28	✗
MOG (Myelin Oligodendrocyte Glycoprotein) antibodies	4 ml Serum, yellow top. Plasma is acceptable CSF also available	Referred to Churchill Hospital, Oxford (CPA: 1144)	Not applicable	S	2-3 weeks	✗
Myelin Associated Glycoprotein (MAG) antibodies	4 ml Serum, yellow top	Referred to Medical School, University Hospital Birmingham (CPA:1432)	Negative	S	14	✓
Motorneurone antibodies (GM1, GD1a +b)	4 ml Serum, yellow top	Referred to Glasgow Neuroimmunology	Normal result is a titre of <1/500	S	2-4	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Voltage Gated Calcium Channel antibodies	4 ml Serum, yellow top	Referred to Churchill Hospital, Oxford (CPA: 1144)	Negative = <45pM Low Positive = 45-100pM	S	21	✘
Anti-CCP Antibodies	4 ml Serum, yellow top		Negative: <7 U/ml Equivocal: 7-10 U/ml Positive: >10 U/ml	TRW	4	✓
Allergy	4 ml Serum, yellow top	Total & Specific IgE (Allergy Testing). Please specify which allergens are required. A small number of less common allergens are sent away to Sheffield Immunology	0 – 0.35 kU/l	TW S	5 20	✓
ISAC test for component allergens	4 ml Serum, yellow top	Referred to Sheffield Immunology (CPA:0113)	See report	S	7	✓
Mast Cell Tryptase	4 ml Serum, yellow top	Required specimens taken at 1-2 hour & 24 hours post reaction	Normal: <14 µg/L Positive: >14 µg/L	W	8	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Immunoglobulins IgG, IgA, IgM, Serum Protein Electrophoresis	4 ml Serum, yellow top	Age related reference ranges. Electrophoresis is performed on every request for immunoglobulins	**15-45 yrs g/l** IgG 5.4-16.0 IgA 0.8-2.8 IgM 0.5-1.9 **≥45 yrs g/l** IgG 6.0-16.0 IgA 0.8-4.0 IgM 0.5-2.0	D	4	✘
Immunoelectrophoresis / Immunofixation	4 ml Serum, yellow top		No paraprotein band	TRW	4	✓
Urine Free Light chains (Bence-Jones Protein)	25 ml random urine in universal container (without preservatives) Early morning if possible		Negative	W	8	✘
IgD levels	4 ml Serum, yellow top	Referred to Medical School, University Hospital Birmingham (CPA:1432)	2 – 100 mg/l	S	14	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Functional antibodies (IgG) to :- Pneumococcus Haemophilus Tetanus	4 ml Serum, yellow top	Tetanus abs referred to Churchill Hospital, Oxford (CPA: 1144)	<u>Pneumococcal:-</u> Inadequate Ab levels: <10 mg/L Adequate Ab levels: >10 mg/L <u>Haemophilus:-</u> Inadequate levels; <0.15 mg/L Minimum protective: 0.15 mg/L Optimum protective: >1.00 mg/L <u>Tetanus:-</u> Basal protective: >0.1IU/ml	FW FW S	13 13 7	✓ ✓ ✓
Pneumococcal Serotypes	4 ml Serum, yellow top	Referred to Churchill Hospital, Oxford (CPA: 1144)	Protective level: ≥0.35 µg/ml	S	18	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
IgG Subclasses IgG4 subclass	4 ml Serum, yellow top	IgG subs will only be done after discussion with Immunology Consultant - functional IgG abs to *Pneumococcus*, *Haemophilus B* and *Tetanus* are more clinically relevant than IgG Subclasses to assess immune-competency. Referred to Churchill Hospital, Oxford (CPA: 1144) IgG4 requested on its own is useful in the diagnosis of autoimmune pancreatitis and other IgG 4 related diseases.	Adult reference range: •IgG1 = 3.80 - 9.30g/L •IgG2 = 2.40 - 7.00g/L •IgG3 = 0.20 - 1.80g/L •IgG4 = 0.04 - 0.86g/L	S	7	✓
Meningococcal C abs levels	4 ml Serum, yellow top	Referred to Manchester Medical Vaccine Evaluation Unit (CPA:0635)	Protective >1:8 Titre	S	28	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
Cryoglobulins	4 ml Serum, yellow top	Clotted specimen must be taken into a pre-warmed container not less than 37°C (and up to 40°C). The assay required an initial 7 days at 4ºC to allow any cryoprecipitate to form. Presence of cryoprecipitate will require further work for identification.	Negative	W	14	✓
C1 Esterase Inhibitor	4 ml Serum, yellow top	Samples are frozen at -70°C upon receipt in the laboratory	0.15-0.35 g/l	FW	14	✓
Functional C1 Inhibitor	4 ml Serum yellow top must be frozen within 1 hour of collection. Must be sent to the referral laboratory frozen and arrive frozen.	FC1 inhibitor will only be done after discussion with Immunology Consultant Referred to Medical School, University Hospital Birmingham (CPA:1432)	70 – 130%	S	28	✓
Functional CH50 Classical Pathway Alternative Pathway	4 ml Serum, yellow top. Frozen within 2 hours of collection	Functional Complement assays will only be done after discussion with Immunology Consultant. Referred to Sheffield Immunology (CPA:0113)	23-46 U/ml	S	20	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
C3 Nephritic Factor (C3NeF)	4 ml Serum, yellow top. Frozen within 2 hours of collection	C3NeF will only be done after discussion with Immunology Consultant Referred to Sheffield Immunology (CPA:0113)	Negative	S	20	✓
C1q	4 ml Serum, yellow top. Frozen within 2 hours of collection	Referred to Sheffield Immunology (CPA:0113)	50-250 Mg/L	S	20	✓
C1q antibodies	4 ml Serum, yellow top	Referred to Sheffield Immunology (CPA:0113)	0-15 U/ml	S	10	✓
Mannose Binding Lectin (MBL)	4 ml Serum, yellow top	Referred to Sheffield Immunology (CPA:0113)		S	7	✓
Angioedema Screening Panel: ANA Total IgE C3,C4 (performed by Biochemistry) Igs	4 ml Serum, yellow top		See individual tests	See individual tests	See individual tests	✓
Lymphocyte Surface Markers HIV Monitoring (CD3,CD4,CD8,CD45) TBNK (CD3, CD56.CD16, CD19, CD45)	4 ml **EDTA** sample to be kept at room temperature	HIV positive samples must be labelled as high risk	Age related reference ranges adapted from Commans-Bitter WM *et al*, J Pediatr.1997;130:388-393	D	2	✓

Table 3: Sample type, volume, reference ranges, assay frequency and turnaround times						
Investigation	**Sample Type**	**Comments**	**Reference Range**	**Assay Frequency**	**Turnaround time in days (excludes week ends)**	**Accredited Test**
HLA-B27 Typing	4 ml **EDTA** sample to be kept at room temperature		Negative	D	3	✓
Class-switched memory B cells (EUROClass)	4 ml **EDTA** sample to be kept at room temperature		Not applicable	D	3	✓
Nitroblue Tetrazolium Test (NBT)	4 ml **EDTA** sample to be kept at room temperature	For Phagocytic Respiratory Burst	Unstimulated: <10 % Stimulated: >30 %	Same Day	3	✘
T cell Proliferation Assay (PHA)	2 **Lithium Heparin** paediatric tubes or 1 adult **Lithium Heparin** plus control tube (usually from parent) Kept at room temperature	Referred to Heartlands Hospital, Immunology. Test only performed Monday, Tuesday and Wednesday. To be arranged with the lab before sending.	Not applicable	S	4-10	✓
Skin Prick Tests		Will be performed by Consultant Immunologist as part of Immunology Outpatients Consultation.				

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9.3.7 Guide to the appropriate use of immunological assays

Diagnosis of SLE	ANA, dsDNA, ENA, Igs and C3/C4 *(please request C3/C4 from Biochemistry)* dsDNA and C34 are useful for monitoring disease progression.
SLE in pregnancy	include anti-Cardiolipin abs in above panels
Diagnosis of Myeloma	Igs and electrophoresis (immunofixation will be performed if indicated) Send both blood and urine
Autoimmune screen	ANA, Smooth Muscle, Igs and C3/C4 *(please request C3/C4 from Biochemistry)*
Vasculitis screen	ANA, ANCA, Igs and C3/C4 *(please request C3/C4 from Biochemistry)* Secondary testing for anti- Cardiolipin and Cryoglobulin may be useful
Renal Screen	ANA, Smooth Muscle, ANCA, Igs and C3/C4 *(please request C3/C4 from Biochemistry)* Secondary testing for Cryoglobulin and GBM may be useful
Angioedema screen	Total IgE, ANA, Igs and C3/C4 *(please request C3/C4 from Biochemistry)*

9.3.8 Description of available assays

Assay	Description / Comments
Acetylcholine receptor abs	Test for Myasthenia Gravis.
Adrenal abs	Test for autoimmune adrenal disease.
Antinuclear abs	This is used as a screening test for Lupus (SLE) and certain other connective tissue diseases. Strong positive results (titres of 1:320 and above) may be clinically significant, particularly with some staining patterns. For example: *Speckled pattern* – connective tissue disease, SLE; *Homogenous pattern* – SLE, and drug induced lupus; *Nucleolar pattern* – scleroderma or sicca syndrome. However, positive ANA (particularly at low titre) may also be seen after infection or even in asymptomatic individuals (especially older people and females).
Aspergillus Fumigates (IgG)	Hypersensitivity pneumonitis, also known as Extrinsic Allergic Alveolitis (EAA), is an inflammatory lung disease resulting from an exaggerated immune response (hypersensitivity) to certain inhaled allergens, including moulds (aspergillus species)
Avian IgG abs – Pigeon Serum Protein	Hypersensitivity pneumonitis, also known as Extrinsic Allergic Alveolitis (EAA), is an inflammatory lung disease resulting from an exaggerated immune response (hypersensitivity) to certain inhaled allergens. Bird fanciers lung is the common syndrome associated with exposure to avian antigens. A Pigeon Serum Protein assay is used to screen for this condition as antigen epitopes in pigeon serum protein are shared across most common pet avian species.
Cardiolipin/Phospholipid abs (B2GP1 abs)	Persistent high levels of anti-cardiolipin antibodies are associated with anti-phospholipid syndrome, characterised by a risk of arterial or venous thrombosis. Please check lupus anticoagulant (Haematology) at the same time. Positive results should be repeated in 12 weeks' time for confirmation.

Assay	Description / Comments
CCP abs	Specific for and suggestive of RA in patients with early un-differentiated arthritis.
Centromere abs	Strongly associated with the limited cutaneous form and the CREST variant of systemic sclerosis. In cases with Raynaud's, the presence of centromere antibody indicates an increased chance of developing connective tissue disease in the future.
Complement C3 and C4	Measurements of both are of value in monitoring the activity of SLE and immune complex disease. C4 is of particular value in both SLE and angioedema when levels are well below normal. C4 levels are used as a screening test for patients with suspected angioedema due to C1 INH deficiency (See below). Please note that C3 and C4 are performed in the Clinical Chemistry department.
C1 esterase inhibitor	Antigenic and functional levels. Typically C1 INH deficiency, both hereditary and acquired, is associated with low C4 levels during acute episodes, which is therefore used as a screening test for suspected HAE or AAE – see below.
Hereditary Angioedema (HAE)	Autosomal dominant disorder commonly due to C1INH deficiency. Most cases have reduced serum C1 INH levels (Type 1). One in ten cases may have normal C1 INH levels, but reduced function (Type 2).
Acquired angioedema (AAE)	Reduced C1 INH levels, most commonly associated with B-cell lymphoproliferative disorders.
Cryoglobulins	These are immunoglobulins that precipitate on cooling of serum or plasma and are classified into three categories: Type 1: Typically monoclonal (commonly IgM) with rheumatoid factor activity. Clinical associations include Waldenströms macroglobulinaemia, myeloma or lymphoma. Type 2 and 3: These are mixed or polyclonal cryoglobulins resulting in the formation of immune complexes that can clinically present as vasculitis, synovitis or glomerulonephritis. (Sample must be collected into a pre-warmed tube and kept at 37ºC till clotted).
ds DNA abs	High levels are associated with active SLE. Low positive levels may be seen in quiescent SLE, RA, and other autoimmune conditions and must be correlated clinically. Assay of antibodies to native, double stranded DNA (dsDNA antibodies), is performed by EIA and followed up with qualitative test by IIF on the kinetoplast of crithidia lucillae.
Endomysial abs	A positive result is strongly associated with coeliac disease. This assay is done by IIF and is used as a confirmatory laboratory test following a positive tTG antibody by ELISA. The gold standard for diagnosis of coeliac disease still remains a tissue diagnosis whilst on a gluten diet. Endomysial antibodies may be falsely negative in very mild gluten induced enteropathy or in patients on a gluten free diet.
ENA abs	the department currently identifies six specificities:-
RNP	Highly specific for MCTD, also 25% of SLE and 15% of Myositis.
Sm.	Highly specific for SLE, with renal involvement and poor prognosis.
Ro (SS-A)	In 75% of Primary Sicca syndrome, 75% of annular LE, 25% of SLE, 20% of MCTD, 5% of Myositis and PBC.

Assay	Description / Comments
La (SS-B)	In 50% of Primary Sjögrens syndrome, 10% of SLE and <5% in other CTD.
Jo1	In 20-40% of patients with aggressive Polymyositis, usually in association with interstitial lung disease and arthralgia.
Scl70	Positive in 20-40% of patients with progressive systemic sclerosis (PSS). These antibodies are considered to be specific for PSS, but may be also seen in some patients with MCTD or overlap syndromes.
Functional Antibodies	These tests are to be used to check immune competency and not as surrogate markers of protection against infection.
Gliadin abs	This assay is not currently recommended and not routinely offered for the diagnosis of coeliac disease. Serum tTG and Endomysial antibodies are more specific screening assays for coeliac disease than Gliadin (NICE guidelines) and should be used in preference. **All requests for Gliadin antibodies will be referred to the Immunology Consultant to establish the clinical relevance.**
Glomerular basement membrane abs	Associated with rapidly progressive glomerulonephritis with or without lung involvement (Goodpastures or pulmonary renal syndrome). Immunosuppression or plasmapheresis may be indicated.
Immunoglobulins (IgG,A,M)	Immunoglobulin levels and electrophoresis are useful screening tests in patients with severe, persistent, recurrent or unusual infections. Reduced Immunoglobulin levels may be seen in primary or secondary immunodeficiency disorders. Secondary causes for low Immunoglobulin levels commonly include:- Haematological malignancies (CLL, Myeloma) Nephrotic syndrome Other protein losing states (enteropathy, lymphangectasia) Drugs (anti convulsants, immunosuppressant's, biologics etc) All patients with persistent low Immunoglobulins should preferably be referred to and evaluated by an Immunology Consultant. Polyclonal increase of IgG can occur in chronic infection and inflammation, chronic liver disease and connective tissue disease. Monoclonal bands are significant in the diagnosis and monitoring of patients with myeloma. Monoclonal gammopathy of uncertain significance (MGUS) is found in 1% of the general population over the age of 50 years.

Assay	Description / Comments
IgG Subclasses	IgG1 and IgG2 subclass deficiencies are the most clinically important in individuals who suffer recurrent infections. However, functional antibodies to tetanus (requiring the presence of IgG1) and pneumococcus (requiring the presence of IgG2) give a much clearer picture of the patient's ability to mount an appropriate antibody response and should be used in preference. **All requests for IgG Subclasses will be referred to an Immunology Consultant to establish the clinical relevance.**
IgE – Total and Specific	**Total IgE:** This assay is commonly requested in patients with atopy or suspected allergies. 'Atopy' is defined as the genetic predisposition to produce greater amounts of IGE. These individuals are more likely to have childhood eczema, asthma or hay fever. The results of total IgE must be interpreted in relation to the clinical history. High levels of total IgE may be seen in patients with personal or family history of atopy particularly atopic dermatitis (eczema), hay fever or asthma. **Allergen specific IgE:** A wide range of allergens are available to test for allergen specific IgE and it is **essential** that as much clinical information as possible is supplied by the clinician so the most appropriate testing can be performed. Allergen specific IgE testing **is not to be used** as a screening test for allergy. Raised allergen specific IgE (> 0.35KuA/L) can be found without any clinical history of allergic reactions, particularly in atopic individuals (See above). Positive or raised specific IgE is not a 100% proof of allergy and must be interpreted in the light of individual atopic status and clinical history. It is recommended that patients with strong clinical history **should to be referred** to the Allergy clinic for further evaluation irrespective of total and/or specific IgE levels.
Intrinsic factor abs	Detected in 70% of patients with pernicious anaemia and are more disease-specific than antibodies to gastric parietal cells.
Liver kidney microsomal abs (LKM)	Positive in autoimmune chronic active hepatitis.
Lymphocyte surface markers	Must be discussed with a senior member of the laboratory staff prior to blood collection.
Mast cell tryptase	Rapid mast cell degranulation during an anaphylactic reaction results in an immediate rise of serum tryptase levels within 1-2 hours. This reaches a peak at around 6 hours and returns to baseline by 24 hours. In order to reflect this please take 1 clotted blood sample as soon as possible after the onset of symptoms, and a second sample within 4 hours. A baseline sample should ideally be taken 24 hours after the reaction.
Mitochondrial abs	M2 type is present in >95% of cases of primary biliary cirrhosis. Other types are associated with a wide range of conditions.

Assay	Description / Comments
Neutrophil cytoplasmic abs (ANCA)	This assay is useful in the diagnosis and management of patients with suspected pulmonary-renal syndrome or ANCA-associated small vessel vasculitis. There are 2 common staining patterns seen on immunofluorescence: cytoplasmic- ANCA (C-ANCA) and perinuclear-ANCA (p-ANCA). Other atypical patterns are sometimes seen, but may not have any clinical significance. C-ANCA pattern (IIF) directed against Proteinase 3 (PR3 – detected by ELISA) is strongly associated with Wegener's granulomatosis. C-ANCA antibody levels may relate to disease activity and will fall to normal with effective treatment. P-ANCA pattern directed against myeloperoxidase (MPO- ELISA) is commonly associated with microscopic polyangiitis (MPA) and other ANCA-associated small vessel vasculitides, but may also be seen in non-vasculitic chronic inflammatory conditions, such as, ulcerative colitis, rheumatoid arthritis and chronic hepatitis. C-ANCA or p-ANCA pattern on IIF not directed against PR3/MPO are less likely to be clinically significant and may not reflect ANCA-related small vessel vasculitides.
Neutrophil function test (NBT)	Must be discussed with a senior member of the laboratory staff prior to blood collection.
Pancreatic islet cell abs	Have a prevalence of 75% in IDDM at diagnosis and antibody levels will decrease and eventually disappear with the duration of the disease.
Rheumatoid factor	All RF requests are screened by a latex test which is very sensitive but less specific for RF. Positive sera are tested further using a quantitative ELISA that is less sensitive but more specific. A positive result to the RF latex and negative to the RF ELISA are frequently seen and do not indicate RA. Approximately 70% of patients with RA are sero-positive but a positive result can be seen in 15% of the general population without RA and should only be interpreted in the clinical context i.e. if there is evidence of active joint inflammation.
Serum electrophoresis	Serum electrophoresis is performed in all requests for immunoglobulin quantification (Serum IgG/A/M levels). Polyclonal increase in the gammaglobulin region can be seen in chronic infection and inflammation, chronic liver disease or connective tissue disease. Monoclonal bands, particularly in this region, are suggestive of possible lymphoproliferative process and require further confirmatory tests. All sera with monoclonal bands on serum electrophoresis will be followed up by immunofixation to type the paraprotein and quantify it wherever possible. In patients where myeloma is clinically suspected, it is strongly recommended that paired serum and urine samples (see below for urine electrophoresis) are sent together. Oligoclonal bands may sometimes be seen in severe infections, post bone marrow transplant patients and rarely in certain primary immunodeficiencies.

Assay	Description / Comments
Skin abs	Antibodies to the intercellular substance of the epidermis (desmosome) are seen in patients with pemphigus. Antibodies to the dermal-epidermal basement membrane are highly specific for bullous pemphigoid and seen in 80% of cases, where the titre correlates with disease activity.
Smooth muscle abs	These are present in high titres in 50-70% of patients with type 1 autoimmune hepatitis. They may also be seen in other types of autoimmune hepatitis, primary biliary cirrhosis and chronic viral hepatitis.
Striated muscle abs	These antibodies are seen in almost all patients with Myasthenia gravis with thymoma; however, in patients without thymoma the antibodies are only present in a small proportion of cases.
Urinary Electrophoresis	This test is performed in the investigation of patients with suspected multiple myeloma (either intact immunoglobulin or light chain myeloma), light chain deposition disease and primary AL amyloidosis. In all patients, particularly initial requests for diagnosis, it is recommended that a simultaneous paired serum sample is sent along with complete clinical details in order to facilitate accurate interpretation of the results. Free urinary light chains (Bence Jones protein) may be seen in all the above mentioned conditions. Subsequent monitoring of light chain only diseases (light chain myeloma, light chain deposition disease or primary AL amyloidosis) may be done with only urine electrophoresis (or serum free light chains if requested).

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10 MICROBIOLOGY

10.1 SUMMARY OF SERVICE

The Microbiology Department at Russells Hall Hospital offers a comprehensive range of tests for the diagnosis of infections caused by bacteria, viruses, parasites, chlamydia and fungi. This includes an extensive range of serological tests for diagnosis and immune status. We have a developing Molecular diagnostic service and provide an andrology service.

Contact Details

	Internal	External (01384)
Enquiries	2019	244019
Main laboratory	2471	
Serology	2475	
Mrs L Baker **Head BMS**	2472	
Consultants:		
Dr E Rees **Head of Department**	2473	
Locum Consultant	2817	
Secretaries:		
Mrs L White **Consultant's Secretary**	2056	
Mrs C.Homer/ Ms S Harper **Department Secretary**	2056	

Infection Control Department
Infection Control Team/Secretary ext: 2174

10.2 LABORATORY OPENING HOURS

Send routine specimens to arrive between 8:00hrs and 19:00hrs weekdays and 08:00hrs and 15:00hrs weekends.

10.2.1 Out of hours Microbiology investigations

Urgent investigations are undertaken by on-call staff, who must be contacted via Russells Hall Hospital switchboard before sending specimens. Advice from the **Medical Microbiologists** is available via switchboard. Please avoid requesting results outside laboratory opening hours. All authorised results are available 24 hrs on the Soarian system. All essential results (e.g., significant blood culture isolates) are notified to clinical staff immediately.

10.3 COMPLETING REQUEST FORMS & SAMPLE LABELLING

The responsibility for requesting a laboratory service or test lies with an authorised and trained practitioner (normally a clinician). It is the responsibility of the requester to ensure that samples are correctly labelled and request forms are completed to agreed standards.

- All microbiology requests must be submitted on MICROBIOLOGY forms with integral specimen bags
- Requests must include all details specified on the form, legibly completed

Effective processing requires that forms include the following as a minimum for acceptance by the laboratory:

	Essential	**Desirable**
Sample	NHS or Case Reference number Patient's full name or unique code identifier (eg GUM patients) Date of birth	Date and time of collection Nature of sample including qualifying detail such as left/right, upper/lower etc. Site of wound Site of swab eg. nose, HVS
Request form	NHS or case reference number Patient's full name or unique code identifier (eg GUM patients) Date of birth Gender Patient's location and destination of report Patient's consultant, GP or name of requesting practitioner Type of sample Investigation(s) required Collection date and time	Clinical information including relevant medication Patient's address including postcode Requestors contact number (Bleep or extension) especially where urgent results require telephoning

- Medical staff should initiate and sign all requests, with the exception of MRSA screens, stool cultures for in-patients with diarrhoea which may be infectious and other investigations included in specialist policies (e.g., ITU screens).

- Samples or request forms received without the minimum essential identification criteria will be rejected without analysis.
- Specimens will also be rejected for the following reasons, although exceptions may be made again for specimens that cannot be easily repeated. In these circumstances the sample may be processed at the discretion of a senior BMS.

    - Leaking or broken container.
    - Incorrect specimen container.
    - A delay in transit which could significantly affect the result.
    - An inappropriate sample for the investigation requested.

- An inappropriate request for the sample provided

- The laboratory will attempt to notify the requestor, ward, department or GP by telephone and the reason for rejection explained so that a repeat sample can be initiated. If the requestor cannot be contacted then the unsuitable report will be issued as soon as possible so the information about the rejected sample is available to requestors via Soarian or Review.

- Requests for additional investigations on existing specimens will be accepted, provided that there is sufficient specimen remaining to perform the test and it falls within the acceptable time limits for testing. All specimens requiring additional tests must also have a further completed request form sent to the laboratory quoting the existing laboratory reference number. Because of the differences in the microbiological investigation for certain specimens it is important to contact the laboratory before requesting additional tests to confirm that this is possible.

- Where electronic request are made, Barcodes on the samples do not replace full sample labelling.

10.4 SPECIMEN COLLECTION TECHNIQUES

10.4.1 Collection Techniques

- Remember that satisfactory results may only be obtained from properly collected specimens delivered promptly to the laboratory - contamination can confuse culture results
- Ensure minimum delay in delivery of specimens to the laboratory
- Best results are obtained if adequate volumes of material are sampled
- Collect specimens before antibiotics are started whenever possible
- Refer to Infection Control Guideline-Standard (universal) Infection Control precautions for details about spillages of bodily fluids and dealing with breakages.

For further guidance, please refer to the 'Summary of Guidelines for Collection of Microbiology Specimens' at the end of this section.

10.4.2 Specimen Containers and Swabs

Hospital wards and departments obtain these from NHS logistics. They are supplied to GPs by Pathology reception.

The following containers are obtained directly from the Microbiology Laboratory:

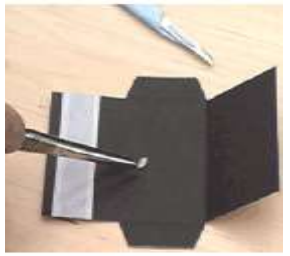
Blood Culture bottles Adult set

Blood Culture bottles Paediatric

Early Morning Urine container for TB (125 ml)

70ml Toxicity tested container for Semen samples

Dermapak for Mycology samples



Pernasal swab for pertussis

Chlamydia swabs

Chlamydia Urine collection tubes

The following containers are recommended for use:

Blue top container with spoon
for stool samples

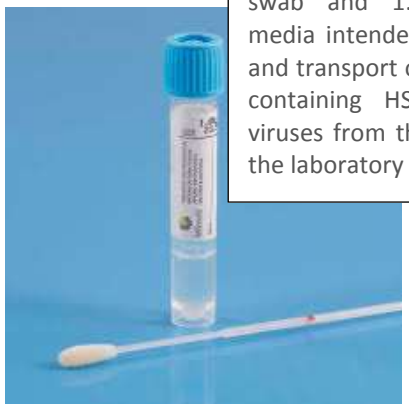
Red top Boric acid
for Urine samples for micro & culture

Plain Universal Container (30ml)

Wide-mouthed Universal
container (60ml)

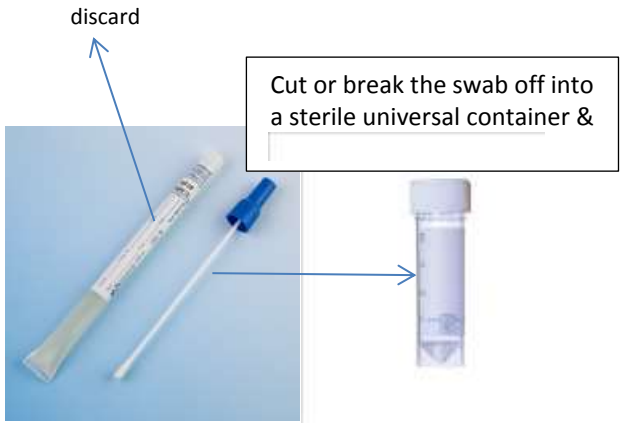
Blue top Trans swab

MSwab™ viral transport medium
for HSV 1 and 2



Each MSwab™ consists of a flocked swab and 1.6mL of transport media intended for the collection and transport of clinical specimens containing HSV 1 and HSV 2 viruses from the collection site to the laboratory

Viral swab for Flu and Respiratory PCR



10.5 TESTS AVAILABLE

The table below details the main tests provided by the laboratory. Some tests are referred to reference laboratories for processing.

Further guidance on sample requirements can be found in the guide at the end of this section.
Guidance on antibiotic prescribing and dosage within the Trust can be found in Antimicrobial Prescribing Guidelines available on the Hub.

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
AAFB Microscopy	60 ml wide-mouthed sterile container		No/Few/Moderate/numerous AAFB seen	Daily	24 hrs	Yes
Acanthamoeba Microscopy	Corneal scraping in small volume of sterile saline, Contact lens or wash fluids	Referred to the Diagnostic Parasitology Laboratory, London School of Hygiene & Tropical Medicine	Result from Referred Laboratory; Negative or Positive	As requested	7-10 days	Yes
Acanthamoeba PCR	Corneal scraping in small volume of sterile saline,	Referred to Micropathology Ltd, University of Warwick Science Park	Result from referred Laboratory; Detected or Not detected	As requested	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Ascitic fluids	Plain sterile universal container		Quantitative microscopy for white and red blood cells. Gram stain reported as organisms/no organisms seen. Differential reported as % lymphocytes/polymorphs	Daily	2hrs	Yes
			Culture reported; No growth or organism isolated plus sensitivities	Daily	3 days	Yes
Bordetella pertussis culture	Pernasal swab in charcoal transport medium- available for the laboratory		The presence of B.pertussis or B.parapertussis will be reported	Daily	5 days	Yes
Bordetella pertussis PCR	Pernasal/nasopharyngeal Aspirates for hospitalised infants. Oral fluid testing for 5-16 year olds (Discuss with Consultant Microbiologist)	Referred to PHE, Heart of England Birmingham	Result from referred laboratory; Detected or Not detected	As requested	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Blood cultures	Plastic BD Bactec bottles See collection instructions guide	Deliver to the laboratory as soon as possible after collection	5 day incubation protocol. Reported as either Negative or organism isolated plus sensitivities. All positive results are phoned to requesting clinician or ward as they are detected.	Daily	5 days (negative)	Yes
C. difficile screen	Type 7 faeces in Blue top container with spoon. Only diarrhoeal samples will be tested. Samples will not be tested if a positive result has been reported within the last 28 days.		C.difficile GDH antigen reported detected/not detected. C.difficile toxin is processed on GDH antigen positive samples only. Result reported as Toxin detected/not detected.	Daily	24hrs	Yes
Creutz feldt-Jacob Disease (CJD)	**The laboratory must be contacted BEFORE requesting this test.** CSF in sterile universal container.	Referred to The National CJD research & Surveillance Unit, Edinburgh	Results reported by referred laboratory	As requested		Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
CSF **Routine microscopy and culture**	Plain sterile universal container		Quantitative cell count white and red blood cells. Gram stain reported as organisms/no organisms seen. Differential reported as % lymphocytes/polymorphs. Culture reported;No growth or organism plus sensitivities	Daily Daily	Microscopy results are available within 2hrs of receipt of sample in the laboratory. Culture report 48 hrs.	Yes
CSF Viral PCR	Plain sterile universal container	Samples are referred to PHE, Heart of England Birmingham	Herpes simplex Type 1 & 2 DNA Varicella zoster DNA Enterovirus RNA Parechovirus RNA	Monday - Friday	7-10 days	Yes
Endoscopy Rinse Waters for colony count	100ml sterile water bottle		Negative- 0 cfu/ml Positive- Quantitative count of cfu/ml with organism identification	Daily	Negative- report 5 days Positive -7 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Enteric routine culture This includes screening for Salmonella, Shigella and Camplyobacter. All samples are screened for Giardia & Cryptosporidia. Liquid and bloodstained samples will be screened for E.coli 0157. Clinical details describing travel history will be screened for Vibrio species and parasites. Children in-patients under 5yrs will be screened for Rotavirus & Adenovirus.	Faeces in Blue top container with spoon		Negative- No enteric pathogens isolated Positive – Organism plus sensitivities	Daily	3 days	Yes
Enteric parasitology The following information would be helpful for investigations: • Detailed Travel history • Date of onset, length of history • Association with known cases • Immunocompromised	Faeces in Blue top container Stool samples are not recommended for Enterobius (threadworm) investigation. A perianal swab in 5ml sterile saline, is the preferred sample	Investigation of "hot stools" for amoebic dysentry is available on request, please contact the laboratory before sending.	Negative-No Ova cysts or parasite seen Positive- Parasite reported individually Some parasites may be referred to the Liverpool School of Tropical medicine for confirmation	Daily	48 hrs	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Schistosoma haematobium investigation	A terminal urine sample in plain universal container. Egg excretion is highest between noon and 3pm. Fluid intake before micturition and exercise may be helpful in increasing egg excretion at other times of day.		Presence or not of ova reported. Advice on individual cases can be obtained from the Duty Microbiologist	Daily	24hrs	Yes
Enteric parasitology **(Giardia/Cryptosporidia)**	Faeces in Blue top container		Positive- Detected Negative- Not detected	Daily	2 days	Yes
Macroscopic examination of worms, worm segments, ticks, lice etc, can be undertaken. Please submit in a sterile container. Advice on individual cases can be obtained from the Duty Microbiologist. Some specimens may be referred to The Diagnostic Parasitology Laboratory, London or The Liverpool School of Tropical Medicine, Liverpool for further identification.						
Enterobius vermicularis (Threadworm/Pinworm)	Blue top swab broken off into 3ml saline in a sterile universal container		Positive – Seen Negative- Not seen	Daily	2 days	Yes
Helicobacter pylori antigen	Faeces in Blue top container		Positive- Detected Negative- Not detected	Daily (Monday – Friday)	24 hrs	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
HVS or Cervical swab for Routine culture Cervical swabs are routinely screened for Neisseria gonorrhoea	Blue top trans swab		Negative culture or significant isolate with sensitivities	Daily	3 days	Yes
Influenza PCR screen	Nose and Throat swabs.	Dry swab broken off into a plain sterile universal container. Referred to PHE Heart of England.	Reported; Influenza A/B not detected Influenza A/B detected	Daily	24hrs	Yes
Joint Fluids	Plain sterile universal container		Semi quantitative microscopy for white and red blood cells. Crystals; Negative- not seen Positive- type of crystal seen is reported Gram stain reported as organisms/no organisms seen.	Daily	Microscopy results are available within 2hrs of receipt of sample in the laboratory. Final report 48 hrs	Yes
			Culture reported; No growth or significant isolate with sensitivities	Daily	3 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Legionella/Strep pneumonia antigen screen	Urine in plain sterile universal container		Antigens detected/not detected in urine	Daily	2 hours	Yes
Leishmaniasis Microscopy/PCR/Antibodies Please discuss with the Duty Microbiologist if microscopy or PCR testing required. The following information would be helpful for investigations: • Relevant clinical details • State whether cutaneous, muco-cutaneous or visceral Leismaniasis is suspected • Date of onset • Travel history	Skin biopsy in sterile universal container Antibody 7-10 ml Blood collected in a plain red top tube.	Referred to Hospital for Tropical diseases, London	Result reported from referred laboratory as positive or negative	Monday-Friday	7-10days	Yes
MRSA screens See Trust Infection Prevention and Control Policy on MRSA Screening MRSA screening Policy	Blue top trans swab		Negative Positive	Daily	24hrs 2 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
MAI (Mycobacterium avium-intracellularae	Blood samples in sodium citrate (Blue top tube)	Referred to PHE, Heart of England Birmingham	Result reported from referred laboratory isolated/not isolated	As requested	10-14 days	Yes
Mycobacterium Culture Sputum Bronchoalveolar lavage (BAL) CSF Urine Tissues and biopsies Pus Pleural Fluids Samples of saliva are not suitable.	**Collect three consecutive sputum samples into a 60 mL wide-mouthed container** The material required is from the lower respiratory tract, expectorated by deep coughing. Expectorate sample directly into the container. Ideally a minimum volume of 1 mL is required. Collect Early Morning Urines (EMU) into 250ml yellow topped sterile container on three consecutive days. Collect pus, tissues or fluids in a sterile universal container.	Positive cultures are referred for full identification, typing and sensitivity testing to the Regional Mycobacteria Reference Laboratory, PHE Heart of England Birmingham	Mycobacteria species isolated/not isolated. Some sample types may be heavily contaminated with other bacteria which may inhibit the successful culture of Mycobacteria. These will be reported as contaminated samples and a repeat sample requested. Urgent microscopy for Mycobacteria is available after discussion with a consultant microbiologist The standard Mycobacterial culture period is 6 weeks, but in certain cases culture may be extended to 12 weeks	Daily	Microscopy reported within 24hrs from receipt in laboratory. Negative report 42 days Positive reports are telephoned directly to clinicians by the Duty Microbiologist. Hard copy reports will follow.	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Mycobacterium and TB PCR The following information would be helpful for investigations: Relevant clinical details • Please provide details of any recent anti-tuberculosis treatment • Please provide details of recent BCG vaccination	**The Duty Microbiologist must be contacted BEFORE requesting this test.** AAFB smear-positive pulmonary samples. CSF, the minimum amount of CSF that will be examined is 0.5 mL. This test can also be used to confirm positive cultures and to detect the presence of the rifampicin resistance gene.	Referred to the PHE Regional Mycobacterium Reference Laboratory, PHE Heart of England Birmingham		Monday to Friday	3 working days (excludes weekends)	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
TB T-Spot test This test should only be considered after discussion with a chest physician or the Duty Microbiologist. • Relevant clinical details • Whether test is being performed to screen for suspected latency (asymptomatic) or for current, active TB infection • M. tuberculosis exposure history • Immunocompromised • If test is being performed prior to immunosuppressive treatment • If patient is a healthcare worker	**Samples can only be processed, Monday to Thursday and must be received in the Microbiology laboratory by 3.00pm.** Blood collected into Monday to Friday **TWO 6 mL lithium heparin tubes** For paediatric samples, use two **paediatric lithium heparin** collection tubes and **collect as much sample as possible**.	Referred to Oxford Diagnostic Laboratories.	Positive or Negative report	Monday to Thursday	5 working days	Yes
Mycology	Hair, skin or nail clippings collected into a sterile universal container or Dermapak		Microscopy; Fungal elements seen/not seen	Daily	48hrs	Yes
			Culture; Negative-Pathogenic fungi not isolated Positive- Organism isolated	Daily	2 weeks	Yes
Mycoplasma PCR	Respiratory secretions in sterile universal container	Referred to PHE Colindale, London	Result reported from referred laboratory	Monday to Friday	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Pneumocystis jirovecii (PCP) detection **To aid prompt processing, please contact the laboratory BEFORE requesting this test**	Bronchial aspirates/lavage collected into a 60ml wide-mouthed container. Transport to the laboratory without delay. Normal sputum is not an acceptable sample and will not be processed. This test is not validated for blood samples	Referred to PHE Heart of England Birmingham	Result reported from referred laboratory	As requested	5 days	Yes
Pregnancy Tests	Early morning urine collected in a Plain sterile universal container		Positive or Negative	Daily	24hrs	Yes
Respiratory Syncitial Virus (RSV) Screen	Nasopharyngeal Aspirate in sterile container		Detected or not detected by Immunochromatography	Daily	2hrs	Yes
Respiratory Virus PCR Includes **Please contact the Duty Microbiology if Avian Flu or MERS-CoV is suspected**.	Nose/Throat swabs Dry swabs broken off into a sterile universal container. Nasopharyngeal aspirate, Sputum in a plain universal container.	Referred to PHE Heart of England	Detected or not detected for each virus. Influenza (all types) Parainfluenzae RSV Human metapneumovirus Adenovirus	Daily	4 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Rotavirus/Adenovirus	Faeces in Blue top container		Detected or not detected by Immunochromatography	Daily	24hrs	Yes
Semen Analysis – infertility investigations **There is an Appointment System for this examination. Please contact the Laboratory on 01384 244056 for more information.**	70ml Yellow top, toxicity tested container. See further Information below		Report will detail: Volume, pH, Sperm Concentration, Motility, Viability and Morphology	Weekly (Thursday)	2 days	Yes
Semen analysis-post vasectomy	70ml Yellow top, toxicity tested container.		Spermatozoa seen or Not seen. Any motile sperm will be reported.	Monday to Friday	24hrs	Yes
Sputum for routine respiratory culture The following information would be helpful for investigations • Current or recent antibiotic therapy • Bronchiectasis • Immunocompromised • Travel History • Occupational risks	60 ml wide-mouthed sterile universal container. The material required is from the lower respiratory tract, expectorated by deep coughing. Expectorate sample directly into the container. Ideally a minimum volume of 1 mL is required. Saliva and pernasal secretions are not suitable.		Normal respiratory tract flora or Significant isolate(s) with sensitivities	Daily	2-5 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Cystic Fibrosis screen Samples will be cultured for CF associated pathogens as well as routine pathogens.	Sputum is the preferred sample but cough swabs, collected with blue top trans swab, will be accepted.		Normal respiratory tract flora or Significant isolate(s) with sensitivities	Daily	2-5 days	Yes
All Swabs/Pus/Fluid/Tissues for Routine Cultures	Blue top trans swab or plain universal container		Negative: No/Mixed/No significant growth	Daily	24hrs	Yes
			Significant isolate(s) with sensitivities		3 days	
Urine **Digital Microscopy and Culture** Midstream urine (MSU) Suprapubic aspirate (SPA) Catheter urine (CSU) Bag urine –infant and young children Other specimens obtained during or as a result of surgery eg. nephrostomy and urostomy.	Midstream urine (MSU) and clean catch urines are the most commonly collected specimens for routine tests. Cleaning the area before sampling makes little difference to contamination rates. Collect urine in red top boric acid container to the line indicated on the side. Plain universals can be used for small volumes.		Microscopy; Quantitative count for White, Red and Epithelial cells.	Daily	24hrs	Yes
			Culture; Negative; No/mixed/no significant Growth.	Daily	2 days	Yes
			Significant isolated with sensitivities. Some isolates may require extended sensitivity testing.	Daily	3-5 days	

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Adenovirus PCR (Respiratory)	• EDTA blood tube • Respiratory sample in plain universal containers • Eye swab – Dry swab in plain universal container	Referred to PHE West Midlands, Heartlands	Adenovirus DNA detected or not detected	Monday-Friday	7-10 days	Yes
Amikacin levels	Red top blood tube	Referred to Southmead Bristol	Once Daily Pre dose <5mg/L Post dose >50mg/L Re-assay interval 6-8 days BD or TDS Pre dose <10mg/L Post dose >20mg/L Re-assay interval 3-7 days	Monday-Friday	7-10 days	Yes
Amoebic antibodies	Red top blood tube	Referred to the National parasitology reference laboratory	Detected or not detected	Monday -Friday	7-10 days	Yes
Aspergillus PCR	EDTA blood tube	Referred to PHE South West, Bristol Laboratory	Detected or not detected	Monday-Friday	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
BK Virus PCR (Polyomavirus)	EDTA blood tube or plain topped Urine	Referred to PHE West Midlands, Heartlands	Detected or not detected	Monday-Friday	7-10 days	Yes
Bordetella pertussis serology	Red top blood tube	Referred to PHE Colindale Bacteriology	In the absence of vaccination >70 IU/ml= consistent with recent	Monday-Friday	7-10 days	Yes
Borrelia Serology (Lymes)	Red top blood tube	Positive screens referred to the Rare and Imported Pathogens Unit Porton Down	All samples screened for IgG and IgM. Any positive results are sent to the Reference Laboratory for further examination. Negative results do not	Monday-Friday	7-10 days	Yes
Brucella antibodies	Red top blood tube	Referred to Brucella Reference Unit, Liverpool	Detected or not detectedDetected or not detected	Monday-Friday	7-10 days	Yes
Campylobacter antibodies	Red top blood tube	Referred to Royal Preston Hospital	Detected or not detected	Monday-Friday	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Candida antibodies	Red top blood tube	Referred to PHE South West, Bristol Laboratory	Detected or not detected	Monday-Friday	7-10 days	Yes
Chikungunya serology or PCR **Samples will not be processed without a full travel history.**	Red top blood tube	Referred to Rare and Imported Pathogens Unit, Porton Down. Please state all travel history	Detected or not detected	Monday-Friday	7-10 days	Yes
Chlamydia antibodies (Respiratory) C. pneumoniae, C. psittacci, C. abortus: PCR assay **Only available after prior discussion with Duty Microbiologist and Reference Laboratory.**	>0.2ml Respiratory sample	Referred to PHE Colindale Bacteriology Department	Detected or not detected	Monday-Friday	7-10 days	Yes
Chlamydia /Neisseria PCR	ROCHE Cobas4800 collection packs for swabs and urine		Chlamydia trachomatis and N.gonorrhoeae DETECTED or NOT detected	Monday-Friday	7 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
CMV DNA PCR **Children <6 months**	Plain top Urine	Referred to PHE West Midlands, Heartlands	Not detected or Quantitative report in Copies/ml	Monday-Friday	7-10 days	Yes
CMV DNA PCR	EDTA blood tube	Referred to PHE West Midlands, Heartlands	Not detected or Quantitative report in Copies/ml	Monday-Friday	7-10 days	Yes
CMV IgG/IgM antibodies	Red top blood tube		Detected or not detected	Monday-Friday	3 days	Yes
Dengue fever serology or PCR **Contact the Duty Microbiologist BEFORE sending samples** **Samples will not be processed without a full travel history.**	Red top blood tube	Referred to Rare and Imported Pathogens Unit, Porton Down.	Detected or not detected	Monday-Friday	7-10 days	Yes
EBV PCR	EDTA blood tube	Referred to PHE West Midlands, Heartlands	Not detected or Quantitative report in Copies/ml	Monday-Friday	7-10 days	Yes
EBV IgG/IgM antibodies	Red top blood tube		Detected or not detected	Monday-Friday	3 days	Yes
Enterovirus antibodies	Red top blood tube	Referred to Epson and St Helier Hospital	Negative or Positive	Monday-Friday	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
E.Coli 0157 antibodies	Red top blood tube	Referred to PHE Colindale Bacteriology Department	Detected or not detected	Monday-Friday	7-10 days	Yes
Farmers Lung antibodies	Red top blood tube	Referred to PHE South West, Bristol	Detected or not detected	Monday-Friday	7-10 days	Yes
Filarial antibodies	Red top blood tube	Referred to National parasitology reference laboratory	Positive or Negative	Monday-Friday	7-10 days	Yes
Galactomanan antigen & PCR	Red top blood tube	Referred to PHE South West, Bristol Laboratory	Detected or not detected	Monday-Friday	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Gentamicin assay	Red top blood tube Pre-dose specimen is taken immediately before dose. Post-dose specimen is taken one hour after the IV/IM dose.		REPORTABLE RANGE FOR GENTAMICIN ASSAYS Gentamicin 0.3 – 10.0µg/ml **For once daily dosing regimens or Multiple dosing please refer to antimicrobial prescribing**	7 days a week	4 hrs	Yes
Hantavirus serology or PCR Contact the Duty Microbiologist BEFORE sending samples Samples will not be processed without a full travel history.	Red top blood tube	Referred to Rare and Imported Pathogens Unit, Porton Down.	Detected or not detected	Monday-Friday	7-10 days	Yes
Hepatitis A IgG/IgM antibodies	Red top blood tube		Detected or not detected	Monday-Friday	3 days	Yes
Hepatitis B screen (surface antigen and core antibody)	Red top blood tube		Detected or not detected	Monday-Friday	3 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Hepatitis B surface antibody	Red top blood tube		Range 0-1000 MIU/ml Specimens with concentration values <10.00 mIU/ml are considered NON REACTIVE	Monday-Friday	3 days	Yes
Hepatitis B Markers	Red top blood tube		Detected or not detected	Monday-Friday	3 days	Yes
Hepatitis B DNA (Quantitative)	2 x EDTA blood tubes		Quantitative report in IU/ml	Monday-Friday	7 days	Yes
Hepatitis B Genotypic Resistance	EDTA blood tube	Referred to Clinical Services Unit (CSU) Public Health England	Reported only on samples with a viral load >1000 copies/ml	Monday-Friday	7-10 days	Yes
Hepatitis C antibody	Red top blood tube		Detected or not detected	Monday-Friday	3 days	Yes
Hepatitis C Genotype	2 x EDTA blood tubes	Referred to PHE West Midlands, Heartlands	Reported only on samples with a viral load >200 IUml	Monday-Friday	7 days	Yes
Hepatitis C RNA (Quantitative)	2 x EDTA blood tubes		Quantitative report in IU/ml	Monday-Friday	7 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Hepatitis E IgG/IgM If patient is for transplant or immunocompromised please request HEV PCR	Red top blood tube	Referred to PHE West Midlands, Heartlands	Detected or not detected	Monday-Friday	7-10 days	Yes
Hepatitis E PCR	Red top or EDTA blood tube	Referred to PHE West Midlands, Heartlands	Quantitative report in IU/ml	Monday-Friday	7-10 days	Yes
Herpes simplex virus PCR-site of swab must be stated. ***For CSF viral screen see Microbiology section***	MSwab™ viral transport medium		Herpes simplex type 1 or 2 detected or not detected	Monday-Friday	7-10 days	Yes
Herpes simplex virus PCR (blood) **This is not available as a routine test. Discuss with duty Microbiologist BEFORE sending samples.**	EDTA blood tube	Referred to PHE West Midlands, Heartlands	Detected or not detected	Monday-Friday	7-10 days	Yes
Herpes simplex IgG antibodies **This is not a routine test. Discuss with duty Microbiologist BEFORE sending samples.**	Red top blood tube	Referred to PHE West Midlands, Heartlands	Detected or not detected	Monday-Friday	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Human Herpes virus (HHV-6 or 7) Antibody, PCR & genotyping	Red top or EDTA blood tube	Referred to PHE West Midlands, Heartlands		Monday-Friday	7-10 days	Yes
Human Herpes virus (HHV 8) Quantitative DNA PCR	Red top or EDTA blood tube	Virus Reference Lab Public Health England		Monday-Friday	7-10 days	Yes
HIV 1&2 antigen/antibody **Tests can be processed urgently after discussion with the Duty Microbiologist**	Red top blood tube		HIV Type 1 / 2 and p24 antigen detected or not detected	Monday-Friday	3 days	Yes
HIV Genotypic Resistance Viral load result and drug history must be stated on request form.	2 x EDTA blood tubes	Referred to PHE West Midlands, Heartlands	Full resistance report on samples with a viral load >1000 copies/ml	Monday-Friday	7-10 days	Yes
HIV -1 Proviral DNA PCR Maternal transmission (mother HIV positive)	Red top blood tube and EDTA blood tube Mother & baby samples required	Virus Referenc Lab. Public Health England 61 Colindale Avenue London	Full report on status	Monday-Friday	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
HIV Therapeutic Drug Monitoring	2 x EDTA blood tubes Sample times, drugs and dosage must be stated on request form.	Referred to Pharmacology Research Laboratory, University of Liverpool	Full report	Monday-Friday	7-10 days	Yes
HIV RNA Quantification	2 x EDTA blood tubes		Quantitative report in Copies/ml	Once a week	7 days	Yes
HIV-1 Tropism	2 x EDTA blood tubes	Referred to PHE West Midlands, Heartlands	Full report	Monday-Friday	7-10 days	Yes
HLA-B*5701	2 x EDTA blood tubes	Referred to Lab 21. Newmarket	Full report	Mon,Tues and Wednesday	7-10 days	Yes
HTLV1 antibodies	Red top blood tube	Referred to Laboratory Clinical Services Unit (CSU) Public Health England 61 Colindale Avenue London	Detected or not detected	Monday-Friday	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Hydatid disease or Echinococcus	Red top blood tube	Referred to National parasitology reference laboratory	Detected or not detected	Monday-Friday	7-10 days	Yes
Itraconazole levels	Red top blood tube	Referred to PHE Southmead Antimicrobial Reference Laboratory	Trough levels should be maintained at >0.5mg/L, but less than 4mg/L. There is a risk of toxicity at higher levels.	Monday-Friday	7-10 days	Yes
Japanese Encephalitis **Samples will not be processed without a full travel history**	Red top blood tube	Referred to the Rare and Imported Pathogens Unit, Porton Down	Detected or not detected	Monday-Friday	7-10 days	Yes
JC Virus PCR (Polyomavirus)	EDTA blood tube, urine or CSF	Referred to PHE West Midlands, Heartlands	Detected or not detected	Monday-Friday	7-10 days	Yes
Leptospira serology	Red top blood tube	Referred to the Rare and Imported Pathogens Laboratory, Porton Down	Detected or not detected	Monday-Friday	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Measles IgG antibody	Red top blood tube		Detected or not detected	Once a week	7 days	Yes
Measles IgM antibody	Red top blood tube	Referred to PHE West Midlands, Heartlands	Detected or not detected	Monday-Friday	7-10 days	Yes
Measles RNA	Dry Throat Swab in a plain universal	Referred to PHE West Midlands, Heartlands	Detected or not detected	Monday-Friday	7-10 days	Yes
Meningococcal PCR	EDTA blood tube	Referred to Meningococcal Reference Unit, Manchester	Negative or Positive	Monday-Friday	7-10 days	Yes
Mumps IgG antibody	Red top blood tube		Detected or not detected	Once a week	7 days	Yes
Mumps IgM antibody	Red top blood tube	Referred to PHE West Midlands, Heartlands	Detected or not detected	Once a week	7 days	Yes
Mycoplasma pneumoniaePCR	Throat Swab or Lower respiratory tract swab	Referred to PHE West Midlands, Heartlands	Detected or not detected	Monday-Friday	7-10 days	Yes
Parvovirus IgG/IgM antibodies	Red top blood tube		Detected or not detected	Once a week	7 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Pneumococcal PCR	EDTA blood tube	Referred to Meningococcal Reference Unit, Manchester	Negative or positive	Monday-Friday	7-10 days	Yes
Procalcitonin	Red top blood tube Samples must be received in the laboratory by 11:00		Procalcitonin level reported in µg/L	7 days a week	24 hrs	Yes
Q fever (Coxiella burnetii)	Red top blood tube	Referred to the Rare and Imported Pathogens Unit , Porton Down	Detected or not detected	Monday-Friday	7-10 days	Yes
Rickettsial antibodies (typhus and spotted fever groups, scrub typhus group)	Red top blood tube	Referred to the Rare and Imported Pathogens Unit,	Detected or not detected	Monday-Friday	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Rubella IgG/IgM antibodies	Red top blood tube		**Rubella IgG** Results 0.0-4.9 iu/ml are negative for IgG antibody to Rubella Results 5.0-9.9 IU/ml are reported as EQUIVOCAL Antibody levels in this range may be insufficient to protect against clinical illness upon exposure to Rubella virus. Results >10IU/ml are POSITIVE for IgG antibody to Rubella and is interpreted as immune to Rubella infection.	Monday-Friday	3 days	Yes
Schistosomal antibodies	Red top blood tube	Referred to National parasitology reference laboratory	Detected or not detected	Monday-Friday	7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Streptococcal antibodies	Red top blood tube		**Anti Streptolysin titre** Normal range is up to and including 200 IU/ml **Anti DNase B** Titres >200 units/ml in adults and > 300 units in school age children are considered significant.	Once a week	7 days	Yes
Syphilis IgG/IgM Total antibody screen	Red top blood tube		Detected or not detected Positive screen samples will have further Treponemal confirmatory tests (RPR & TPPA and Syphilis IgM	Monday-Friday	3 days	Yes
Treponemal (Syphilis) serology TPPA, RPR and Syphilis IGM Only performed on positive screening samples or infants where only a small volume of blood is available.	Red top blood tube		**RPR report** • Non Reactive • Borderline Reactive • Neat Reactive All Neat Reactive results are titrated to and end point. **TPPA report** Result ≥1/80 is considered Positive **Syphilis IgM** Detected or not detected	Once a week	7 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Tickborne encephalitis	Red top blood tube	Referred to Rare and Imported Pathogens Unit, Porton Down	Detected or not detected	Monday-Friday	7-10 days	Yes
Toxocara antibodies	Red top blood tube	Referred to UCL Hospitals NHS Trust (Parasitology)	Detected or not detected	Monday-Friday	7-10 days	Yes
Toxoplasma IgG/IgM antibodies	Red top blood tube		Detected or not detected IgM positive sample are referred to the Toxoplasma reference laboratory, Swansea for further investigations	Monday-Friday	3 days 7-10 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT		FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Teicoplanin Levels	Red top blood tube	Referred to Southmead Antimicrobial Reference Laboratory	Staph.aureus Skin and soft tissue infection Bone and joint infection Infective endocarditis OPAT on 25mg/kg 3 x per week	Pre 15-30 but <60 mg/L Pre 20-40 but <60 mg/L Pre 30-40 but <60 mg/L	Monday-Friday	7-10 days	Yes
Viral PCR	Dry Swab or CSF	Referred to PHE West Midlands, Heartlands	Detected or not detected		Monday-Friday	7-10 days	Yes
Vancomycin assay	Red top blood tube		REPORTABLE RANGE FOR VANCOMYCIN Vancomycin 3.0 – 100.0 µg/ml		7 days a week		
Varicella zoster IgG antibody	Red top blood tube		Detected or not detected		Pregnant ladies: 7 days a week Routine screen: once a week	24 hrs -7 days	Yes

INVESTIGATION **MICROBIOLOGY**	SAMPLE TYPE/CONTAINER	COMMENTS	END RESULT	FREQUENCY	95% COMPLETION time, from receipt in the laboratory	ACCREDITED TEST
Varicella Zoster IgM	Red top blood tube	Referred to PHE West Midlands, Heartlands	Detected or not detected	Monday-Friday	7-10 days	Yes
West Nile Virus serology or PCR **Unless a full travel history and clinical details are provided samples will not be processed**	Red top blood tube	Referred to the Rare and Imported Pathogens Unit, Porton Down	Detected or not detected	Monday-Friday	7-10 days	Yes
Yellow Fever serology or PCR **Unless a full travel history and clinical details are provided samples will not be processed**	Red top blood tube	Referred to Rare and Imported Pathogens Unit, Porton Down	Detected or not detected	Monday-Friday	7-10 days	Yes
Zika Virus serology **This test is not available for individuals who have no symptoms of Zika infection.** **Contact the Duty Microbiologist BEFORE requesting this test**	Red top blood tube	Referred to Rare and Imported Pathogens Unit, Porton Down	Detected or not detected	Monday-Friday	7-10 days	Yes

10.6 INFORMATION for GU Medicine Users

Prior to use, any culture plates should be kept at room temperature for a maximum of two hours to ensure there is no excess moisture on the surface of the agar

Inoculation of culture plates:

Subsequent to the identified swabs (cervical/urethral/vaginal etc) being taken, the sampled material is transferred to the relevant labelled culture plates. To ensure that the maximum amount of material is inoculated onto the plate the swab should be applied firmly over the entire area of the agar whilst simultaneously rotating the tip. When inoculating the plate it is important not to break the surface of the agar.

Preparation of slides for Gram staining:

The material collected on the swab is applied to a labelled microscope slide with the aim of transferring a thin layer over the surface taking care to avoid the edges of the slide.

Preparation of a wet film:

Place a drop of saline onto a labelled microscope slide and gently press the tip of the swab into this drop to transfer the sampled material. Coverslip is the applied directly onto the fluid.

It is important to ensure that the amount of saline used is sufficient to make the preparation 'wet' without it being excessive and flooding the slide. Excess fluid can be removed using a clean dry swab.

10.7 INFORMATION for collecting samples from eyes for Acanthamoenba investigation

Scrape: the best sample is a scrape using a fine scalpel. Place the sample into a sterile universal container with a small volume (approx. 200 µl) of sterile saline or distilled water. Do not leave the blade in the container as it can rust and can have a detrimental effect on culture conditions.

Punch biopsies: should be placed in a sterile universal container with a small amount of sterile saline or distilled water.

Portions of excised cornea may also be used. Material from the blade can be rinsed into a sterile container with a small volume of sterile saline or distilled water.

Please do not send needles. These can be flushed out with a small amount of sterile saline or distilled water into a sterile universal container.

Swabs or washings will be less efficient in detecting the organism.

Culture can also be performed from contact lenses or fluids; isolation from these specimens, whilst suggestive, does not necessarily implicate the amoeba as causing patient's symptoms. Amoebic genera (other than Acanthamoeba), flagellates, ciliates and other organisms may regularly be found in contaminated washing fluids and on lenses.

Please make sure the sample is labelled with patient name, hospital or NHS number, date and time of collection. Complete a Microbiology request form and place the sample in the attached bag and seal.

Please contact the Duty Microbiologist on extension 2056, before requesting Acanthamoeba PCR.

Sterile saline and containers are available from Microbiology (ext 2471) if required.

10.8 REPORTS

- Telephone to request urgent or preliminary results. Cultures are reviewed daily by Medical Microbiologists and preliminary results are telephoned to clinical staff when appropriate. Notify the medical staff about patients with serious infections - it may be possible to expedite preliminary results.
- Reports are issued to comply with specified turnaround times as far as possible.
- Organisms interpreted as 'of doubtful significance' may be reported without antibiotic sensitivities. Following clinical discussion, it may be possible to provide this information.

For any queries about microbiological investigations please do not hesitate to contact the laboratory.

For interpretation of results or antibiotic advice please contact the duty microbiologist via switchboard.

10.9 UNCERTAINTY OF MEASUREMENT & SOURCES OF VARIABILITY

There are two main sources of uncertainty attached to the measurement of analytes. One area is uncertainty associated with pre-analytical processes and the second area is the variation (or imprecision) due to the analytical process in the laboratory and biological variation within and between individuals.

Pre-analytical sources of uncertainty include, bleeding the right patient, labelling blood tubes correctly, using the right preservatives and anti-coagulants if required and minimising transport delays.

It is important that the correct specimen container is used. Samples that are sent using incorrect or inappropriate containers may not be tested. The specimen containers for semen samples have been checked to ensure they do not have spermicidal properties which could adversely affect the test. Samples for culture should, if possible, be taken before antibiotics are started. Delays in the time from collection to receipt of the sample in the laboratory may allow contamination organisms to overgrow leading to potential misleading results. Certain tests are more sensitive if the samples are taken at particular times of the day, for example, early morning urine samples for Mycobacteria cultures.

Some tests are 'time sensitive', for example samples for gamma interferon testing (T-spot) must reach the lab by 3.30pm on the day of collection and can only be accepted Monday to Friday. For this reason more details are outlined in the table of tests and specimen requirements.

The contribution to the uncertainty of measurement associated with biological variation is determined by the physiology of the subjects observed and this uncertainty is caused by the inherent biological variation around the homeostatic set point. Factors contributing to biological variation include biological rhythms, puberty, menopause, age and gender. Similarly, the analytical variation will be determined by a number of factors, for example the method of analysis and calibration of the analysers. Together, biological and analytical variation determines the 'critical difference' which is a measure of the value by which two consecutive measurements on the same patient of the same analyte must differ to be considered a statistically significant change in the results. The sensitivity and interpretation of some tests rely on the laboratory being given relevant clinical details such as foreign travel, hospitalisation abroad, occupational factors and vaccination history in some cases.

Therefore, the pre-analytical processes, biological and analytical variation together all contribute to the uncertainty of measurement. Please contact the laboratory if you require further information.

10.10 SUMMARY OF GUIDELINES FOR COLLECTION OF MICROBIOLOGY SPECIMENS

Click a heading to navigate through the tables:

10.10.1 Cultures

Collection	Delivery	Comments
BLOOD CULTURES		
1. Wash hands well 2. Clean skin with a 2% chlorhexidine in 70% isopropyl alcohol impregnated swab and allow to dry 3. Clean tops of culture bottles with a 2% chlorhexidine in 70% isopropyl alcohol impregnated swab and allow to dry 4. Mark off 10ml on both culture bottles using the gauge on the side of the label. Keeping the bottle upright and below venepuncture site, collect 10ml of blood into each bottle. **NB** - aerobic must be collected before anaerobic. 5. Please refer to Trust guidance for full description	• Send to Microbiology without delay for incubation. • It is not necessary to notify on-call microbiology staff. • Do NOT refrigerate.	• Do not cover bar code with patient ID labels. • Do not remove barcode. • Paediatric bottles are available for children. • All significant results are notified to clinical staff • Take peripheral and line cultures from patients with IV lines • Take 3 blood cultures at 30 minute intervals for suspected endocarditis
BODY FLUIDS		
Synovial, Pleural, Peritoneal 1. Prepare hands as for aseptic procedure 2. Clean skin with a 2% chlorhexidine in 70% isopropyl alcohol impregnated swab and allow to dry 3. Collect specimen, at least 5 ml into sterile container	• Send to lab. without delay	• Request mycobacteria if relevant

Collection	Delivery	Comments
CAPD fluids Send 20-25 ml dialysate in sterile container for cell counts and add 10 ml to each Bactec(blood culture) bottle for cultures	Send to lab without delay	
CEREBROSPINAL FLUID		
1. Wash hands well (prepare as for aseptic procedure) 2. Clean skin over lumbar spine with a 2% chlorhexidine in 70% Isopropyl alcohol impregnated swab and allow to dry 3. Collect 2-3 ml CSF into each of 3 containers. Send first and third specimens to Microbiology, and second specimen to Biochemistry	Notify lab. and send without delay	• Request special investigations if clinically relevant e.g., mycobacteria, viruses, cryptococcus. • Sterile CSFs from patients with suspect meningococcal infection will be referred for PCR.
EYE		
Sample within the lower eyelids, collecting pus if available.	Transport medium (blue top).	• Avoid contamination by skin flora of eyelids. • Moistening swabs with sterile saline may make this test less irritant. • Chlamydia swabs are available if required (e.g. persistent neonatal conjunctivitis)

Collection	Delivery	Comments
FAECES/ENTERIC PATHOGENS		
Collect FAECES using plastic spoon in blue-topped container.	Send to lab. as soon as possible. If necessary refrigerate for up to 24hrs.	• Give clinical details to allow selection of appropriate tests. • Routine tests will detect salmonella, shigella, E. coli 0157, campylobacter and cryptosporidia. • Request C. difficile if antibiotic colitis is suspected. • Describe any foreign travel, suspected food poisoning or association with outbreaks.
Perianal swab for Threadworm Sample perianal skin well with swab on rising (eggs are laid during the night on perianal skin).	Place swab in sterile saline, break off tip and close container firmly.	
'Hot stool' for acute amoebic dysentery Freshly passed stool.	Send immediately to lab	Notify lab staff before sending specimen.
RESPIRATORY		
Sputum Send expectorated secretions, preferably collected by a physiotherapist.	Send to the laboratory without delay.	• Specimens which are largely saliva will be rejected.
If **tuberculosis** is suspected, send 3 specimens requesting microscopy and culture for mycobacteria.	If delay in transport is inevitable(e.g., weekends), refrigerate (≤ 24 hrs).	• Notify a microbiologist to arrange appropriate tests if investigating immuno-compromised patients. • If legionnaires disease is suspected. Legionella urinary antigen detection should be requested if relevant; sputum culture for legionella is available.
Throat swabs Use a tongue depressor and good light to examine pharynx. Sample fornices well, collecting pus if present.	Transport medium (blue top).	Refer to MRSA policy for MRSA investigation.

Collection	Delivery	Comments
Nose swabs Moisten swab in transport medium. Use same swab to sample both nostrils.	Transport medium (blue top).	
Pernasal swabs for pertussis Ask parent or nurse to hold child's head firmly. Use special pernasal swab to sample posterior nasopharynx via nose.	Pertussis transport medium.	Swabs available from laboratory on request.
SKIN/SOFT TISSUE		
Abscess Clean skin with alcohol skin preparation. Aspirate pus if possible or pass swabs as deep into lesion as possible.	Send pus to laboratory within4 hours or swab in transport medium within 24 hours.	• Tissue or aspirated pus is always preferred to swabs. • Anaerobes die on exposure to air
Decubitus ulcer Cleanse surface with sterile saline, removing slough if necessary. Swab base of lesion.	Transport medium (blue top).	Swabs should only be collected if there is clinical evidence of infection.
Wounds 1. Clean skin with sterile saline and sample infected tissue. 2. Dampen swab with sterile saline if wound is dry and rotate several times over lesion.	Transport medium (blue top).	• Superficial sampling may detect only contaminants. • Only sample infected wounds
Intravenous Catheter Tips 1. Cleanse skin surrounding exit site with a 2% chlorhexidine in 70% isopropyl alcohol impregnated swab. 2. Remove catheter aseptically and cut off 3. 5cm distal tip with sterile scissors. Place in sterile container.	Send to laboratory within 4 hrs	• Only send tips if clinical infection is suspected and blood cultures have also been submitted • Do not send swabs from IV exit sites unless inflamed and there is pus/exudate to sample.

Collection	Delivery	Comments
URINE NOTE: To prevent specimen deterioration, urines must be submitted in red top boric acid containers which should be filled to the line, unless it is clear that only a low volume can be achieved e.g. Paediatrics, renal failure then a plain container can be used. Boric acid specimens should be delivered on day of collection unless refrigerated (up to 48hrs). Refrigerated specimens in plain containers should reach the lab within 24hrs.		
Midstream urine (MSU) 1. Clean urethral meatus with soap and water if there is any soiling 2. Females should hold labia apart and males retract the foreskin 3. Void the forestream (several ml) and collect the midstream directly into container or initially into receiver or 'multicup'. Transfer into boric acid specimen container which should be filled to the line. Very small volumes may be collected in plain sterile universals.	Send to the laboratory with minimum delay.	• Screening for UTI by leucocyte esterase and nitrite is worthwhile for simple cystitis, but is not acceptable for children, in pregnancy and repeated tests • GP's- consider dipstick tests for leucocyte esterase/nitrite if MSU's cannot be delivered to lab within 24hrs.
Catheter urine (CSU) Disinfect collection port with a steret	As for MSU	Only collect CSU's when there is clinical evidence of infection e.g. Fever, suspected septicaemia, loin pain (except for Urology, ITU and units where consultants have advised otherwise.
Urinary catheter tips	**Do not send for culture**	
Urine collected from infants Wash baby's external genitalia with soap and water and dry. Apply self-adhesive collecting bag and remove when ≥ 15ml urine has been collected	Send directly to the laboratory as contaminants are almost invariably present.	

Collection	Delivery	Comments
Early Morning Urines (EMUs) for Mycobacteria 1. Collect <u>entire</u> EMU (in large containers available from the laboratory) on 3 consecutive days 2. EMUs **must** be in a plain container. ***Boric acid must NOT be used.***	Send each specimen to the laboratory as soon as possible after collection.	
Urine collection for Chlamydia detection Collect urine in Urine Preservative Tube available from the laboratory.	Send the specimen to the laboratory as soon as possible after collection.	
UROGENITAL		
High vaginal swab A speculum must be used for sampling the vaginal fornix to avoid contamination from the Introitus or perineum.		Please give adequate clinical summary so that a suitable range of tests may be undertaken.
Endocervical swab As above	Transport medium (blue top)	The endocervix must be sampled if gonorrhoea is suspected.
Urethral swab Insert swab 2-4 cm into urethra and rotate.	Transport medium (blue top)	Chlamydia swabs are available from the lab if sexually transmitted disease is possible
Chlamydia/ Neisseria gonorrhoea PCR investigations FEMALES: vaginal swab MALES: urine sample	ROCHE CT/NG transport medium Vaginal swabs & urines- Follow pictorial instructions on packet	Chlamydia swabs and Urine containers are available from the laboratory
ENVIRONMENTAL SPECIMENS Always consult one of the Medical Microbiologists or Infection Control Nurses before submitting environmental specimens.		

10.10.2 Antibiotic Assays

Collection	Delivery	Comments
5-10 ml clotted blood (plain, dark red topped tube).	Send to lab without delay	Always use Microbiology forms
Gentamicin Pre-dose specimen is taken immediately before dose. Post-dose specimen, 1 hour after IV/IM dose.		For once daily dosing regimens or Multiple dosing please refer to antimicrobial prescribing guidelines on The Hub
Vancomycin Pre-dose vancomycin levels immediately before dose.		• Pre-dose vancomycin levels should be 5-10 mg/l • A post dose specimen is not usually indicated unless patient is immunocompromised, or not responding. Collect 2 hrs after infusion is completed. • For once daily dosing regimens or Multiple dosing please refer to antimicrobial prescribing guidelines on The Hub

10.10.3 Serology

Collection	Delivery	Comments
Refer to the table in 'Serology Test' section above for appropriate specimen type and bottle	Ensure safe transport for all blood specimens.	Always use Microbiology request forms.
Serious blood borne infections (HIV, hepatitis B, hepatitis C hepatitis E)	Wherever possible, patients' informed consent must be obtained before testing.	Repeat specimens must be tested for patients who test positive for HIV antibodies, to confirm the result
Immunity		• State date of contact as relevant or immunisation status. • TORCH screening - this term is misleading and should be avoided. Serum can be tested for rubella, parvovirus and toxoplasma but is not useful for HSV or CMV. Please discuss problem cases with Microbiologist

10.10.4 Mycology

Collection	Delivery	Comments
Skin Scrape skin scales into Dermapak using a scalpel. Collect as much as possible from active margin of lesion to enhance the chance of positive microscopy.		Dermapaks are available from lab.

Collection	Delivery	Comments
Hair 1. Collect 10-12 affected hairs with base of shafts intact, into Dermapak (available from lab) 2. Scrape scalp lesions as above.		
Nails Scrape from infected part of nail and nail bed and include infected nail clippings, into Dermapak		Avoid distal nail clippings. Cleaning with a Steret enhances the chance of positive microscopy.

10.10.5 Virus Investigations

Collection	Delivery	Comments
Vesicles, skin lesions, throat, eye Sample with swab and break off into plain universal container	Send to lab without delay.	Sample well to ensure that exfoliated cells are collected.
Nasopharyngeal aspirates		Tests for RSV antigen are undertaken at RHH
Bronchoalveolar lavage	Send to lab without delay	Lab tests RSV, adenovirus, flu A & B paraflu, and CMV PCR are available
CSF	Send to lab without delay	Herpes simplex, Varicella zoster, Enterovirus and Perechovirus are part of the CSF virus screen
Faeces		• Rotavirus and adenovirus tests are routinely performed for in-patient children <5 years. • Other tests for Norovirus are indicated for outbreaks of gastroenteritis – consult Microbiologist
Genital swabs for Herpes 1 & 2 PCR Use MSwab & container with transport media	Send to lab without delay	

10.10.6 Semen Analysis

Collection	Delivery	Comments
Semen for Infertility There is an appointment system for semen analysis for infertility investigations. The patient must be provided with a toxicity tested 70ml wide neck, yellow top specimen container and a completed Microbiology request form. PATIENT INFORMATION LEAFLET: SEMEN FOR INFERTILITY	Sample must be produced within one hour of the given appointment time.	Samples received without an appointment will not be examined.
Semen post vasectomy The patient must be provided with a toxicity tested, 70ml wide neck specimen container and a completed Microbiology request form. Patient Information Leaflet: Post vasectomy	Sample must be delivered to the laboratory within one hour of collection. Samples will only be accepted Monday to Friday 08:00hrs to 16:00 hrs. Samples will not be accepted on Bank Holidays	
Semen samples for culture Microbiological contamination from non-semen sources (e.g. commensal organisms from the skin) must be avoided. The man should pass urine first. The wash hands and penis with soap, to reduce the risk of contamination of the specimen with commensal organisms from the skin. Dry hands and penis with a fresh disposable towel. Ejaculate into a plain sterile container.	The sample must be delivered to the microbiology laboratory within 2 hours of collection.	

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10.11 REFERENCE LABORATORIES

Referral Laboratory	Tests	Accreditation
Oxford Diagnostic Laboratories 91 Milton Park Abingdon OX14 4RY	TB T-Spot assays	UKAS REF 4066
Meningococcal Reference Unit Clinical Science Building Manchester Royal Infirmary Oxford Road Manchester Royal Infirmary M13 9WZ	Meningococcal PCR Pneumococcal PCR N.meningitidis typing	CPA REF 635
Antimicrobial Reference Laboratory North Bristol NHS Trust Southmead Hospital Bristol BS10 5NB	Specialist antibiotic assays	CPA REF 38
National Parasite Reference Laboratory Department of Clinical Parasitology Hospital for Tropical Diseases 3rd Floor Mortimer Market Centre Mortimer Market London WC1E 6JB	Amoebic serology Schistosome antibodies Toxocara antibodies Leishmania microscopy/PCR Hydatid serology	CPA REF 2354
Diagnostic Pathology Laboratory Faculty of Infectious and Tropical Diseases London School of Hygiene and Tropical Medicine Keppel Street London Tel: 0207927 2427	Parasite identification Acanthamoeba microscopy	CPA REF 2204
Liverpool School of Tropical Medicine Pembroke Place Liverpool L3 5QA DX 6966301 LIVERPOOL 92L	Microsporidia Filarial serology	UKAS 9362

Referral Laboratory	Tests	Accreditation
Rare and Imported Pathogens Laboratory Public Health England Manor Farm Road Porton Down Salisbury SP4 8QA	Imported fever diagnosis Q fever Anthrax Dengue Lyme serology Rickettsiae West Nile Virus Japanese encephalitis Yellow fever Tick borne encephalitis Flavivirus screen Hantavirus Leptospiral serology	CPA REF 1612
Gastrointestinal Bacteria Reference Unit Public Health England 61 Colindale Avenue London NW9 5EQ	Reference facility for gastrointestinal pathogens Salmonella, Shigella, Vibrio and E.coli 0157 confirmation, typing & antibodies Listeria	CPA REF 1834
Antimicrobial Resistance and Healthcare Associated Infections Unit Public Health England 61 Colindale Avenue London NW9 5EQ	New antimicrobials, susceptibility testing service, resistance mechanisms Bacterial identification Staphylococcus toxin gene detection (PVL)	CPA REF 1834
Sexually Transmitted Bacteria Reference Unit Public Health England 61 Colindale Avenue London NW9 5EQ	Gonorrhoea confirmation LGV testing	CPA REF 1834
Anaerobe Reference Unit Public Health Wales University Hospital of Wales Heath Park Cardiff CF14 4 XW	Anaerobic organism identification	CPA REF 2913

Referral Laboratory	Tests	Accreditation
Micropathology Ltd University of Warwick Science Park Venture Centre Sir William Lyons Road Coventry CV4 7EZ	Acanthamoeba PCR Triple PCR screen Acanthamoeba, Adenovirus& Herpes	CPA REF 1926
Mycology reference laboratory (Mycology RL) Bristol Public Health England South West Laboratory Myrtle Road Kingsdown Bristol BS2 8EL	Mycology identification Cryptococcus investigations Aspergillus PCT & Galactomannan antigen Candida antibodies Farmers Lung antibodies Itraconazole leves	UKAS 8043
Respiratory and vaccine preventable bacteria reference unit (RVPBRU), Public Health England 61 Colindale London NW9 5EQ	Bordetella serology & identification Chlamydia (respiratory) Mycoplasma PCR Legionella identification Haemophilus typing Streptococcus pneumoniae typing Ureaplasma Streptococcus pyogenes Group A typing	CPA REF 1834
Brucella reference unit Liverpool Clinical Laboratories Virology Department Royal Liverpool and Broadgreen University Hospital NHS Trust Prescott Street Liverpool L9 8XP	Brucella serodiagnosis	CPA REF 1864
Virus Reference Laboratory Public Health England 61 Colindale AVenue London NW9 5EQ	HHV-8 HTLV 1 antibodies HIV Proviral DNA HIV p24 antigen	CPA REF 2904

Referral Laboratory	Tests	Accreditation
Toxoplasma reference laboratory (TRL) Department of Microbiology Singleton Hospital Sgeti Swansea SA2 8QA	Toxoplasma confirmatory tests	CPA REF 2913
PHE Birmingham Public Health Laboratory Heart of England NHS Foundation Trust Bordeslet Green East Birmingham BS2 8HW 0121 424 2500 DX No: 6780100 BIRMINGHAM B	Specialist Virology & Molecular confirmatory tests C.difficile ribotyping HIV therapeutic drug monitoring HIV Genotypic Resistance Polyomavirus BK & JC HHV6 Respiratory virus PCR Bordetella PCR Mumps IgM CMV PCR CMG IgG Avidity EBV PCR Hepatitic C Genotype Hepatitis E serology & PCR Herpes PCR Herpes Serology HIV 1 Tropism Measles IgM Syphilis confirmatory tests VZV PCR VZV IgM VZV IgG Pneumocyctis PCR 16sPCR sequencing Rubella IgM confirmation	UKAS REF 8213
Regional Mycobacteria Reference Laboratory Public Health England Heart of England NHS Foundation Trust Bordesley Green East Birmingham BS2 8HW	MAI isolation Mycobacteria identification and sensitivity Rifampicin resistance PCR MTB PCR	UKAS 8213

Referral Laboratory	Tests	Accreditation
The National Creutzfeldt-Jakob Disease Research & Surveillance Unit Western general Hospital Crewe Road Edinburgh EH4 2XU	CJD	National CJD Reference Centre
Royal Preston Hospital Sharoe Green Lane North Fulwood Preston PR2 9HT	Campylobacter antibodies	UKAS REF 8545
Virology Department St Helier Hospital Wrythe Lane Carshalton Surrey SN5 1AA	Enterovirus antibodies	CPA REF 1225

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