PATHOLOGY SERVICES HANDBOOK

http://www.swlpath.nhs.uk/

CPA ACCREDITED LABORATORIES

0356 – CELLULAR PATHOLOGY
4003 – CLINICAL BLOOD SCIENCES
0943 – MICROBIOLOGY
1929 – PROTEIN REFERENCE UNIT & IMMUNOPATHOLOGY

For current accreditation status please see http://www.cpa-uk.co.uk

Document Number	PATH001
Authorised by	Pathology Care Group Lead
Produced by	Pathology Quality Managers
Edition	4.03
Date of Issue	January 2016
Review Date	June 2016
No. of pages	82

http://www.swlpath.nhs.uk/

Preface

This handbook outlines the pathology service offered by South West London Pathology (SWLP), which is an NHS partnership of three London hospital trusts: St. George's University Hospitals NHS Foundation Trust, Kingston Hospital NHS Foundation Trust and Croydon Health Services NHS Trust.

It is intended to help hospital staff and local general practitioners to make the best use of the laboratory services. The information provided includes the types of specimen required, instructions for collecting specimens with particular emphasis on safety, the range of investigations offered, as well as reference values.

If you have questions about any aspect of the pathology service, staff members will be pleased to help you (see telephone numbers opposite and under the relevant department).

This handbook is an updated version of earlier editions and we have tried our best to make it user-friendly. The authors would be most grateful if any errors or amendments could be brought to their attention for correction as well as any suggestions for the next edition.

A website containing information on South West London Pathology is also available at http://www.swlpath.nhs.uk/

Dr Aodhan Breathnach
Clinical Director
South West London Pathology

Saghar Missaghian-Cully
Managing Director
South West London Pathology

Table of Contents

1 GENERAL INTRODUCTION AND GUIDANCE

1.1 ORDER COMMS

Where available, Cerner Order Comms should be used by the requesting clinician to order tests and label specimens appropriately.
If you do not know how to use Cerner Order Comms, user guides are available on the St George's NHS Trust intranet site.
If Cerner Order Comms is not available, or your test cannot be requested using this system, samples should be labelled and a request form sent as detailed below:

1.2 REQUEST FORMS – (WHEN CERNER ORDER COMMS IS UNAVAILABLE/NOT USED)

Request forms need to be completed legibly and completed using a ballpoint pen. Of similar importance is the need to give the **correct location, ensuring this information appears on each individual form for the appropriate laboratory,** so that results arrive where they are needed. **Providing the hospital number/NHS number will minimise delays.**
It is the responsibility of the medical officer to ensure that all request forms and specimens carry **ALL** of the following information.

1. Patients surname and first name(s) or coded identifier (e.g. GUM patients)
2. Hospital number/NHS number
3. Date of birth and sex
4. Location
5. Consultant name/GP name
6. Tests requested
7. Name of requesting doctor (printed) together with bleep no
8. Relevant clinical information to justify the request
9. GP code

Current information is usually more relevant than an admission diagnosis. Without full information it is impossible to examine a specimen adequately or report on it constructively. This is the minimum dataset required; please see specific specialties for further details.

1.3 SAMPLE LABELLING – (WHEN NOT USING CERNER ORDER COMMS)

Information on the sample container **MUST** include:

1. Patients surname and first name(s) or coded identifier (e.g. GUM patients)
2. Hospital number/NHS number (if available)
3. Sex
4. Date of birth
5. Time and date of sampling
6. Location
7. Specimen type

Forms and samples that omit the above information may not be analysed. Inadequately/incorrectly labelled samples for the Transfusion department will not be processed. This measure is required both for the safety of patients and for the medico-legal protection of hospital staff.

1.4 INFECTION RISK FROM BLOOD OR OTHER BODY FLUIDS

All biological specimens should be considered as potentially hazardous and handled accordingly. However, special precautions are necessary for obtaining and handling specimens from patients infected (or thought to be infected) with high-risk pathogens. It is important to remember that carriers may be asymptomatic. Infection may be acquired by spillage of blood and other body fluids on to recently broken skin, by accidental scratches, puncture wounds from needles, instruments or possibly by splashing into the eye, nostrils and lips of susceptible persons. Therefore take care with all specimens for your own safety and that of others.

Please remember that it is the responsibility of the person who requests laboratory examination of the specimen to ensure that both the form and the container are correctly labelled to indicate a danger of infection.

1.5 PROCEDURE FOR OBTAINING BLOOD SAMPLES FROM LOW RISK PATIENTS

a) Personal hygiene

Inspect your hands and make sure that any recent cuts or abrasions are covered with a waterproof dressing without visible air holes. Wear gloves if appropriate. Avoid needle pricks, spilling blood and contaminating with blood the outside or rim of the specimen container. Do not lick labels, envelope etc.

b) Tray

To reduce the risk of spillage make sure that all the equipment you need is to hand and safely held on a tray preferably in suitable holders or compartments. All parts of the tray should be either disposable, autoclaveable or cleanable by 1% Virkon solution. Make sure this solution is to hand.

c) Vacutainer Blood Collection System

This is the preferred blood collection system and enables a variety of tube types to be used.

d) Screw Top Sample Containers

Use the appropriate container (see individual laboratory sections). This is to ensure the correct anticoagulant, if required, and minimises the chance of the specimen clotting.

e) Closure

Ensure that the cap on the container is secure. Leaking containers are dangerous; furthermore if the sample leaks you may have to bleed the patient again. If there is anticoagulant in the container dissolve it in the blood by inverting the tightly closed container slowly several times.

f) Needle

Dispose of needle, syringe or Vacutainer system as a single unit. Keep all this equipment separate from all the other waste and discard it into a container approved and marked for disposal of "SHARPS"'. NEVER ATTEMPT TO RE-SHEATH.

g) Discards

Mediswabs, gloves, cotton wool, and other blood-contaminated materials used for venepuncture should be carefully placed into a clinical waste bin.

h) Spillage of blood

If any sharp items, e.g. broken glass, are involved, where possible use thick, heavy duty gloves, otherwise use ordinary surgical gloves. In the event of broken glass, pick up all fragments carefully with forceps and discard them into a container approved and marked for the disposal of "sharps", never into a plastic bag.
Dilute any split blood with 1% Virkon solution or chlorine granules and mop it up with absorbent paper. Put the mopping up material into a yellow plastic bag, close it securely, e.g. by knotting it, and send it for incineration. Remove the gloves, put them in a yellow plastic bag, close it securely and send for incineration. Then wash your hands.

Never attempt to re-sheath a needle. Never leave a needle, or "sharp" for someone else to clear away, discard it safely.

1.6 PROCEDURE FOR OBTAINING BLOOD SAMPLES FROM A SUSPECTED OR KNOWN "HIGH RISK" PATIENT

Special precautions are needed for samples that are collected from patients who are at high risk of hepatitis B, C or HIV.

a) Additional precautions for obtaining a blood sample from a suspected or known "high risk" patient

Blood samples should **only be taken by staff experienced in venepuncture**. The following precautions **MUST** be taken:

1. Wear well-fitting surgical gloves and plastic apron.
2. If available, wear safety spectacles.
3. A yellow hazard-warning label must be put on the specimen container.
4. Blood samples should be double bagged and where possible sent in a robust screw-capped container with the cap securely tightened, and sealed in a plastic bag with an integral-sealing strip.
5. The request form, to which a yellow hazard label must be attached, should be placed in the external pocket of the bag.
6. The specimen should be transported in the upright position.

b) Disposal of blood contaminated items

All syringes, needles or Vacutainer systems should be disposed of as a single unit into a sharps bin. Mediswabs, gloves, cotton wool and any spilt blood must be dealt with at once by disinfecting with 1% Virkon solution (10,000 ppm of available chlorine) or chlorine granules.

(In collecting and transporting specimens from outpatients, the same precautionary measures must be taken as described above).

c) Action to be taken in the event of an accident involving blood or other body fluids from a suspected or known "high risk" patient

If there is personal injury from a needle prick or cut, the following action should be taken:

1. Make the lesion bleed freely at once to help wash away infection.
2. Wash it immediately and thoroughly with running tap water.
3. Apply a suitable dressing (as provided in first aid boxes).
4. If blood or other body fluid is splashed into the eye, nose or on the lips, wash it away immediately with running tap water.
5. Follow Needle Stick Injury Procedure applicable to your workplace.

d) Accidental Exposure to Blood Borne Pathogens

i. Procedure

Any accident involving the puncture of the skin by a needle or scalpel contaminated with blood from **ANY** patient, or the spilling of such blood on broken skin must be reported as soon as possible to your superior. The member of staff concerned **MUST** attend the Staff Health department immediately. If the accident occurs outside of normal working hours, the member of staff concerned **MUST** attend A&E immediately as is standard procedure.

ii. Advice

For advice during normal working hours, in the first instance contact Occupational Health on extension 1661. Members of the Medical Microbiology/Virology department are also available for advice (see yellow wall notice – "Accidental Exposure to Blood Borne Pathogens"). Outside normal working hours you may contact either the Duty Virologist on extension 5686/5702 or on their air call via switchboard, or the Infectious Diseases Registrar via Switchboard.

GP surgeries should follow their own standard operating procedures for Accidental Exposure to Blood Borne Pathogens.

1.7 PATHOLOGY SENIOR MANAGEMENT

Saghar Missaghian-Cully	Managing Director	020 8725 0960
Aodhan Breathnach	Clinical Director, Training Programme Director and Consultant Microbiologist	020 8725 5735
Jennifer Owen	Head of Operations	020 8725 1870
Jamie Laughlin	Microbiology Discipline Manager	020 8725 5698
Sean Lynch	Clinical Blood Sciences Discipline Manager	020 8725 5474
Robin Whittaker	Cellular Pathology Discipline Manager	020 8725 2840

1.8 LABORATORY OPENING HOURS

Department	**MON to FRI**	**SAT**	**SUN**	**BH**
Clinical Blood Sciences: Chemical Pathology	08.00 – 20.00	09.00-13.00	09.00-13.00	09.00-13.00
Clinical Blood Sciences: Haematology	08.00 – 18.00	08.00-14.00	08.00-14.00	08.00-14.00
Cellular Pathology	08.00 – 17.00	-	-	-
Medical Microbiology	09.00 – 17.00	08.30-12.30	-	08.30-12.30
PRU/Immunology	08:00 – 16.00	-	-	-

1.9 EMERGENCY INVESTIGATIONS

DEPARTMENT	**NORMAL WORKING HOURS**	**OUT OF HOURS**
Clinical Blood Sciences: Chemical Pathology	Telephone laboratory in advance (ext 2651)	Bleep 6032 in advance

Clinical Blood Sciences: Haematology	Send to laboratory immediately	Send to laboratory immediately
Cellular Pathology	Telephone laboratory in advance (see page 14)	NO SERVICE
Medical Microbiology	Telephone laboratory in advance	Contact lab staff on call via switchboard
PRU/Immunology	Telephone laboratory in advance	NO SERVICE

Once the laboratory concerned has agreed that the specimen is an emergency, it should be forwarded as soon as possible either by using the pneumatic tube system or a porter and/or transport, as appropriate. **NB: Haematology specimens should be forwarded immediately without contacting the Haematology laboratory, if they are viewed as emergencies.**

A doctor must make all requests for urgent analysis. Results of tests on all urgent requests will be telephoned to the doctor as soon as they are available, provided the appropriate contact number is entered on the request form.

Please request a test to be done urgently only when it is essential for the immediate well-being of the patient **- not for your convenience.**

1.10 OUT OF HOURS

For out of hours service information, please check under relevant department.

IMPORTANT: Are you making proper use of the laboratories?

Please avoid sending samples outside of the core hours unless they are urgent.

Complete the request form legibly and fully; including a contact number (often we do not know where to send the results). Samples which are inadequately identified may not be analysed. Please indicate clinical diagnosis and any drug therapy.

Only ask for tests you really need; remembering clinical budgets be selective.

If the request is urgent, please see section headed "Emergency Investigations" on the previous page for actions required.

If you have clinical or analytical queries relating either to patients or the services, the on-call Consultants/medical staff are always available to discuss these with you.

1.11 SPECIMENS

In order to keep turnaround times to a minimum, send all specimens to the laboratory as quickly as possible by using either the pneumatic tube system (for operating guidelines see chapter 9) or a porter and/or transport, as appropriate.

2 CENTRAL PATHOLOGY RECEPTION

Central pathology reception (ext. 2651) is open for the delivery of specimens between 0900 and 1800 Monday to Friday and 0900 to 1400 at weekends and on bank holidays.

Mr Philip Graham	Central Pathology Reception Manager	0208 266 6827

Please ensure samples reach the laboratories as early in the working day as possible.

2.1 SPECIMEN COLLECTION AND TRANSPORT

Hospital – Phlebotomy Collection rounds start at 0730. **PLEASE NOTE: THE PHLEBOTOMIST CANNOT ACCEPT ANY REQUESTS FOR BLOOD TESTS AFTER 0730hrs**.

St Georges Porters General Portering enquiries contact ext.2134/Bleep 6426

DAY	TIME	CONTACT DETAILS
Mon-Fri	07.30-18.00	General porters ext.2134/Bleep 6426
Sat	08.00-14.00	As above
Out-of-hours		As above

AREA	CONTACT DETAILS
Lanesborough Wing	Bleep 6373
St. James Wing	Bleep 6402
AM Wing /Knightsbridge Wing	Bleep 6417

There is also an on-line portering tele-tracking service under applications on the Trust Intranet.

GP surgeries For those locations included in the **courier service** specimens **are collected each day (Monday–Friday)** from 0900. Any queries please contact the transport department 020 8725 2406. Specimen transportation and collection is managed by the Trust Services Department, consisting of a number of courier runs, subject to continuous change and improvement. There are separate transport runs for consumable deliveries.

2.2 TIMETABLE FOR ISSUING OF REPORTS – (SEE ALSO SPECIFIC DEPARTMENTAL NOTES)

Most pathology reports are available via the electronic patient record (EPR) and Cerner as soon as they are authorised. In addition, hard copy reports are distributed from Pathology on weekdays:

Telephone Results	**Please access EPR or Cerner to view result wherever possible.** This will minimise the risk of errors for numerical results and reduce depleting Pathology staff resources whilst handling unnecessary calls. **If results are requested by telephone,** include the full name (and hospital number) of the patient. Persons receiving messages should record them in the designated place, and read results back to check for errors of transmission.

2.3 PHLEBOTOMY SERVICES - TIMES

2.3.1 ST GEORGE 'S HOSPITAL

OUTPATIENT DEPARTMENT	MONDAY – FRIDAY OPENING TIMES	EXT	BLEEP
Lanesborough Wing	08:00 -16:30	1733	6500
St. James' Wing	0900 -16:45 (15:45 Friday)	3044	6500

2.3.2 OUTPATIENTS AND GENERAL PRACTITIONER REQUESTS

Samples will be collected from patients with the appropriate request forms. Please help the Phlebotomists by clearly indicating the required test and fasting or non-fasting if applicable. Please ensure that patients are informed correctly in regard to whether they need to fast prior to their blood test. Fasting indicates nil by mouth, except for still water, preferably 10-12 hours prior to their blood test. No appointment is necessary as patients are seen, in turn, using a numerical ticketing system. Please be aware that the last ticket is issued at 16.30. This is to ensure that all patients are attended to prior to closing time. Under 10's who are referred for a blood test by their GP will only be seen on Tuesday and Thursday afternoons from 14.00 – 16.00 unless the request is urgent (e.g. malaria parasites). The busiest periods are between 09:00 – 12.30 & 15.00 – 17.00.

2.3.3 INPATIENTS

Phlebotomy teams visit each ward commencing 07.30 each day Monday - Sunday. To use this service, orders must be placed on the Cerner Order Comms system and the cut-off time for orders is 05.00 for a service that day. Fully completed request forms for each patient must be placed in the blood test request folder provided by 0730.

Ambulant patients can visit the Lanesborough Wing or St James Wing outpatient Blood Test Room during the times specified (see 'Outpatients and General Practitioner Requests').

2.3.4 ST JOHN'S THERAPY CENTRE

A phlebotomy service is available on weekdays, as follows:

Monday – Thursday 08.00 – 16.00
Friday 08.00 – 13.00

Under 10's who are referred for a blood test by their GP will only be seen from 09.00 – 12.00 Monday – Friday.

The Blood Test room is located in the outpatient department.

2.3.5

3 CELLULAR PATHOLOGY

The South West London Pathology transformation project for Cellular Pathology took place in 2014 and saw the development of St George's as the hub of the "hub and spoke" model for Cytopathology, incorporating Kingston and Croydon Hospital gynaecological cytology in February and March 2014 respectively.
On 4th August 2014, the merger of Croydon histopathology department occurred.

The Mortuary Services remain The St George's Mortuary and remain within St George's University Hospitals NHS Foundation Trust.

St George's University Hospitals NHS
NHS Foundation Trust

St Georges Hospital, Jenner Wing Basement, George's Hospital, Blackshaw Road, SW17 0QT

3.1 RESULTS

All results are posted on the EPR as soon as reporting is complete.
Results are best viewed via the EPR rather than phoning the laboratory.

3.2 CONSULTANTS AND SENIOR STAFF

Dr Caroline Finlayson	Clinical Lead	4993
Dr Barry Newell	Histopathology	4963
Dr Brendan Tinwell	Histopathology & Cytopathology	5282
Dr Caroline Finlayson	Histopathology	4993
Dr Charan Kaur	Histopathology	5068
Dr Colan Hoyen	Histopathology	6277
Dr Heung Chong	Histopathology	5247
Dr Hari Krishnan	Histopathology & Cytopathology	0055
Dr Iona Jeffrey	Perinatal & Paediatric Pathology	5281
Dr John Du Parcq	Histopathology	0012
Dr Kavita Amarasinghe	Histopathology	5082
Dr Leslie Bridges	Neuropathology	4983
Dr Lorrette Ffolkes	Histopathology	3906
Dr Lida Alarcon	Histopathology	4994
Dr Jayson Wang	Histopathology & Cytopathology	5277
Dr Jonathan Williams	Histopathology	4995
Dr Lorrette Ffolkes	Histopathology	5068
Dr Paul Johns	Neuropathology	5271
Dr Phil Wilson	Histopathology & Cytopathology	5266
Dr Ramzi Rajab	Histopathology & Cytopathology	1356
Dr Rukma Doshi	Histopathology & Cytopathology	0505
Dr Ruth Nash	Histo, Cyto, Perinatal & Paediatric	0651
Dr Syamala Thomas	Histopathology	4943
Dr Val Thomas	Histopathology & Cytopathology	2448
Robin Whitaker	Discipline Manager	2840

Darrin Siiankoski	Quality & Health and Safety Manager	4997
Peter Foot	Histology Technical Lead	5254
Robert Akutu	Cytology Technical Lead	6168
Robin Dobinson	Mortuary Manager	6109
Scott Johnson	Office Manager	5264

3.3 ENQUIRIES – During Working Hours

Results & Enquiries	5267, 5269, 5264 or 5263
Cellular Pathology Fax	020 8767 7984
Perinatal Secretary Fax	020 8725 5261
Fine Needle Aspiration Bookings	5267, 5269 or 5263
Frozen Section Bookings	**5256 or 5257**
Gynaecological consumables	0208 725 5267
Histopathology consumables	0208 725 5257
Mortuary Services	5240
Coroner's Officers (Wandsworth & Merton)	0207 641 5305

3.4 OUT OF HOURS ADVICE AND REQUESTS

- The on-call mortuary technician can be contacted 'out of hours' on Pager SG240.
- There is no 'out of hours' service for Histopathology or Cytopathology.

3.5 HISTOPATHOLOGY

LOCATION - St. George's Hospital, Basement - Jenner Wing Cellular Pathology, Histology Section

3.5.1 HISTOLOGY LABORATORY OPENING HOURS

MON	TUE	WED	THU	FRI	SAT	SUN	BH
← 07:30 – 17:00 →					CLOSED		

3.5.2 SUBMISSION OF HISTOPATHOLOGY SPECIMENS

If an URGENT report is required please state this on the request form. Always provide a contact or bleep number. Hand -deliver urgent specimens to Cellular Pathology.

Most specimens should be submitted in adequate 10% neutral buffered formalin - sufficient to fully cover the specimen with the exception of the samples listed below:

Exceptions - which should be immediately hand delivered fresh via theatre staff. These specimens should be booked with the laboratory as outlined in section 3.5.6

- **Frozen section specimens** - send fresh immediately in a dry pot.
- **Lymph nodes** - send fresh immediately in a dry pot.
- **Muscle biopsies** - send fresh immediately in a dry pot (unless being sent from an outside hospital in which case they should be sent in a dry pot on 'wet' ice to keep cool).
- **Nerve biopsies** - send fresh immediately; wrapped in a slightly dampened saline gauze.
- **Paediatric GI biopsies for Hirschprung's disease** – send fresh immediately; on a swab slightly moistened saline in a dry pot.
- **Renal biopsies** - send fresh immediately; on gauze slightly moistened with saline in a dry pot.
- Skin biopsies for immunofluorescence - send fresh immediately; on saline moistened gauze in a dry pot.

3.5.3 REQUEST CARD

Each set of specimens from an individual patient must be accompanied by a fully completed Histopathology request card including a bleep or contact number.

3.5.4 PROCEDURE FOR HIGH RISK SPECIMENS

High-risk specimens are those that could, potentially contain category 3 or 4 pathogens (i.e. Hepatitis B or C, HIV etc.). For a comprehensive list of micro-organism refer to the Advisory Committee on Dangerous Pathogens (ACDP).

All high risk specimens must be clearly labelled with a yellow biohazard label on both the specimen and request form.

3.5.5 SPECIMEN PROBLEMS

- Unlabelled / Unidentifiable specimens will not be processed.
- Samples pots must be securely fastened prior to transportation.
- Leaking specimens may result in poor sample processing.

3.5.6 HISTOPATHOLOGY REPORTS

Histopathology department aims to process and report 90% on of small biopsies within seven calendar days; and 90% of larger excision specimens within 10 calendar days (including neuropathology specimens). Please note this process may take longer if further investigations such as immunocytochemistry / electron microscopy are necessary to achieve a diagnosis. All completed reports are available on EPR and copies of authorised reports are sent to the Consultant. Please check on EPR before making enquiries through the Cellular Pathology Office.

3.5.7 FROZEN SECTION RAPID DIAGNOSTIC SERVICE

- **Service is not provided on infectious specimens (e.g. TB & HIV).**
- Service available from 08.30 to 16:30- Monday to Friday.
- **Frozen section cases must be received in the laboratory by 4.30pm**

Please Book Frozen Sections in advance, by calling ext. 5256 and providing the following details –

- **Date Required**
- **Time Required**
- **Patient's Name**
- **D.O.B.**
- **Hospital Number**
- **Clinical Details**
- **Any Infection / Radiation Risk?**
- **Theatre**
- **Theatre Extension Number**
- **Surgeon**

Advanced notice & booking reduces the delays in processing and reporting of results

- The fresh specimen must be hand-delivered to Cellular Pathology Department – Basement Jenner Wing.
- If the frozen section is no longer needed please phone the Histopathology laboratory on ex 5257 or ex 5256 to cancel the request.

Verbal frozen section results will only be given to MEDICALLY qualified staff.

3.5.8 MUSCLE & NERVE BIOPSY DIAGNOSTIC SERVICE

- **Service is not provided on infectious specimens (e.g. TB & HIV).**
- Service available from 08.30 to 16:30- Monday to Friday.
- **Cases must be received in the laboratory by 4.30pm**

Please Book Muscle & Nerve Biopsies in advance, by calling ext. 5256 and providing the following details –

- **Date Required**
- **Time Required**
- **Patient's Name**
- **D.O.B.**
- **Hospital Number**
- **Clinical Details**
- **Any Infection / Radiation Risk?**
- **Theatre**
- **Theatre Extension Number**
- **Surgeon**

Advanced notice & bookings reduces the delays in processing and reporting of results

- The muscle / nerve biopsy must be hand-delivered to Cellular Pathology Department – Basement Jenner Wing.
- If the biopsy is no longer being taken phone the Histopathology laboratory on ex 5257 or ex 5256 to cancel the request.

3.5.9 AVAILABILITY AND CLINICAL ADVICE

- Clinical advice from Consultant Histopathologists is available from Monday to Friday at most times by phone; please see contact information detailed above.

3.5.10 OUT OF HOURS ADVICE AND REQUESTS

- There is no 'out of hours' service for Histopathology

3.5.11 CONSUMABLES AVAILABLE

- Empty specimen pots from 0.5L to 5L volume are provided for St George's theatres. Contact the laboratory on 5257 in advance and quote sizes required. Theatres should arrange to collect these pots at a time mutually convenient with the laboratory
- Pre-filled 10% neutral buffered formalin 50ml pots will only be provided to GP surgeries.
- Neutral buffered formalin is not provided by the Histopathology laboratory – please contact the Pharmacy Dept.

3.5.12 REFERENCE CENTRES

Histopathology samples are occasionally referred to one of the sites below for additional tests or second opinion. These referral centres should not be contacted directly. For further information please contact the Cellular Pathology Department.

3.6 CYTOPATHOLOGY

LOCATION - St. George's Hospital, Basement - Jenner Wing Cellular Pathology, Cytology Section

3.6.1 OPENING HOURS

MON	TUE	WED	THU	FRI	SAT	SUN	BH
← 08:30 – 16:30 →					CLOSED		

3.6.2 SUBMISSION OF SPECIMENS

Diagnostic specimens must be accompanied by a single part non-gynaecological cytology request card. All specimens must be sent immediately, so that the cells remain in good condition for analysis. Where several tests are required on a sample, the sample should be divided before being sent to the pathology department an accompanied with all the form(s) appropriate for each pathology department. Where available, order comms may be used by requesting clinicians to order tests and label specimens.
A single part bespoke cervical cytology request must accompany all gynaecological specimens. These are available from the Open Exeter Website.

3.6.3 INSTRUCTIONS FOR COMPLETING REQUESTS FORMS

A request form must accompany all specimens to the laboratory. This should clearly show the patient's details, including:

- Name i.e. first name and surname
- Hospital number/NHS number
- Date of birth
- Ward/GP name and number
- Type of specimen
- Date and time of sample
- All relevant clinical data
- Previous sample test date and any relevant history/treatment must be stated on request forms for cervical cytology

3.6.4 SPECIMEN LABELLING INSTRUCTIONS

The minimum data required is the patient's name and date of birth & where applicable the NHS number must be on all specimen containers, using a ballpoint pen.
For slides a HB pencil is required as ink is removed during processing by various dyes and solvents. Please be advised that air-dried slide preparations must be avoided on patients that are identified as 'danger of infection'. In such instances, these specimens should be put straight into hanks solution for preparation under controlled conditions in the laboratory.
Mismatched or inappropriately labelled specimens or request forms will not be processed, as this constitutes to a clinical risk. Hospital clinicians may be informed to take responsibility for any amendments.

3.6.5 SAMPLE TRANSPORTATION INSTRUCTIONS

Cervical Specimens:
Cervical cytology samples must be labelled with the patients surname, forename and date of birth and where possible the NHS number. A request form must be completed with full patient data, clinical symptoms and relevant history. The request form and vial should be placed into a sealable specimen bag for dispatch to the laboratory. Transport drivers will collect on the same day or the next working day.

Note: as these cells are fixed immediately there is no need to refrigerate the cervical specimen.

Fine needle aspirate and brush specimens:
Where the clinician prepares needle washes, slides must be sent in slide carriers and in cases and needle rinses ideally in Hanks medium. Both slide carriers and Hanks medium can be obtained from the cytology laboratory.

3.6.6 PROCEDURE FOR HIGH RISK SPECIMENS

High-risk specimens are those that could, potentially contain category 3 or 4 pathogens (i.e. Hepatitis B or C, HIV etc). For a comprehensive list of micro-organism refer to the Advisory Committee on Dangerous Pathogens (ACDP).

All high risk specimens must be clearly labelled with a yellow biohazard label on both the specimen and request form.

3.6.7 SPECIMEN PROBLEMS

- Unlabelled specimens will not be processed.
- Lids on cervical samples must be tightened so that the two black marks cross each other on the vial, and generally all lids must be securely fastened prior to transportation.
- Leaking specimens may not be processed.

3.6.8 AVAILABILITY AND CLINICAL ADVICE

- Clinical advice from a Consultant Cytopathologist is available from Monday to Friday at most times by phone; please see the contact information detailed in sections 3.1 & 3.2.

3.6.9 OUT OF HOURS ADVICE AND REQUESTS

- There is no 'out of hours' service for Cytopathology

3.6.10 CONSUMABLES AVAILABLE

Non-gynaecological cytology:
The Cytology section provides consumables to hospital based clinics for specimens such as urine, serous effusions or respiratory samples; this includes Hanks solution. Clinics should phone the laboratory in advance on ex 5267 to arrange to collect these consumables.

Gynaecological cytology:
The Cytology section provides Gynaecological Cytology kits to GP surgeries, Family Planning and Hospital based clinics at the respective 'hub and spoke' hospitals at Croydon, Kinston & St George's. These kits consist of consumable stock, Thin Prep vials (containing 50 ml PreservCyt solution), specimen bags and Cervex® brushes. Specimen request forms should be sourced from Open Exeter. All consumable requests should be faxed directly to their respective hospital Central Pathology Reception departments based at Kingston, Croydon and St George's.

Contact Numbers –

- Croydon 0208 401 3000
- Kingston 0208 546 7711
- St George's 0208 725 5267

3.6.11 NON-GYNAECOLOGICAL CYTOLOGY

The term non-gynaecology relates to all diagnostic specimens received within Cytology, which do not form part of the cervical screening programme. This laboratory aims to report all diagnostic

specimens within 10 working days. Under certain circumstances, reports may be required by a certain day/time; this information must be stated on the request form.

In order to process specimens immediately, diagnostic specimens require sufficient and relevant clinical information. This should include the following:

- Clinical Information
- Symptoms
- Underlying conditions
- Previous history of neoplasia / pathological conditions
- Recent infections

This information will help in the interpretation of the specimen.

3.6.12 FINE NEEDLE ASPIRATION CYTOLOGY

An on-site Fine Needle Aspiration service, for superficial masses as well as breast and radiologically localised lesions, is available during working hours. To maintain cell integrity these samples should ideally be processed within 24 hours. Results on consultant-performed fine needle aspirates are available within 48 hours unless further investigations are necessary.

3.6.13 TABLE OF SPECIMEN TYPES

Specimen Type	Appropriate Specimens	Container
Ascitic Fluid		Send in 10 ml of Hanks* in a 25-50 ml sterile universal container.
Bronchial Brushings	Smears made from the brush specimen must be fixed immediately and allowed to dry We recommend that the brush is sent to laboratory.	Slides must be labelled in pencil with patient name and date of birth/ Hospital number. Brush -Send in 10 ml of Hanks* in a 25 ml sterile universal container.
Bronchial Washes		Send in a 25 ml sterile universal container.
Bronchoalveolar Lavage		Send in a 25 ml sterile universal container. Please state on request form if haemosiderin or fat laden macrophages require identification.
CSF	Please send to laboratory immediately after taking specimen and before 4:30 pm If the specimen is taken outside of normal laboratory hours the specimen must be refrigerated	Send in a 25 ml sterile universal
Cyst Fluids		Send in 10 ml of Hanks* in 25 ml sterile universal container.
Gastrointestinal Tract Material	Brush is sent to laboratory DO NOT PREPARE SLIDES	Send in 10 ml of Hanks* in 25 ml sterile universal container.
Fine Needle Aspirates	Prepare slides as directed by clinician or laboratory personnel Alcohol fixed and air dried preparations Maximum of 4 slides Rinse needle in Hanks medium	Rinse needle in Hanks* medium. Slides must be labelled in pencil with patient name and date of birth/ Hospital number. Please state on slides which are air dried (AD) and fixed Needle wash - send in 10 ml of Hanks in 25 ml sterile universal container.
Peritoneal Fluid		Send in 10 ml of Hanks* in 25-50 ml sterile universal container

Pleural Fluid		Send in 10 ml of Hanks* in 25-50 ml sterile universal container
Sputum	Early morning deep cough prior to breakfast & washing teeth.	Sputum pot
Urine	Freshly voided urine preferably mid-morning Avoid early morning urine as cells are too degenerate for microscopy	Sterile universal container (25ml)

*Hanks solution is available from the Cytology section upon request.

3.6.14 GYNAECOLOGICAL CYTOLOGY

This laboratory currently investigates over 85000 gynaecological cytology requests each year. The department aims to report 98% of cases within 12 days.

3.6.15 CLINICAL INFORMATION

Cervical specimens must have sufficient, relevant clinical information to ensure that the correct follow up for subsequent specimens is given. Relevant clinical information includes:

- Date of last specimen
- Whether the patient is pregnant/post natal
- Details of any hormones including contraceptive devices
- Any symptoms of abnormal bleeding
- Any previous abnormal specimens
- HPV status if known
- Any previous treatment

This will help in the interpretation of the cervical specimen and ensure that the correct follow up management is given.

3.6.16 GUIDANCE FOR PREPARING CERVICAL SPECIMENS

Smear takers must attended a smear taker course and complete a training log book. A smear taker PIN code must be obtained from the Public Health Programme Manager for Cancer Screening: Aziz Khalida

Each GP practice and hospital clinic is in possession of a resource pack and toolkit for guidance on smear taking. Once the specimen is taken using “Cervex-broom”, it must be thoroughly rinsed in the liquid within the vial. Ultimately the “Cervex-broom” will appear ‘bent and squashed. The vial must be labelled using a ballpoint pen with the patient’s name, date of birth and/or NHS number.

Occasionally a cervical brush may be used on patients with a stenosed os. This could be due to previous treatment or previous endocervical abnormality. Under these circumstances cell from the brush must be placed into the same vial as that as the cervical broom specimen. The bristles of the brush are rolled around the outside of the vial a few times to ensure that all material is removed.

A note must be made on the request form if a brush sample is also taken.

3.7 MORTUARY SERVICES

LOCATION - St. George's Hospital, Basement - Jenner Wing, Cellular Pathology

Access for clinicians, visitors and patient relatives for viewings is via the Perimeter Road entrance.

OPENING HOURS 08:00 – 16:00 Monday to Friday

The on-call mortuary technician can be contacted 'out of hours' on Pager SG240.

3.7.1 ADULT AND PERINATAL POST MORTEM SERVICE

Post Mortem Examinations

Written consent is required from the next of kin for a post mortem. This is undertaken in Bereavement Services (3411/2716/2819) in the case of adult post mortems but in relevant wards and departments for perinatal and paediatric cases. In cases of unexpected, peri-operative, drug or toxin related or traumatic death, or death of a patient with industrial disease the Coroner's officers should be consulted on 020 7641 5305. For further information and advice contact the Mortuary on ex 5240 (Monday to Friday) and ask to speak to the Consultant Pathologist on post mortems.

3.7.2 ADVICE ON DEATH CERTIFICATION AND CORONERS (Section 7)

Confirmation of Death, Medical Certification and Cremation Forms

Before the body is removed, it is the responsibility of the doctor concerned to examine a patient whose death is suspected, and to establish that death has taken place. A registered or pre-registered medical practitioner may issue a Medical Certificate of Cause of Death (MCCD) when he/she knows the cause of death, knows it to be natural, has attended the patient during 'their final illness', has attended the patient within fourteen days before death or viewed the body after death and has no reason to refer the case to the Coroner. Advice on death certification is also detailed in the front part of death certificate books and also within the Trust Guidance for Staff Relating to Patients Dying in Hospital on the intranet - http://stginet/Procedural%20Documents/Patient%20related/Patient_Management/Clin_1_3.pdf and on the Home Office Website. Also refer to - http://stginet/Procedural%20Documents/Patient%20related/Patient_Management/Death%20of%20an%20Adult%20Patient.pdf

In order to complete part B – new part 4 ('part 1') of the Cremation form the member of medical staff **must have seen the patient both before and after death**. The doctor completing part C – new part 5 ('part 2') is also required both to speak to the person completing part B and at least one other person with knowledge of the deceased. The new cremation forms and regulations are in place from January 2009 which require more clinical detail and a clinical summary in part B as well as the GMC registration number of those signing both parts B and Parts C of the forms. This will require access to the clinical notes which will be available in Bereavement Services.

Detailed advice is available on the Department of Justice website
http://www.justice.gov.uk/guidance/cremation.htm
GMC website http://www.gmc-uk.org (for checking registration and GMC number)

Referral to the Coroner

The following categories of deaths should *usually* be reported to the coroner:

- Sudden and unexpected deaths in adults and infants
- Deaths involving accidents, violence, neglect or poisoning including drugs

- Deaths during surgery or before the effects of anaesthesia have abated
- Cases associated with lack of care or neglect.
- Deaths which might have been caused by an industrial injury or disease
- Deaths in custody, including deaths in hospital of prisoners from whatever cause
- Deaths whilst under a Deprivation of Liberty Safeguard (DoLS) order
- Deaths during pregnancy or childbirth and deaths due to abortion
- Suicide
- Cases where the cause of death is not known
- Cases where the identity of the deceased is not known.
- Cases where, *for whatever reason*, a doctor cannot be found to complete a MCCD

NB: There is no national standard of a '24 hour rule', although it is local practice to refer such cases to HMC for Inner London West. It is advisable to contact Coroners' officers where death occurs shortly after admission to hospital even if the cause of death is known; the Wandsworth and Merton Coroners Officer's phone number is 020 7641 5305.

For advice on death and post mortems in general, contact the Mortuary on ex 5240 (Monday to Friday) and ask to speak to the Consultant Pathologist on post mortems.

For advice on cremation certificates, contact Bereavement Services on ex 3411/3410/2819

3.7.3 VIEWING OF DECEASED PATIENTS

Viewing of Deceased by Next of Kin

- The relatives of the deceased should be informed that appointments are necessary.
- To Arrange a Viewing within Working Hours contact the Mortuary on 5240 to arrange an appointment.

Out of Hours Viewing

- Out of hours viewing is only permitted under exceptional circumstances and must be done with reference to the Coroner's officers if the case has or will be referred to them.
- Out of hours viewings can only be arranged through the duty bed manager after discussion with the mortuary technician on call.

3.7.4 ORGAN AND TISSUE DONATION

Contact the In-House Trust Organ and Tissue Donation Co-ordinator via the Trust switchboard. Consent forms are required for both organ and tissue donation.

4 CLINICAL BLOOD SCIENCES:

CHEMICAL PATHOLOGY CHEMICAL PATHOLOGY, HAEMATOLOGY AND BLOOD TRANSFUSION FORM THE CLINICAL BLOOD SCIENCES DEPARTMENT

LOCATION - St. George's Hospital, Jenner Wing, Level 0

4.1 CONSULTANTS AND SENIOR STAFF

Dr F. G. Boa	Clinical Lead & Consultant Clinical Scientist	2941
Dr P. O. Collinson	Consultant Chemical Pathologist	5934
Mr Sean Lynch	Laboratory Manager	5474
Mr Tony Baily	Automation Manager	5598
Mr David Greenwood	Quality Manager	3797
Mrs Fatima Fernandes	Secretary	5923

4.2 LABORATORY WORKING HOURS

MON	TUE	WED	THU	FRI	SAT	SUN	BH
←		0800 – 2000		→	0900-1300	0900-1300	0900-1300

Note that all results are posted on the EPR as soon as analysis is complete. Results are best viewed via the EPR rather than phoning the laboratory.

4.3 ENQUIRIES - WORKING HOURS

Results	5468
Duty Biochemist	Bleep 6032

4.4 ENQUIRIES - OUT OF HOURS

Consultant on call – via Hospital Switchboard	1000 Aircall SG138
On-call Biomedical Scientist	Bleep 6032

4.5 LABORATORY SERVICES

The laboratory offers a **wide range of individual tests,** most of which are performed on site, with the results available on the same day. Some analyses are carried out less frequently, e.g. weekly, as indicated in the tables in Section 4.23. Information on the specimen requirement, reference range, turnaround time and any special precautions for each test, is listed in this table. Please refer to the specimen type, in the next section, for volume requirements.

More **specialised investigations** may be referred to laboratories elsewhere in the UK (see * in tables in Section 4.23). These are more costly and may have particular sample requirements and longer turnaround times. Contacting the Duty Biochemist is advisable to discuss any special specimen collection or patient preparation procedures. Other tests not listed may be available but prior discussion with the Duty Biochemist is essential before a specimen is sent to the laboratory. The details of the referral laboratory will be printed on the

report, along with the appropriate reference range and any interpretive comments. Please contact the laboratory for information about referral tests and laboratories.

4.5.1 URGENT REQUESTS (CLINICAL EMERGENCY ONLY)

Samples requiring urgent analysis require a prior telephone call to the laboratory on 2651. Samples from Accident & Emergency are automatically treated as urgent.

Tests marked in **bold** in the tables in Section 4.23 are analysed on the main laboratory instruments and are normally available outside normal working hours.

Other tests are available outside normal laboratory working hours in special circumstances after discussion with the Duty Consultant on-call.

4.5.2 RESPONSE TIMES FOR URGENT REQUESTS

The time between arrival in the laboratory and the reporting time of results for urgent electrolytes, urea, and glucose, should normally be within 60 minutes.

Unexpected results outside critical limits will be telephoned as soon as they are available to the ward or contact number as indicated on the request form. It is a matter of patient safety that the contact details and location of the patient are current and correct to enable critical results to be communicated quickly and easily.

4.5.3 ADDITIONAL REQUESTS

The general policy is that an addition of a test to a sample already analysed in the laboratory is the exception rather than the rule. This is because the sample may be unsuitable, insufficient, too old or unavailable for the 'add-on' test. Requests for add-on tests are usually discussed with the Duty Biochemist and will be performed at their discretion, considering the necessity of the test to patient care. The add-on test will be performed when the sample is located and therefore no turnaround time can be specified. Add-on tests cannot be treated as urgent and if a fast turnaround is required, then a new specimen should be sent.
Tests may be added to outpatient, primary care, and paediatric samples if a suitable sample is available (samples are stored for at least 3 days). Time critical tests may be added to inpatient and A&E samples and these should be requested on the same day, and preferably within 4 hours of the sample being taken. For all add-on requests, please contact the Duty Biochemist (bp 6032) with the patient details and the laboratory number of the sample that the test is to be added on to.

4.5.4 REPEAT REQUESTS

Due to increasing numbers of inappropriate repeat requests for Chemical Pathology tests, the laboratory has implemented automatic blocking of repeat testing for the following tests on inpatients and outpatients:

Thyroid function tests: No repeat within 4 weeks
Vitamin B12 and folate: No repeat within 4 weeks
BNP: No repeat within 24 hours
Lipid profile: No repeat within 7 days
CRP: No repeat within 18 hours
Liver function tests: No repeat within 18 hours
25OH Vitamin D: No repeat within 4 weeks

A comment will be put on report to alert the clinician that the repeat request will not be processed. Please contact the Duty Biochemist if you wish to discuss the repeat request.

4.5.5 BLOOD SPECIMENS

Serum should be sent as indicated in Table 1, unless otherwise indicated, e.g. unstable tests or those requiring whole blood**.**

For details of type of samples and special procedures for certain tests, see the tables in Section 4.23.

For adults, one correctly filled serum gel tube will be sufficient* for electrolytes, liver function, bone, CRP, lipids, haematinics, thyroid function, and troponin I.
For paediatric patients, a 1mL filled serum tube will be sufficient* for electrolytes, liver function, bone, and CRP.
* = depending on haematocrit.

Table 1. Types of containers and volumes of blood samples

Biochemistry vacutainer tubes			
Label/Cap	Tube	Volume (mL)	Sample
Rust	Gel	5	Clotted Blood Serum SST
Red	Plain	5	Clotted Blood Serum
Green	Lithium heparin	5	Plasma (Lithium heparin)
Grey	Fluoride oxalate	5	Plasma (Fluoride)
Lavender	EDTA	6	Plasma (EDTA)
Royal Blue	Plain	5	Clotted Blood Serum
Paediatric bottles			
Label/Cap	Tube	Volume (mL)	Sample
Gold	Gel	1	Clotted Blood Serum SST Paed
Red	Plain	1	Clotted Blood Serum Paediatric
Green	Lithium heparin	1	Plasma (Lithium heparin paed)
Lavender	EDTA	1	Plasma/whole blood Paediatric
Grey	Fluoride oxalate	1	Plasma (Fluoride paediatric)

When uncertain, please contact the Duty Biochemist on bleep 6032 for advice.

4.5.6 URINE SPECIMENS

For qualitative analyses, a fresh random urine sample in a yellow urine monovette (10 mL) or a plain silver-top container (10 – 25 mL) is required. **Please note that urine collected into a boric acid container (red-top) is unsuitable for biochemistry analyses.**

For quantitative analyses, a timed (24 hour) urine collection is required. The exception is albumin/creatinine ratios, which require a random or early morning urine (preferred).
The 24hour urine collection container and patient instructions for performing a timed urine collection can be obtained from Pathology Central Reception (ext. 5468). A patient instruction leaflet on the dietary restrictions for Urinary 5HIAA collection can also be obtained from Pathology Central Reception.

Please record legibly on both the urine container and the request form the TIME and DATE of both the START and FINISH of the collection, and the patient's full NAME, WARD and Hospital Number. Forms and urine samples that omit the above information may not be analysed.

4.5.7 CREATININE CLEARANCE

For estimation of creatinine clearance, please ensure a blood sample is taken during the 24 hour urine collection period.

Urine samples should be taken to the laboratory as soon as possible after collection is completed.

4.5.8 FAECES

Small faecal samples ('walnut' sized is approximately 10g) should be sent in blue plastic screw-top container. After placing the sample in the container with the small plastic spoon, clean the outside if necessary and place the container in a plastic bag. Please ensure that these samples are properly labelled and are transported to the laboratory as soon as possible. Time and date of collection **MUST** be indicated on all specimens to avoid rejection.

4.5.9 FLUIDS

Cerebrospinal fluid (CSF), preferably a clean tap, blood free sample, should be collected into a plain silver top or white sterile container. CSF must be collected into a grey fluoride oxalate tube for labile tests such as CSF glucose and lactate measurement. A minimum volume of 0.5mL CSF (between 10-15 drops) is required for most investigations.
CSF samples for bilirubin analysis (xanthochromia) in suspected subarachnoid haemorrhage must ideally be the last fraction taken, protected from light (e.g. foil wrapped around the container) and NOT transported by pneumatic tube system to the laboratory. An information sheet on collection of CSF samples for xanthochromia is available from Pathology Central Reception (ext. 5468).

Other fluids (e.g. pleural fluid, amniotic fluid) should be collected into a monovette or silver top container that is clearly marked with the fluid type. A volume of 5mL is sufficient for analysis. Please contact the Duty Biochemist for further advice on the specimen requirements and arrangements for the biochemical investigation of fluids.

4.5.10 LABILE TESTS

Specimens for labile tests require prompt handling and storage, and must be transported to the laboratory as soon as possible. Please refer to table 4.23 – labile tests are indicated in bold in the "Comments" column.

If you are not sure of the stability and collection requirements of the analyte you wish to measure, please contact the Duty Biochemist on bleep 6032 for further information. **For any labile test you should always contact the laboratory ahead of sample collection to enable prompt handling and storage of the specimen(s).**

Please note that in some cases you may need to bring the specimen to the laboratory yourself as the phlebotomy service, the pneumatic tube system or the portering services may not be available. **Any special collecting procedures are given in the specimen requirement tables in Section 4.23. Please contact the laboratory (ext 5468) if ice is required for transport.**

4.5.11 TOXICOLOGY SCREENING

For suspected drug overdose, screening tests for a number of drugs may be appropriate. Urine (8 mL) in a monovette, should be sent when the agent responsible for poisoning is uncertain or unknown. Serum is not accepted for screening purposes, but may be necessary for the assay of specific poisons. Where this is so, please discuss with the Duty Biochemist.

4.6 GUIDELINES TO THERAPEUTIC DRUG MONITORING

These guidelines should optimise the effectiveness of monitoring serum drug concentrations and reduce the risk of toxicity.

4.6.1 INDICATIONS FOR SERUM DRUG LEVEL MEASUREMENT

1. Maintenance of therapy (steady state).
2. Inadequate clinical response.
3. Compliance monitoring.
4. Suspected toxicity.
5. Combination therapy (when another drug alters the relationship between dose and serum concentration).
6. Following dose change (in general dosage changes should be based on clinical assessment. Drug level measurement is not required each time).
7. Developing hepatic or renal disease.

4.6.2 MONITORING THERAPY

Serum drug levels usually reach a steady state a few days after starting a regular oral dosage or making a dosage adjustment.

	Adults (oral dosage) Time to steady state days	**Usual dosage per day at steady state (mg)**
Carbamazepine	4 - 5*	400 - 1200
Digoxin	7**	0.125 - 0.5
Lithium	3 - 7	900 - 1500
Phenobarbitone	10 - 25	90 - 180
Phenytoin	7 - 35	300 - 400
Theophylline	2	100 - 400
Sodium Valproate	2 - 6	600 - 2000

*****Start of therapy 2-4 weeks ****Longer in renal disease**

4.6.3 SAMPLE COLLECTION PROCEDURE FOR THERAPEUTIC DRUGS

Record on Request Form:

1. Sample collection time and date
2. Time and date of last dose
3. Current dosage
4. Concurrent medication and relevant medical information

Time of sample in relation to dose is important.
The trough level, collected immediately before the next dose (at steady state), is most reproducible but the peak level may also be useful in some circumstances.

If Sodium Valproate is to be measured, the sample should be taken at a standard time, preferably before the morning dose (Note: the value of valproate monitoring is controversial and is rarely helpful, except when compliance is in doubt). Toxic effects show no clear relationship to serum concentration.

Pre-dose (trough)	Carbamazepine, Valproate (morning), Phenytoin (if given as one large dose), Theophylline (peak also useful)
6 hours post-dose	Digoxin

12 hours post-dose	Lithium

4.6.4 USUAL THERAPEUTIC (TARGET) RANGES

Therapeutic ranges are only a guide. Some patients may be well controlled with serum concentrations below or above the therapeutic ranges given below. Factors affecting serum concentrations should also be taken into account.

	Adults	Neonates
Carbamazepine	4 - 12 mg/L (single therapy) 4 - 8 mg/L (multiple therapy)	-
Digoxin	0.5 - 2.0 ug/L	Up to 3.0 ug/L
Lithium	0.4 - 1.0 mmol/L	-
Phenobarbitone	10 - 40 mg/L	13 - 30 mg/L
Phenytoin	5 - 20 mg/L	6 - 14 mg/L
Theophylline	10 - 20 mg/L	5-11 mg/L
Sodium Valproate	50 - 100 mg/L*	-

*No definitive data to support a therapeutic range.

4.6.5 EFFECT OF AGE IN THERAPEUTIC DRUG MONITORING

Factor	Effect
Reduced drug metabolism	Serum phenobarbitone, theophylline increased in the elderly
Decreased albumin	Serum phenytoin decreased in the elderly
Decreased GFR	Reduced dosage for digoxin, lithium required in neonates and the elderly
Hypokalaemia (e.g. diuretics)	Digoxin toxicity more likely
Variation in half life: e.g. neonates infants 1 month children 1-15 years adults	Phenytoin t ½: 30-60 hours 2-7 hours 2-29 hours 20-30 hours

4.6.6 IMMUNOSUPPRESSANT DRUG MONITORING

Tacrolimus and ciclosporin level monitoring is performed in Clinical Blood Sciences. The ciclosporin service is offered on Mondays, Wednesdays and Fridays only and the tacrolimus service is offered Monday – Friday. Samples arriving before 12:00 h are analysed the same day and results are available after 16:00 h. Weekend tacrolimus or ciclosporin analysis is only by prior arrangement made with the consultant or the Duty Biochemist by 13:30 h Friday.

An EDTA whole blood sample (6 mL) is required for tacrolimus and/or ciclosporin monitoring. The recommended sampling time is the trough level immediately before the next dose (at steady state). The request form should include details of sample collection time and date, time and date of last dose, and current dosage.

Samples **must not** be taken from lines that have been used to administer drugs or close to an infusion site.

4.6.7 ANTIBIOTIC LEVELS

Certain antibiotic levels (gentamicin, vancomycin, amikacin) are performed in Blood Sciences and clinical advice on specific patients is given by Medical Microbiology (ext. 5686). Guidelines on the use of antibiotics can be found in the *Grey Book* (Guidelines for the management of common medical emergencies and for the use of antimicrobial drugs; http://stginet/greybook).

Full details on once daily gentamicin dosing are given in the Grey Book and on a special information sheet available from Pharmacy on ext. 1759. Please also refer to the essential information given by Microbiology (Section 6.12.6 in this handbook).

4.6.8 DYNAMIC FUNCTION TESTS/SPECIALIST TESTS

Dynamic function tests may be arranged by contacting the Sister in the Endocrine Investigation Unit (EIU), on ext 0923. Specialist investigation of endocrine disorders should be discussed with the consultant Endocrinologists: Professor Nussey (aircall SG127), Dr Bano or Dr Seal.

Sweat tests are arranged by contacting the Children's Respiratory Nurse Specialist Helen Jones on ext 2272 or by aircall SGC 102.

4.7 ESTIMATED GFR

The estimated glomerular filtration rate (eGFR) is calculated in adults (>18 years).
For guidance on the interpretation of eGFR, see www.emrn.org.uk.

4.8 TEST PROFILES AVAILABLE FOR REQUESTING

Profile	Other names	Consists of	Sample requirements
Renal profile (Blood)	Electrolytes, U and E's	Sodium, potassium, Bicarbonate, Chloride, Urea, Creatinine	Blood, Rust
Lipid profile		Cholesterol, Triglycerides, HDL, calculated LDL, total cholesterol/HDL ratio	Blood, Rust
Liver Profile	LFTs	Bilirubin, ALT, Alkaline phosphatase, gGT, albumin	Blood, Rust
Bone Profile		Alkaline phosphatase, Calcium, Phosphate	Blood, Rust
Electrolytes (Urine)		Sodium, Potassium	Urine, Monovette

4.9 CHEMICAL PATHOLOGY SPECIMEN REQUIREMENTS, REFERENCE AND THERAPEUTIC DRUG RANGES

* = Test performed at a referral laboratory **Bold** = test usually available out of routine hours

Test	Specimen and tube *(colour)*	Reference and therapeutic ranges *(units)* Adults	Comments *(reporting frequency)*
ACTH*	EDTA Lavender	See report for interpretation	By arrangement. **Labile, to lab within 10 mins** 2 – 3 weeks
Acylcarnitine profile*	Blood spot (min 2 spots) Guthrie card	See report for interpretation	3-4 weeks
Adenosine deaminase CSF*	CSF Plain	0 – 6 IU/L	2 weeks
Adenosine deaminase*	Pleural Fluid Plain	0 – 45 IU/L	2 weeks
Alanine aminotransferase (ALT)	Serum Rust	<52 U/L Male <40 U/L Female	Daily Daily
Albumin	Blood Rust	35 – 50 g/L	Daily
Albumin (urine) Albumin / creatinine ratio	Early morning urine	 < 3.0 mg/mmol Creat.	Daily
Alcohol	Blood Rust	See report for interpretation	Daily

Test	Specimen and tube *(colour)*		Reference and therapeutic ranges *(units)* Adults	Comments *(reporting frequency)*
Aldosterone*	Blood	reen	See report for interpretation	Overnight recumbency recommended 4 weeks
Alkaline phosphatase	Blood	Rust	30 - 130 U/L	Daily
Alkaline phosphatase isoenzymes	Blood	Rust	See report	2 weeks
Alpha fetoprotein	Blood	Rust	< 10 KU/L	Daily
Aluminium*	Blood No gel	Royal blue	< 0.37μmol/L	2 – 3 weeks
Amikacin	Blood	Rust	See report for interpretation	Daily
Amino acids*	Blood	Green	See report for interpretation	2 weeks
Amino acids (CSF)*	CSF	Plain	See report for interpretation	Matched Blood required. 2 weeks
Amino acids (urine)*	Random urine		See report for interpretation	2 – 3 weeks
Ammonia	Blood	Green	Sick or premature <150μmol/L Neonate <100μmol/L Infant – 16y <50μmol/L	**Labile. Transport on ice to lab.** Haemolysis invalidates assay. Urgent / Daily
Amylase	Blood	Rust	20 – 104 U/L	Urgent / Daily
Amylase isoenzymes*	Blood	Red	See report for interpretation	2 – 3 weeks
Androstenedione*	Blood	Red	See report for interpretation	2 – 3 weeks
Angiotensin converting enzyme	Blood	Rust	22 – 85 U/L	Falsely low values found in patients on ACEI. Daily
Angiotensin converting enzyme (CSF)*	CSF (min vol 1mL)	Plain	0 – 1.2 IU/L	2 – 3 weeks
Apolipoprotein A1	Blood	Rust	0.94 – 1.78 g/L Male 0.94 – 1.98 g/L Female	Weekly
Apolipoprotein B	Blood	Rust	0.52 – 1.09 g/L Male 0.49 – 1.03 g/L Female	Weekly
Apolipoprotein E (genotyping)	Blood	Lavender	See report for interpretation	Monthly
Beta HCG				See hCG
Beta hydroxybutyrate*	Blood	Green	See report for interpretation	Need paired glucose sample.
Bicarbonate	Blood	Rust	22 – 29 mmol/L	Urgent / daily
Bile Acids	Blood	Rust	<14 μmol/L	Daily.
Bilirubin (conjugated)	Blood	Rust	< 9 μmol/L	Urgent / daily
Bilirubin (CSF) (CSF Xanthochromia)	CSF (min vol 0.5mL, 10 drops)	Plain Protect from light	Not detected	Available Monday – Friday during 0800 – 1900 h. Saturday and Sunday 0900 – 1200 h. **Do not send by pneumatic tube system**
Bilirubin (total)	Blood	Rust	< 21 μmol/L	Urgent / daily
Bilirubin (urine)	Random urine	Protect from light	Not detected	Fresh urine Daily
Biotinidase*	Blood	Green	See report for interpretation	2 weeks
BNP (NT proBNP)	Blood	Rust	See report for interpretation	Daily
CA125	Blood	Rust	< 35 KU/L	Daily
CA15-3	Blood	Rust	< 30 KU/L	Daily
CA19-9	Blood	Rust	< 37 KU/L	Daily
Caeruloplasmin	Blood	Rust	0.2 – 0.6 g/L	Daily
Caffeine*	Blood	Red	25 – 77 μmol/L 25 – 100 μmol/L < 3 months	Weekly
Calcitonin*	Blood	Red	See report for interpretation	By arrangement. **Labile. Collect on ice and transport to lab on ice.** 2 – 3 weeks
Calcium	Blood	Rust	2.20 – 2.60 mmol/L	Urgent / daily
Adjusted Calcium (calculated)	Blood	Rust	See report	Total calcium adjusted to an albumin of 40g/L
Calcium urine (total)	24h Urine	Plain	2.5 – 7.5 mmol/24h	Urgent/daily
Calprotectin	Faeces	Blue top	See report for details	10 days

Test	Specimen and tube *(colour)*		Reference and therapeutic ranges *(units)* Adults	Comments *(reporting frequency)*
Carbamazepine	Blood	Rust	4 – 12 mg/L Single therapy. 4 – 8 mg/L Multiple AED therapy	Sample should be pre-dose, include dosage details on request form. Daily
Carcinoembryonic antigen (CEA)	Blood	Rust	< 0 - 5 μg/L	Daily
Carnitines*	Blood	Green	See report for interpretation	1 – 2 weeks
Catecholamines* Noradrenaline (NA) Adrenaline (ADR)	Blood	Green	See report for interpretation	By arrangement. 2 weeks
Catecholamines (urine) No longer routinely available, see urine Metadrenalines				
Chloride	Blood	Rust	95 - 108 mmol/L	Urgent / daily
Chloride (sweat)	Special		<60 mmol/L	By arrangement. Contact CF nurse to arrange sweat test.
Cholesterol	Blood	Rust	*Desirable:* < 5.2 mmol/L	Daily
Cholinesterase (For Phenotyping)* Dibucaine number Fluoride number Ro 02-0683 number Phenotype	Blood	Red	See report for interpretation	By arrangement. Test for investigation of prolonged apnoea post anaesthesia or family studies 2 – 3 weeks
Chromium* and cobalt* (Hip replacements)	Blood	Lavender	See report for interpretation	3 weeks
Citrate (urine)*	24h Urine	Plain	See report for interpretation	2 weeks
Clobazam*	Blood	Red	See report for interpretation	2 – 3 weeks
Copper*	Blood	Royal blue	11 - 20 μmol/L	2 weeks
Copper (tissue)*	Liver biopsy on moistened filter paper		<50 μg/g dry weight Normal See report for interpretation	Biopsy specimen to weigh at least 5mg and ideally 15 mg. This corresponds to a tissue core 1-3 cm in length. 2 -3 weeks
Copper (urine)*	24h Urine	Plain	< 1 μmol/24h	By arrangement 2 – 3 weeks
Cortisol	Blood	Rust	150 - 650 nmol/L 0900h 30 – 250 nmol/L Midnight	Daily
Cortisol (urine)*	24h Urine	Plain	60 – 260 nmol/24h	By arrangement 2 weeks
C-peptide*	Blood	Red	See report for interpretation	**Labile. Transport to lab on ice.** Patient must be hypoglycaemic (glucose <2.5 mmol/L). 2 – 3 weeks
C-reactive protein	Blood	Rust	< 10 mg/L	Urgent / daily
Creatine kinase (CK)	Blood	Rust	40 – 320 U/L Male 25 – 200 U/L Female Values up to 2.5 – 3x ULN found in Afro-Caribbeans	Urgent / daily
Creatinine	Blood	Rust	60 - 110 μmol/L	Urgent / daily
Creatinine (urine)	24h Urine	Plain	10 – 18 mmol/24h Male 8 – 16 mmol/24h Female	Daily
Creatinine clearance	24 h urine + Blood	Plain urine Rust	80 – 140 mL/min	Blood collected within one day of urine collection. Daily
Ciclosporin	Blood	Lavender	No reference range provided.	Every Mon, Wed & Fri. Weekends only by prior arrangement with consultant
Cystine urine (quantitative)*	24h Urine	Plain	See report for interpretation	2 weeks
Dehydroepiandrosterone sulphate (DHEAS)*	Blood	Red	See report for interpretation	2 weeks
11-deoxycortisol*	Blood	Red	See report for interpretation	2 – 3 weeks
Digoxin	Blood	Red	0.5 – 2.0 μg/L therapeutic range	Sample should be 6 hours post dose. Include dosage details on request form. Daily
Dihydrotestosterone*	Blood	Red	See report for interpretation	3 - 4 weeks
Drug screen (toxicology/overdose)*	Random Urine	Monovette	See report for interpretation	Blood needed only for quantitative results 1 – 2 weeks

Test	Specimen and tube *(colour)*		Reference and therapeutic ranges *(units)* Adults	Comments *(reporting frequency)*
Drugs of abuse screen (urine)*	Random Urine	Monovette	Negative	Qualitative results Daily
Erythropoietin*	Blood	Red	See report for interpretation	Include haemoglobin to aid interpretation of result 2 – 3 weeks
Fat globule screen	Faeces	Plain	Normal	Weekly
Ferritin	Blood	Rust	15 – 250 μg/L Male 10 – 150 μg/L Female	Daily
Follicle stimulating hormone (FSH)	Blood	Rust	1 – 10 IU/L Male Female Ranges 1 – 10 IU/L Follicular 2 – 9 IU/L Luteal 5 – 27 IU/L Mid-cycle peak > 30 IU/L Post-menopausal	Daily
Folate	Blood	Rust	5.0 - 10 μg/L	Daily
Free fatty acids*	Blood	Green	See report for interpretation.	By arrangement. **Contact lab for specimen collection details** 2 – 3 weeks
Free T3	Blood	Rust	2.7 – 6.5 pmol/L	Daily
Free T4	Blood	Rust	10 – 23 pmol/L	Daily
Fructosamine*	Blood	Red	See report for interpretation	By arrangement 2 – 3 weeks
Galactose-1-phosphate uridyl transferase*	Blood	Green	20.2 – 46.4 μmol/h/gHb	Patient should not have been transfused red cells within the last 6 weeks. 2 – 3 weeks
Gamma glutamyltransferase (γGT)	Blood	Rust	< 64 U/L Males < 38 U/L Females	Daily
Gastrin* (see gut hormones)	Blood	Lavender		
Gentamicin	Blood	Rust	See report for interpretation	Daily
Glucose	Blood	Grey	3 – 6 mmol/L fasting	Urgent / Daily
Glucose (CSF)	CSF	Grey	Relates to Blood glucose (normal = 2/3 value)	Urgent/Daily
Glycosaminoglycans (urine)	Random Urine	Monovette	See report for interpretation	1 – 3 weeks
Growth Hormone	Blood	Rust	Requested as part of dynamic function test. See report for interpretation.	Daily
Gut Hormones* Vasoactive intestinal polypeptide (VIP) Pancreatic polypeptide (PP) Gastrin Glucagon Somatastain Chromogranin A Chromogranin B CART	Blood	Lavender	See report for interpretation	**Labile.** Transport to lab on ice immediately. Please state medication on form. Patient should be fasting 2 – 3 weeks
Haemoglobin A_{1c} (HbA_{1c})	Blood	Lavender	26 - 48mmol/mol	Daily (Mon-Fri)
HDL Cholesterol	Blood	Rust	0.9 – 1.9 mmol/L Male 1.1 – 2.6 mmol/L Female	Daily
Homocysteine	Blood Fasting	Lavender	5 – 15μmol/L	**Labile.** Daily
Homovanillic acid (HVA)*	Random Urine	Monovette	See report for interpretation	By arrangement 1 -2 weeks
Human chorionic gonadotrophin (Total)	Blood	Rust	< 4 IU/L	Daily / urgent
5-Hydroxyindoleacetic acid 5HIAA* (urine)	24h Urine	Plain	9 – 47 μmol/24h	By arrangement. **Contact lab for dietary restrictions**. 1 – 2 weeks
17-Hydroxyprogesterone*	Blood	Red	See report for interpretation	2 weeks
IGF binding protein 3*	Blood	Red	Varies with age, See report for interpretation	2 – 3 weeks

Test	Specimen and tube *(colour)*		Reference and therapeutic ranges *(units)* Adults		Comments *(reporting frequency)*
Insulin-like growth factor IGF-I	Blood	Rust	Varies with age, see report for interpretation		Weekly
IGF-II * IGF-II/IGF-I ratio*	Blood	Red	See report for interpretation		By arrangement. 2 – 3 weeks
Insulin	Blood	Rust	See report for interpretation		Daily
Iron	Blood	Rust			Not routinely available. See ferritin
Iron-binding capacity % Iron saturation	Blood	Rust	45 – 80 μmol/L 20 – 50 %		Daily
Ketones (urine) qualitative	Random urine	Plain	Not detected		Daily
Lactate	Blood CSF	Grey Grey	0.9 – 1.8 mmol/L		Urgent / Daily
Lactate dehydrogenase	Blood	Rust	<175 U/L		Daily
Lamotrigine*	Blood	Red	See report for interpretation		2 – 3 weeks
LDL (calculated)	Blood	Rust	< 3.5 mmol/L ***desirable***		Values calculated from total cholesterol and HDL cholesterol and triglyceride Daily
Lead*	Blood	Lavender	< 1.4 μmol/L Industrial < 0.5 μmol/L Environmental		1 – 2 weeks
Levetiracetam*	Blood	Red	See report for interpretation		2 – 3 weeks
Lipase	Blood	Rust	20 – 50 U/L		Daily
Lipoprotein (a)	Blood	Rust	>300 mg/L associated with increased risk of IHD		Weekly
Lithium	Blood	Rust	0.4 – 1.0 mmol/L (therapeutic range)		Sample should be 12 hours post dose Urgent/Daily
Luteinising hormone (LH)	Blood	Rust	1 – 9 IU/L	Male	Daily
			Female 2 – 9 IU/L 1 – 13 IU/L 14–90 IU/L >15 IU/L	Ranges Follicular Luteal Mid-cycle peak Post-menopausal	
Lysosomal Enzymes* (see White Cell Enzymes)	Blood	Green	See report for interpretation		By arrangement. Please do not take sample on Fridays. 6 – 8 weeks
Magnesium	Blood	Rust	0.7 – 1.0 mmol/L		Daily
Manganese*	Blood **MUST USE PLASTIC CANNULA**	Lavender	See report for interpretation		By arrangement. 3 - 4 weeks
Metadrenalines (Urine)	24h Urine	Plain	See report for interpretation		2 weeks
Methaemalbumin	Blood	Rust	Not detected		Daily
Methaemoglobin	Blood	Rust	Not detected		Daily
Methotrexate*	Blood	Red	See report for interpretation		1 week. Urgent by arrangement
Mucopolysaccharide (see Glycosaminoglycans)	Random Urine				
Microalbumin	Early morning urine		See report for interpretation		See albumin (urine)
Neurotransmitters (CSF)	CSF	Special tubes	See report for interpretation		By arrangement. **Contact lab to arrange collection**
Oestradiol	Blood	Rust	130 – 500 pmol/L 110– 620 pmol/L < 90 pmol/L	Follicular Luteal Post-menopausal	Daily
Oligosaccharides (urine)*	Random Urine	Plain	See report for interpretation		By arrangement 2 – 3 weeks
Opiate screen (urine)	Random Urine	Plain	Negative		Daily

Test	Specimen and tube *(colour)*		Reference and therapeutic ranges *(units)* Adults	Comments *(reporting frequency)*
Organic acids(urine)*	Random Urine	Plain	See report for interpretation	2 – 3 weeks
Orotic acid (urine)*	Random Urine	Plain	See report for interpretation	By arrangement 2 – 3 weeks
Osmolality	Blood	Rust	275 – 295 mmol/kg	Urgent / Daily
Osmolality (urine)	Random urine	Plain	100 – 1400 mmol/kg	Urgent / Daily
Oxalate (urine)	24h Urine	Plain	0.14 – 0.46 mmol/24h	Send 24 hour collection to laboratory promptly. 2 – 3 weeks
Oxcarbazepine*	Blood	Red	See report for interpretation	2 – 3 weeks
Paracetamol	Blood	Rust	Not detected	Urgent / daily Refer to 'Grey book' for treatment guidelines
Parathyroid hormone (PTH)	Blood	Lavender	1.1 – 6.9 pmol/L	**Labile** Daily
PTH-related protein*	Blood	Special tube – contact Duty Biochemist	See report for interpretation	**By arrangement. Labile.** Transport to lab on ice immediately. **Contact Duty Biochemist before collection.**
Phenobarbitone	Blood	Rust	10 – 40 mg/L therapeutic range	Daily
Phenytoin	Blood	Red	5 – 20 mg/L	Daily
Phosphate	Blood	Rust	0.8 – 1.5 mmol/L	Daily
Porphobilinogen (quantitative)*	Random Urine	Protect from light	Not detected	Ideally collect sample during episode. Contact Duty Biochemist if required urgently. 2 weeks
Porphyrins (faecal)*	Faeces (Liquid stool unsuitable)	Protect from light	Not detected	4 weeks
Porphyrins and PBG screen (urine)(qualitative)	Random Urine	Protect from light	Not detected	Very dilute samples are unsuitable. Weekly
Porphyrins (whole blood)*	Blood	Lavender Protect from light	Not detected	4 weeks
Potassium	Blood	Rust	3.5 – 5.3 mmol/L	Urgent / Daily
Potassium (urine)	Random or 24h Urine	Monovette or Black bottle	25 – 125 mmol/24h	Urgent / Daily
Progesterone	Blood	Rust	< 3 nmol/L Follicular phase 10 – 80 nmol/L Luteal phase	Daily
Proinsulin*	Blood	Red	See report for interpretation	By arrangement. **Labile Transport to lab on ice.** Patient must be hypoglycaemic (glucose <2.5 mmol/L). 1 – 2 weeks
Prolactin	Blood	Rust	102 - 496 mU/L Female 86 – 324 mU/L Male	Daily
Prostate Specific Antigen	Blood	Rust	< 4.0 μg/L	Daily
Protein (CSF)	CSF	Plain	0.1 – 0.4 g/L	Urgent / Daily
Protein (urine)	24h Urine	Plain	< 0.1 g/24h	Daily
Pyruvate*(blood)	Whole Blood	Special tube	See report for interpretation	By arrangement**. Contact duty Biochemist to arrange collection** 2 – 3 weeks
Pyruvate (CSF)*	CSF	Special tube	See report for interpretation	By arrangement**. Contact duty Biochemist to arrange collection** 2 – 3 weeks
Reducing substances (faecal)	Faeces		Not detected	**Labile** Daily

Test	Specimen and tube *(colour)*		Reference and therapeutic ranges *(units)* Adults	Comments *(reporting frequency)*
Reducing substances (urine)	Random Urine		Not detected	**Labile** Daily
Renin*	Blood	Green	See report for interpretation	By arrangement. 4 weeks
Salicylate	Blood	Rust	Not detected	Urgent/daily
Selenium*	Blood	Royal Blue	0.9 – 1.65 μmol/L	1 – 2 weeks
Sex hormone binding globulin (SHBG)	Blood	Rust	15 – 70 nmol/L Male 20 -110 nmol/L Female	Daily
Sodium	Blood	Rust	133 - 146 mmol/L	Urgent / daily
Sodium (urine)	24h Urine	Plain	40 – 220 mmol/24h (varies with dietary sodium)	Urgent / daily
Steroid profile (urine)*	24h Urine	Plain	See report for interpretation	2 – 3 weeks
Sulphaemoglobin	Blood	Green	Not detected	1 week
Tacrolimus	Blood	Lavender	No reference range provided	Daily (Mon-Fri), weekends by prior arrangement with consultant
Testosterone	Blood	Rust	9–24 nmol/L Male 0.4–2.7 nmol/L Female < 1.1 nmol/L Pre-pubertal	Daily
Testosterone/SHBG ratio	Blood	Rust	20 – 100 Male < 4 Female	Daily
Theophylline	Blood	Rust	10 – 20 mg/L therapeutic range	Urgent / Daily Pre-dose but peak also useful. Record dosage details on request form.
Thioguanine nucleotides*	Blood	Lavender	See report for interpretation	2 – 3 weeks
Thiopurine methyltransferase*	Blood	Lavender	See report for interpretation	2 – 3 weeks
Thyroglobulin*	Blood	Rust	< 25μg/L	3 – 4 weeks
Thyroxine (T4) Triiodothyronine (T3)				See FT4 See FT3
Thyroid stimulating hormone (TSH)	Blood	Rust	0.4 – 5.0 mU/L	Daily
Topiramate*	Blood	Red	See report	2 – 3 weeks
Total protein	Blood	Rust	60 – 80 g/L	Daily
Toxicology screen*	Random Urine	Monovette		See Drug Screen
Triglyceride	Blood	Rust	0.8 – 2.0 mmol/L	Daily
Troponin I	Blood	Rust	<50 ng/L	Urgent / Daily
Urate	Blood	Rust	200 - 430 μmol/L Male 140 - 360 μmol/L Female	Daily
Urate (urine)	24h Urine	Black bottle	1.5 – 4.5 mmol/24h	Daily
Urea	Blood	Rust	2.5 – 7.8 mmol/L	Urgent / Daily
Urea (urine)	Random or 24h Urine	Monovette or black bottle	250 – 500 mmol/L	Urgent / Daily
Valproate (sodium)	Blood	Rust		Daily For compliance only, no definitive data to support a therapeutic range. Sample should be taken pre-dose (morning).
Vancomycin	Blood	Rust		Daily
Vanillylmandelic acid (VMA) HMMA*	Random or 24h Urine	Monovette or black bottle	< 35 μmol/24h	2 weeks
Very long chain fatty acids*	Blood	Red	See report for interpretation	3 – 4 weeks
Vitamin A*	Blood	Red	See report for interpretation	2 weeks
Vitamin B1* (Thiamine), Vitamin B6* and Vitamin B2*	Blood	Lavender	See report for interpretation	By arrangement. Transport to lab on ice. Keep protected from light. 3-4 weeks
Vitamin B12	Blood	Rust	180 – 1000 ng/L	Daily
Vitamin D (25 OH cholecalciferol)	Blood	Rust	See report for interpretation	Weekly

Test	Specimen and tube *(colour)*		Reference and therapeutic ranges *(units)* Adults	Comments *(reporting frequency)*
Vitamin D (1,25 $(OH)_2$ cholecalciferol*)	Blood	Red	40-150 nmol/L	2 weeks
Vitamin E*	Blood	Red	See report for interpretation	2 weeks
White cell enzymes* Arylsulphatase A Acid lipase Beta - glucocerebroside Sphingomyelinase Alpha - galactosidase	Blood	Green	See report for interpretation	By arrangement. Specify the enzyme analysis required 6 – 8 weeks
Zinc*	Blood	Royal Blue (for trace elements)	See report for interpretation	2 weeks

4.10 PAEDIATRIC REFERENCE RANGES

TESTS *(units)*	AGE RANGE	REFERENCE VALUES / THERAPEUTIC RANGES
Alkaline phosphatase **	Neonate Infant – 16 years	70 – 380 U/L 60 – 425 U/L
Ammonia **	Sick or premature Neonate Infant – 16 years	<150 µmol/L <100 µmol/L < 50 µmol/L
Bilirubin **	2 – 7 days 14 days – 16 years	10 – 200 Should decrease to adult values by day 10 (breast–fed infants may take longer) < 21 µmol/L
Calcium **	Neonate Infant – 16 years	2.00 – 2.70 mmol/L (Actual not adjusted) 2.20 – 2.70 mmol/L
Creatine kinase	1 year – 13 years	15 – 130 U/L
Creatinine	1 month – 12 months 1 year – 10 years 10 years – 16 years	18 – 35 µmol/L 7 – 62 µmol/L 44 – 88 µmol/L
Digoxin	neonates	up to 3.0 µg/L
17- hydroxyprogesterone	neonates	See report for interpretation
Free T3	12 years – 20 years	See report for interpretation
Free T4	0 day - 5 days 5 days - 4 weeks > 4 weeks	10 – 40 pmol/L 10 – 25 pmol/L 10 – 23 pmol/L
Insulin-like Growth Factor (IGF) -1 nmol/L	0 day – 1 year 1 year – 2 years 2 years – 3 years 3 years – 4 years 4 years – 5 years 6 years – 7 years 7 years – 8 years 8 years – 9 years 9 years – 10 years 10 years – 11 years 11 years – 12 years 12 years – 13 years 13 years – 14 years 14 years – 15 years 15 years – 16 years	7.2 – 42.5 6.6 – 39.4 6.4 – 37.6 6.4 – 36.8 6.5 – 37.2 6.8 – 38.6 7.4 – 41.1 8.3 – 44.9 9.6 – 50.4 11.4 – 58.8 14.4 – 71.6 18.6 – 90.1 23.8 – 110.5 28.6 – 126.4 30.8 – 129.5
IGF Binding Protein-3	0-16 years	See report for interpretation
Lactate (plasma)**	No age related	0.6 – 2.5 mmol/L

TESTS *(units)*	AGE RANGE	REFERENCE VALUES / THERAPEUTIC RANGES
	differences	
Mucopolysaccharide/creatinine ratio mg/mmol (urine)	1 month – 3 months months – 12 months 1 year – 3 years 3 years – 7 years 7 years – 15 years	9 – 41 4 – 35 2 – 22 6 – 16 2 – 11
Phenytoin	neonates	6 – 14 mg/L
Phenobarbitone	neonates	12 – 30 mg/L
Phosphate **	Neonate infant 1 – 16 years	1.3 – 2.6 mmol/L 1.3 – 2.4 mmol/L 0.9 – 1.8 mmol/L
Potassium**	Neonate Infant 1 – 16 years	3.4 – 6.0 mmol/L 3.5 – 5.7 mmol/L 3.5 – 5.0 mmol/L
Testosterone nmol/L Female	1 day – 10 days 1 month – 2 years	0.2 – 1.2 nmol/L 0.1 – 0.7 nmol/L
Testosterone nmol/L Male	1 day – 2 days 4 days – 10 days 1 month – 4 months 3 months – 12 months 1 year – 10 years	2.1 – 19.8 nmol/L 0.5 – 1.7 nmol/L 1.7 – 12.5 nmol/L 0.1– 1.6 nmol/L 0.1 – 0.7 nmol/L
Theophylline	neonates	5 – 11 mg/L
TSH	10 days – 14 days 1 month – 18 years	<10 mU/L 0.5 – 4.0 mU/L
Urea**	Neonate Infant 1 – 16 years	0.8 – 5.5 mmol/L 1.1 – 5.0 mmol/L 2.5 – 6.5 mmol/L

Definitions: Neonate <4 weeks; Infant 4 weeks – 1 year

**New National Pathology Harmony reference ranges July 2011.

Other ranges are taken from Clinical Biochemistry and the Sick Child 2nd Edn. 1994 Clayton, BE and Round JM and Clinical Guide to Laboratory Tests, Tietz , 2nd Edn.

4.25 REFERENCE RANGES IN PREGNANCY

	12 WEEKS	**24 WEEKS**	**36 WEEKS**
Albumin g/L	35 – 45	30 –38	22 – 37
Alkaline phosphatase U/L	27 – 90	32 – 108	82 - 274
Cholesterol mmol/L	3.3- 7.3	4.2 – 9.3	4.9 – 10.8
Creatinine μmol/L	48 – 78	41 – 78	47 – 87
Glucose mmol/L	2.9 – 5.9	2.7 – 5.3	2.7- 5.5
HDL cholesterol mmol/L	1.3 – 3.1	1.4 – 3.4	1.4 – 3.3
Triglycerides mmol/L	1.1 – 3.7	1.7 – 4.1	2.8 – 7.1
Urate mmol/L	0.10 – 0.27	0.12 – 0.31	0.16 – 0.42
Urea mmol/L	1.9 – 6.2	1.8 – 5.6	1.6 – 5.0

Reference ranges have been adapted from Handbook of Diagnostic Biochemistry and Haematology in Normal Pregnancy. Ed Lockitch, 1993

5 CLINICAL BLOOD SCIENCES: HAEMATOLOGY AND BLOOD TRANSFUSION

5.1 CONSULTANTS AND SENIOR STAFF

Dr Matthias Klammer	Clinical Lead / Consultant Haematologist Bone marrow transplantation	3238
Dr Steve Austin	Consultant Haematologist – Haemostasis and Haemoglobinopathies	5447
Dr Fenella Willis	Consultant Haematologist – Haemato oncology	5446
Dr Maria Pelidis	Consultant Haematologist – Paediatric Haematology	3921
Dr Ayad Atra	Consultant Haematologist – Paediatric Haematology	3921
Dr Mickey Koh	Consultant Haematologist – Bone marrow transplantation	3238
TBA	Locum Consultant Haematologist Anticoagulation and Thrombophilia	0774
Dr Ruth Pettengell	Consultant - Lymphoma	5454
Dr. Elizabeth Rhodes	Consultant Haematologist - Sickle/ Haemoglobinopathies	1709
Dr. James Uprichard	Consultant Haematologist – Haemostasis & Blood Transfusion	4282
Mrs. S. Mandry	PA to Dr Klammer	1172
Mr Sean Lynch	Laboratory Manager	5474
Mr. David Greenwood	Quality Manager	3797
Mr M. Free	Section Head - Transfusion	5473/6220
Mr R. Lee	Section Head - Diagnostic Haematology	5464
Mr J. Archer	Section Head - Haemostasis	5479
TBA	Section Head - Cell Markers	5482
Mr D. Element	Section Head - Haemoglobinopathy Screening	5520
Mr M. Grumbridge	Transfusion Practitioner	0607/ blp 6844
Mrs K. Feane	Transfusion Practitioner / BMS 2	4652
Miss S Carr	Transfusion Practitioner	3616

5.2 LABORATORY WORKING HOURS

MON	TUE	WED	THU	FRI	SAT	SUN	BH
← 0800 – 1800 →					0800-1400	0800-1400	0800-1400

5.3 ENQUIRIES - WORKING HOURS

Blood Sciences Reception	5468
Diagnostic Haematology	5464
Blood Bank	5471/5477
Transfusion Practitioner	0607/4652 bleep6844
Coagulation	5479
Haemoglobinopathy Screening Laboratory	5520
Leukaemia Diagnosis	5482
Consultants/Registrars	5462/5463

5.4 ENQUIRIES - OUT OF HOURS

Blood Sciences Reception	5468
On-call Haematologist (via hospital switchboard)	1000

5.5 HAEMATOLOGY TESTS: SPECIMEN REQUIREMENTS, SPECIAL INSTRUCTIONS, FACTORS AFFECTING TEST PERFORMANCE & TURN-AROUND TIMES

TEST	SPECIMEN BOTTLE, MINIMUM VOLUME and FORM	SPECIAL INSTRUCTIONS	Factors that may affect performance of the test or interpretation of results	Usual turnaround times
Full Blood Count + platelets Film/Differential; Malarial Parasites Reticulocytes, Sickle Test*****, HPLC Haemoglobinopathy screen*, .	Lavender EDTA 6 ml Or paed pink top bottle 0.5ml Minimum volume required is 1.5mL if taken in 6.0mL tube Multidisciplinary request form FBC sample will be used	Films (including malaria) can only be made on FBC samples on day of venepuncture Malaria requests must be accompanied with details of area travelled and prophylaxis taken Reticulocytes may be requested on samples up to 72hours old. Please check for previous results. For HPLC Haemoglobinopathy screen in a male partner, please give **full name** and date of birth of partner on request form and use mother's hospital number with '/**PNR'** suffix. For at risk infants, **identify both parents** on request form. Include mother's hospital number for cross-reference as part of summary. May be added to FBC requests on samples up to 72 hours old.	*Sickle test is not valid for infants under 6 months of age. If child at risk of haemoglobinopathy, request HPLC Haemoglobinopathy screen. Transfusion will interfere with haemoglobinopathy screening and sickle results.*	FBC A&E 1 Hour Urgent 2Hours Routine 3Hours Film 2-3 Days (Mon – Fri) Malarial parasites 2 Hours Sickle test urgent 1 hour Routine 48hrs Haemoglobinopathy screen 72 hours
Monospot.	Lavender EDTA 6ml Multidisciplinary	May be added to FBC requests on samples up to 72 hours old.		48 hours

TEST	SPECIMEN BOTTLE, MINIMUM VOLUME and FORM	SPECIAL INSTRUCTIONS	Factors that may affect performance of the test or interpretation of results	Usual turnaround times
	request form			
Erythrocyte Sedimentation Rate.	Lavender EDTA 6ml Multidisciplinary request form	Paediatric ESR – Paediatric manual ESRs can be set up from EDTA samples that are no more than 4 hours old (A separate EDTA sample will be needed if an FBC is also required).	Samples must be no more than 4 hours old	Same day
Plasma Viscosity	Lavender EDTA 6ml (minimum volume) Multidisciplinary request form under 'other tests'	Separated plasma sent by laboratory **on same day of venepuncture** to Haematology Dept St Thomas' Hospital 4th Floor North Wing Lambeth Palace Road LONDON SE1 7EH		7-10 days
Acidified Glycerol Lysis Test (AGLT)	Lavender EDTA 6ml Minimum volumes – see FBC Multidisciplinary request form under 'other tests'	By arrangement with Diagnostic Haematology laboratory Contact Ext 3920 The test can only be performed on samples less than 24hours old		24 hours
G6PD	Lavender EDTA 6ml			2 – 3 days Mon - Fri
Lymphocyte subsets, CD4 counts.	Lavender EDTA 6ml Minimum volume 2ml	Must be accompanied by a FBC request with additional Lavender EDTA 6ml.		24hrs except for sample received on Friday

TEST	SPECIMEN BOTTLE, MINIMUM VOLUME and FORM	SPECIAL INSTRUCTIONS	Factors that may affect performance of the test or interpretation of results	Usual turnaround times
	Multidisciplinary request form under 'other tests'	May be added to FBC request on samples up to 24hours old		
Immunophenotyping	Collection as advised by Leukaemia diagnosis laboratory ex 5482 Multidisciplinary request form under 'other tests'	By discussion and arrangement with Haematology SPR May be added to FBC request on samples up to 24hours old		Verbal 24hrs Formal report 5 working days
PNH screen	Lavender EDTA 6ml Minimum volume 1ml Multidisciplinary request form under 'other tests'	May be added to FBC request on samples up to 24hours old		Verbal 24hrs Formal report 5 working days
Paediatric lymphocyte subset	Lavender EDTA 1ml or paed pink top bottle 0.5ml Must be accompanied by a FBC request with **additional** paed pink top bottle 0.5ml	May be added to FBC request on samples up to 24hours old		24hrs except for samples received on Friday.
JAK2 mutation	Lavender EDTA 1 x 6ml	By discussion and arrangement with Haem SPR or consultant.		Four weeks

TEST	SPECIMEN BOTTLE, MINIMUM VOLUME and FORM	SPECIAL INSTRUCTIONS	Factors that may affect performance of the test or interpretation of results	Usual turnaround times
	Multidisciplinary request form under 'other tests'	Cannot be added to existing requests		
TCR/IgH gene rearrangement studies	Lavender EDTA 2 x 6ml PB and BM samples. Paraffin Sections are also suitable Minimum volume 1 x 6ml subject to cell count Multidisciplinary request form under 'other tests'	May be added, after consultation with Haem or Onco SpR/Consultant, to FBC request on samples up to 48 hours old		4 Weeks
Platelet glycoprotein assay	Collection tube with special anticoagulant provided by cell markers lab.	By arrangement with Cell Markers lab Contact Ext 5482. By prior arrangement only.		Verbal results within 24 hours. Formal reports 5 working days.
Coagulation screening tests, Anticoagulant control.	Blue Citrate 2.7ml Paediatric 1ml (minimum volume) Multidisciplinary request form	Samples **must** be filled to mark, taken with minimum stasis and analysed within 4 hrs after venepunture. May be added to samples less than 4 hours old.	Samples taken from lines may be contaminated with heparin which could affect results.	Urgent 60 – 90 minutes (dependant on extent of tests required) Routine 4 hours
Fibrinogen, D Dimer	Blue Citrate 2.7ml Paediatric 1ml	May be added to samples less than 4 hours old.		Urgent 60 – 90 minutes (dependant on extent of tests

TEST	SPECIMEN BOTTLE, MINIMUM VOLUME and FORM	SPECIAL INSTRUCTIONS	Factors that may affect performance of the test or interpretation of results	Usual turnaround times
	(minimum volume) Multidisciplinary request form			required) Routine 4 hours
Coagulation factor assays	Blue Citrate 3 x 2.7ml (minimum volume Multidisciplinary request form under 'other tests'	*Samples must be filled to mark, taken with minimum stasis and sent to lab within 4 hrs after venepunture.*		*1 week*
Thrombophilia screening	Blue Citrate 3 x 2.7ml (minimum volume Multidisciplinary request form under 'other tests	Samples must be filled to mark, taken with minimum stasis and sent to lab within 4 hrs after venepunture.		1 week
Prothrombin mutation & Factor V Leiden	Lavender EDTA 6ml Minimum volume 1ml Multidisciplinary request form under 'other tests''	By arrangement with Haemostasis laboratory. Contact ext: 5479 May be performed on FBC samples that are < 24 hours old		2 weeks
MTHFR	Lavender EDTA 6ml Minimum volume 1ml	By arrangement with Haemostasis laboratory. Contact ext: 5479 Sent to Histopathology Royal Surrey County Hospital,		4 weeks

TEST	SPECIMEN BOTTLE, MINIMUM VOLUME and FORM	SPECIAL INSTRUCTIONS	Factors that may affect performance of the test or interpretation of results	Usual turnaround times
	Multidisciplinary request form under 'other tests''	Egerton Road, Guildford, GU2 5XX		
ADAMT-13	Lavender EDTA 6ml Minimum volume 1ml Multidisciplinary request form under 'other tests''	By arrangement with Haemostasis laboratory. Contact ext: 5479 Sent to Dr I Mackie. Haemostasis Research Unit, University College Hospital London, 1st Floor, 51 Chenies Mews, London WC1E 6HX		3 weeks
Platelet Function Analysis/PFA100	Blue Citrate 2 x 2.7ml Minimum volume Multidisciplinary request form under 'other tests''	By arrangement with Haemostasis laboratory. Contact ext: 5479	Platelet count must be >100 x 10^9, HCT >0.300	Same day
Platelet aggregometry	Blue Citrate 3 x 2.7ml Minimum volume Multidisciplinary request form under 'other tests''	By arrangement with Haemostasis laboratory. Contact ext: 5479	Platelet count must be >100 x 10^9, HCT >0.300	Same day
Blood Grouping and Antibody screening, .	Pink Cap EDTA 6 mL Minimum volume	Shelf life for additional tests will vary between 24 hours to 7 days depending on transfusion history. Contact lab for advice		24 hours
Cross match	Pink Cap EDTA	See above		Urgent x match 1 hour

TEST	SPECIMEN BOTTLE, MINIMUM VOLUME and FORM	SPECIAL INSTRUCTIONS	Factors that may affect performance of the test or interpretation of results	Usual turnaround times
	6 mL Minimum volume			
Direct Antiglobulin (Coombs) test	Lavender EDTA 6ml Or paed pink top bottle 0.5ml Multidisciplinary request form under 'other tests''	May be added to FBC or G&S requests on samples < 24 hours old		24 hours
Red cell immunohaematology Histocompatibility & Immunogenetics Platelet Immunology Granulocyte Immunology	Sample requirements detailed on request form NBS Form 1A NBS Form 3A NBS Form 4A NBS Form 5A (Available from Blood Bank)	Discuss with laboratory. Samples referred to Bristol for testing and have limited shelf life		
Cold Agglutinin Titre	Red top 5ml Minimum volume	Discuss with laboratory. 5 ml clotted blood, which must be kept at 37°C.		48 hours

5.6 REPORTS

Copies of reports will be returned where appropriate.

5.7 DIAGNOSTIC HAEMATOLOGY REFERENCE RANGES

Adult reference range and normal values for age and sex printed on report form.

TEST	AGE/SEX	REFERENCE RANGE
White cell count (WBC)		4.0 – 11.0 x 10^9/L
Red cell count (RBC)	M	4.5 – 6.0 x 10^{12}/L
	F	3.8 – 5.5
Haemoglobin	M	130 – 180 g/L
	F	120 – 160 g/L
Packed cell volume/haematocrit	M	0.41 – 0.52 L/L
	F	0.37 – 0.47 L/L
Mean cell volume (MCV)	M	80 – 97 fl
	F	78 – 97 fl
Mean cell haemoglobin (MCH)		27 – 33 pg
Platelets		150 – 400 x 10^9/L
Reticulocytes		25 – 100 x 10^9/L
Erythrocyte sedimentation rate (ESR)	<50 years	1 – 10 mm/hr
	>50 years	<20 mm/hr
Plasma Viscosity		1.1 – 1.35 mPa.s
Differential WBC Neutrophils		1.7 – 8.0 x 10^9/L
Eosinophils		0.1 – 0.8
Basophils		<0.3
Lymphocytes		1.0 – 4.0
Monocytes		0.24 – 1.1
Haemoglobin A2		2.1 – 3.8%
Haemoglobin F		<1.0%
G6PD		Reported as normal or deficient. If deficient, assay will be performed.
Red cell volume*	**M**	**30 ± 5 mL/Kg**
	F	**25 ± 5 mL/Kg**
Plasma volume*		**45 ± 5 mL/Kg**
Total blood volume*		**70 ± 10 mL/Kg**
T cells		1.08 – 1.98 x 10^9/L
B cells		0.05 – 0.40 x 10^9/L
CD4		0.71 – 1.31 x 10^9/L

***To be carried out by Radiopharmacy/Nuclear Medicine.**

The laboratory staff are available to advise on the most suitable tests to confirm the nature of a blood disorder, such as bone marrow examination, , tests for a suspected haemolytic process etc.

5.8 HAEMOSTASIS REFERENCE RANGES

SCREENING	
TEST	**REFERENCE RANGE**
INR	0.8 – 1.1
Activated Partial Thromboplastin time ratio APTTR	0.85 – 1.15
Thrombin time	11 – 16 secs
Reptilase time	Control + 4 secs
Fibrinogen	2 – 4 g/L
D-dimers - immunological	<300 ng/ml
ANTICOAGULANT CONTROL	
TEST	**REFERENCE RANGE**
INR (Warfarin)	See anticoagulant guidelines
APTT (unfractionated heparin iv)	APTTR 1.5 – 3.5
Anti-Xa (low molecular weight or unfractionated heparin sc)	Refer to haematologist

For coagulation factor assays, thrombophilia screening and platelet function tests, please consult laboratory staff on 5479.

Medical staff of the haemophilia unit are available at all times for advice on all anticoagulant, bleeding and thrombotic disorders throughout the 24 hours via bleep.

THROMBOPHILIA SCREENING	
TEST	**REFERENCE RANGE**
Lupus inhibitor ***(Lupus anticoagulant screen: DRVVT&RTI tests)***	Written comment ***(DRVVT&RTI = 0 – 1.20)***
Antithrombin	75 – 150 iμ/dl
Protein S	66 – 130% of normal control plasma
Protein C	70 – 150 iμ/dl
Activated Protein C Resistance	Ratio >2.2 – 3.5
Factor V Leiden PCR	If APCR < 2.2
Prothrombin mutation PCR	If there is clinical suspicion of thrombophilia
Factor VIII	50-150u/dl

5.9 BLOOD TRANSFUSION

Please note that for more detail on any aspect of the Blood Transfusion service, you should refer to the Trust's Blood Transfusion policy, by clicking Here

The group and save policy will state our aim that two blood grouping samples, from discrete phlebotomy episodes, are tested before blood components are issued.

For blood grouping, antibody screening and cross matching please provide 6 mL in special Pink cap EDTA tube. If you wish to convert a "Group and Save" to a crossmatch, please telephone the laboratory on 5471. Plasma saved for 1 week.

Allow 1 clear working day for elective crossmatching.

Crossmatched blood is routinely returned to stock after 24hrs unless discussed with the laboratory.

5.10 BLOOD PRODUCTS AVAILABLE

Fresh Frozen Plasma	Order by telephone, giving clinical disorder requiring the product.
Cryoprecipitate	Order by telephone, giving clinical disorder requiring the product.
Platelet concentrate	Platelets – usually available within 2 hours. Order by telephone: May require Clinical Haematology confirmation.
Human Albumin Solution (HAS) (4.5% and 20%)	Blood group not required.

5.11 ANTI-D IMMUNOGLOBULIN

Routine Antenatal prophylaxis is offered to all RhD Negative patients. 1500 iu Anti-D is given at 28 weeks.

For Rh D negative woman (or mother), post-delivery of RhD positive child 500 iu. Kleihauer performed automatically. Ward informed if further Anti-D required and the need for a further Kleihauer examination, or referral of sample to National Blood Service for confirmatory testing.

Following spontaneous/therapeutic abortion, give 500 iu. Anti-D should be administered within 72 hours A Kleihauer test should be requested where gestation is 20 weeks or more.

Addressograph labels, unclear or incorrectly labelled samples will NOT be accepted.

Both the request form and blood sample must be labelled with the following: First name, surname, hospital number, date of birth and gender, and samples must be signed and dated. It is Hospital policy to reject incorrectly labelled Transfusion samples. No changes are allowed to rejected samples.

6 MEDICAL MICROBIOLOGY

Location - First Floor, Jenner Wing

6.1 CONSULTANTS AND SENIOR STAFF (EXTENSION NUMBERS)

Dr T. Planche	SWLP Microbiology Clinical Lead/ Consultant Microbiologist	020 8725 2683
Dr P. Riley	Bacteriology Lead/ Consultant Microbiologist	020 8725 5707
Dr A. Breathnach	SWLP Clinical Director/ Consultant Microbiologist	020 8725 5735
Dr M. Laundy	Infection Control Lead/ Consultant Microbiologist	020 8725 5678
Dr M. Cotter	OPAT Lead/ Consultant Microbiologist	020 8725 5734
Dr A. Houston	Consultant in Infection	020 8725 5673
Dr D. Carrington	Virology Lead/ Consultant Virologist	020 8725 5686
Dr C. Pope	Consultant Clinical Scientist (Microbiology & Virology)	020 8725 5734
Dr S. Furrows	Consultant Microbiologist	020 8934 2037
Dr S. Patel	Consultant Microbiologist	020 8934 2036
Dr J. Cepada	Consultant Microbiologist	020 8934 3344
Dr E. Demertzi	Consultant Microbiologist	020 8934 3070
Dr M. Sahathevan	Consultant Microbiologist	020 8401 3383
Dr.M Twagira	Consultant Microbiologist	020 8401 3383
Dr R. Holliman	Consultant Microbiologist	020 8725 5673
Mr J. Laughlin	Discipline Manager	020 725 5698
Ms J. Alli-Balogun	Quality Manager & Health and Safety Adviser	020 8725 5176
Miss C. Prendergast	Chief Biomedical Scientist Microbiology	020 8725 5175
Mr A. Spratt	Chief Biomedical Scientist Virology	020 8725 5689

6.2 CLINICAL LIAISON

Ward Consultation / Blood Cultures	Bleep 6959
General Intensive Care Unit	Bleep 7118
Cardiothoracic Surgery ICU	Bleep 7118
Neurosurgery ICU	Bleep 7118
OPAT Referrals	Bleep 8170 or Page SG278
General Clinical Advice/Signing SpR	Bleep 6480

6.3 LABORATORY OPENING HOURS

MON	TUE	WED	THU	FRI	SAT	SUN	BH
← 09.00 – 17:15 →					09:00-12:00		09:00-12:00

Sample containers may be obtained from Central Pathology Reception (ground floor Jenner Wing) during normal working hours only.

6.4 CERNER ORDER COMMS

Where available, Cerner Order Comms should be used by the requesting clinician to order tests and label specimens appropriately.
If you do not know how to use Cerner Order Comms, user guides are available on the St George's University Hospitals NHS Foundation Trust intranet site.
If Cerner Order Comms are not available, or your test cannot be requested using this system, samples should be labelled and a request form sent as detailed below.

6.5 REQUEST FORMS

Request forms need to be completed legibly and completely using a ballpoint pen. Of similar importance is the need to give the **correct location, ensuring this information appears on each individual form for the appropriate laboratory,** so that results arrive where they are needed. **Providing the hospital number will minimise delays.**
It is the responsibility of the doctor requesting the test to ensure that all request forms and specimens carry **ALL** of the following information.

1. Patients surname and first name(s)
2. Hospital number / NHS number
3. Date of birth and sex
4. Location
5. Date and time when specimen was taken
6. Specimen type
7. Consultant name/GP name
8. Tests requested
9. Name of requesting doctor (printed) together with bleep no
10. Clinical information / details to justify the request
11. Details of any recent foreign travel e.g.: where and when
12. GP code / name / address
13. Site of specimen (if applicable)

Current information is usually more relevant than an admission diagnosis. Without full information it is impossible to examine a specimen adequately or provide appropriate clinical interpretation.

6.6 SAMPLE LABELLING – (WHEN NOT USING CERNER ORDER COMMS)

Information on the sample container **MUST** include:

1. Patients surname and first name(s)
2. Hospital number/NHS number
3. Sex
4. Date of birth
5. Time and date of sampling
6. Location
7. Sample type e.g. swab/urine/tissue/wound (site if applicable)

The policy for the Department of Microbiology is NOT to process unlabelled specimens. Occasionally unrepeatable unlabelled specimens may be processed at the discretion of the Signing Registrar but the results will be withheld and a comment will be added informing the requester to contact the Signing Consultant or Registrar to discuss the results.

6.7 OUT OF HOURS

Medical Advice contact via Hospital Switchboard	SGH Micro SpR SG 395 SGH Micro Consultant SG 624 SGH Virology consultant SG 176 KH Micro consultant: KH switchboard 020 8546 7711
Biomedical Scientist contact via Hospital Switchboard	1000/5703

6.8 ENQUIRIES DURING WORKING HOURS

Bacteriology Clinical Advice/Signing SpR/consultant	5676/5685/1970 - Bleep 6480 if urgent
Bacteriology General Enquiries/Results	5693/5695
Virology Clinical Advice	5686/5687
Virology General Enquiries/Results	5692
Kingston Hospital Microbiology Consultants	07823403087 or KH switchboard 020 8546 7711
Croydon Hospital Microbiology Consultants	020 8401 3383

6.9 ADDITIONAL TESTS

Tests may be added to samples if a suitable and sufficient sample is available by contacting Medical Microbiology and discussing with the signing consultant. Samples are stored for varying times dependant on sample types. For additional tests, contact Medical Microbiology as soon as possible after the specimen has been sent.

6.10 URGENT REQUESTS

Samples requiring urgent analysis during normal working hours require a prior telephone call to the laboratory on 5692/5693. During out of hours please contact the Laboratory via the hospital switchboard on 1000.

6.11 REFERENCE LABORATORIES

The microbiology laboratory has a procedure for referring specimens to other laboratories for some specialist tests, which includes records of all referred samples and of all reference laboratory facilities used. Information can be accessed by contacting Medical Microbiology. These referral centres should not be contacted directly.

6.12 REPORTING RESULTS

Results are issued electronically and are available on EPR or on Cerner Millennium for tests requested using the Order comms system. The status of the report should be considered **final** unless otherwise indicated i.e. Provisional or amended. Printed

reports are only issued for the Courtyard clinic, Antenatal clinic and the Chest clinic and other sites on request for specific GP practices.

6.13 BACTERIOLOGY

6.13.1 BLOOD CULTURES

6.13.2 ADULTS

SGH patients: inoculate a single BLUE aerobic bottle with 8-10 ml of blood.

Where an anaerobic MAUVE bottle is required for individual patients where anaerobic infection is suspected, these can be collected from the Department of Medical Microbiology, Level 1, Jenner Wing. Contact the on-call BMS out of hours. If advice is needed for situations when anaerobic blood cultures are needed, please contact the signing SpR/consultant on 5676/5685/1970 or Bleep 6480.

KH patients: inoculate a blue aerobic and a mauve anaerobic bottle with 8-10 ml of blood in each.

6.13.3 PAEDIATRICS

Inoculate 1 pink top paediatric bottle with 1-5 ml of blood.

It is recognised that paediatric samples may be difficult to take. Please send any sample you manage to obtain regardless of volume.

6.13.4 VENOUS CATHETERS

If a venous catheter infection is suspected, send two blood culture samples – blood taken from the venous catheter and blood from venepuncture of a peripheral vein. Ensure that the time of the blood culture is recorded.

Preliminary positive blood culture results i.e. Gram stain and provisional identity (adult and paediatric) are telephoned to the Medical staff that requested the test. Blood cultures are incubated for 5 days before negative results are issued. On occasion incubation can be extended e.g. if brucellosis is suspected. If advice is needed for situations where extended incubation is needed, please contact the signing SpR/consultant.

6.13.5 BLOOD CULTURES FOR MYCOBACTERIAL ISOLATION (FOR MTB AND MAI CULTURE ONLY)

Black top bottles must be collected from Microbiology Reception. Inoculate no more than 5 ml of blood per bottle.

All positive mycobacterial cultures are telephoned. Cultures are incubated for 42 days before negative results are issued. On occasion incubation can be extended. If advice is needed for situations where extended incubation is needed, please contact the signing SpR/consultant.

It should be noted that these are NOT tests that can be left for

phlebotomists to perform. They should be performed as a separate activity solely for the purpose of obtaining blood for culture and emphasis on strict aseptic techniques placed to avoid contamination. Blood culture bottles once inoculated must only be stored at room temperature prior to loading on the BC analyser.

6.13.6 ANTIBIOTIC AND ANTIFUNGAL LEVELS IN BLOOD

Gentamicin, Amikacin and Vancomycin levels are performed in Blood Sciences. Voriconazole and itraconazole levels are performed by the Analytical Unit. Other antibiotic/antifungal levels are available in the Microbiology Department after referral to a Reference Laboratory e.g. rifampicin, teicoplanin and moxifoxacin. For advice on availability of specific drug assays please contact the signing SpR/Consultant on 5676/5685/1970 or Bleep 6480.

Guidance on dosing, assaying and interpretation of gentamicin, amikacin and vancomycin levels can be found on the Trust intranet via the Antibiotic Prescribing link. For advice about other assay results or dosing queries please contact the signing SpR/Consultant.

6.13.7 CEREBROSPINAL FLUID

Take into at least two sterile universal containers, preferably 2-3 mls. Mark the containers with the order they were taken. All microscopy results from non-AMH patients are telephoned. All positive microscopy and culture results are routinely telephoned. In addition, all microscopy results are available on EPR as soon as specimens are processed.

Please remember that a separate sample should be sent to Blood Sciences for protein estimation and Blood Sciences will also require a sample taken into a fluoride tube with a yellow label, for glucose estimation.

If sample is taken out of hours, please inform the on-call Biomedical Scientist once the samples have been taken.

CSF microscopy is performed on all specimens and a white cell differential is additionally done on specimens with a WBC count > 10/μl. ALL CSF specimens with a WBC count up to 5/μl would be considered to be within normal limits. Higher counts are seen in bacterial or viral meningitis and also in patients with extra-ventricular drains or V-P shunts in situ.

Further tests can be performed in immunocompromised patients, such as Cryptococcal antigen in CSF or serum.

Cultures are incubated for 48 hours before issue of negative results. If prolongation of culture is needed e.g. fungal meningitis this should be discussed with the SpR/consultant. All positive culture results will be telephoned as soon as they are available.

It is recognised that paediatric samples may be difficult to take. Please send any sample you manage to obtain regardless of volume.

6.13.8 MENINGOCOCCAL INFECTION

In addition to culture of CSF and blood, a molecular diagnostic test (PCR) is available from a reference laboratory. Please send CSF in a sterile container or blood in an

EDTA tube (Lavender top). A throat swab (blue top) should also be obtained in all cases to detect pharyngeal carriage.

6.13.9 RESPIRATORY SPECIMENS

Send routine specimens in 60 mL silver top sterile containers. Bronchial traps are acceptable – check that the specimen contains sputum (saliva alone will be discarded as unsuitable for culture). In cases of severe pneumonia, a urine sample should be sent for pneumococcal and legionella antigen testing, also in a 60 ml silver topped container. Containers with tubing still attached present a safety hazard, ensure specimen containers have an appropriate screw topped lid.

Cultures are incubated for at least 24 hours before issue of negative results.

6.13.10 ACID FAST BACILLI (AFB) INCLUDING TB PCR

Three consecutive daily specimens are preferred. Positive results by microscopy or culture are telephoned. Identification of AFB species and antibiotic sensitivities are carried out at a reference laboratory (takes at least two weeks). Cultures are incubated for 42 days before issue of negative results. On occasion incubation can be extended. If advice is needed for situations where extended incubation is needed, please contact the signing SpR/consultant.

TB PCR (detects *M.tuberculosis* complex and rifampicin resistance) is performed in-house routinely on all samples that are newly positive by microscopy from any specimen site i.e. respiratory and non-respiratory specimens.

TB PCR is also performed in-house for all new culture positives when the microscopy had been negative for any specimen site i.e. respiratory and non-respiratory cultures.

Any other requests for TB PCR must be first discussed with the signing microbiology consultant.

PCR results are available in 1-2 days

6.13.11 BRONCHO-ALVEOLAR LAVAGE

The sample is divided in the laboratory for bacteriology and virology; investigations for **PCP** and **AFB** are undertaken during normal working hours only. (In exceptional circumstances these investigations can be performed at other times with Microbiology Consultants agreement).

6.13.12 PCP

This test should be specifically requested if required. Routine processing occurs on Tuesday and Friday and results available on the same day as testing.
If an urgent PCP result is required, please discuss with a Microbiology Consultant. This test will only be done on induced sputum or bronchial alveolar lavage.

6.13.13 NASOPHARYNGEAL ASPIRATES / BAL / INDUCED SPUTUM

These specimens are processed for respiratory viruses. If bacterial culture required please contact the microbiologist.

6.13.14 URINE

Routine mid-stream urine specimens: collect into boric acid urine containers (red lid) or sterile universal. If only a small volume of urine is collected e.g.: paediatrics, send the sample in a 60 ml sterile plastic container.
Do not use boric acid bottles for paediatrics or small volumes of urine <10 ml.

Specimens that are not processed will be retained in the laboratory for up to 48 hours after the report is issued and you can contact the laboratory if you want the specimen to be processed.

Catheter specimens of urine should **NOT** be sent in the absence of systemic illness irrespective of Nephur test findings.

Suprapubic aspirates – please label as 'urine SPA'.

Microscopy can be done urgently as a special request or if casts are requested.

The culture results are usually ready within 24 to 72 hours.

It is recognised that paediatric samples may be difficult to take. Please send any sample you manage to obtain regardless of volume.

6.13.15 ACID FAST BACILLI IN URINE

This investigation should only be performed for patients with suspected renal tract tuberculosis. For other patients, please discuss with the Consultant Microbiologist before sending. Three consecutive early morning specimens are preferred – these are cultured; microscopy is **NOT** undertaken. Cultures are incubated for 42 days before issue of negative results. Positive results are telephoned.

6.13.16 SCHISTOSOMIASIS

Please send a terminal urine sample (void early stream of urine and pass final few mls into universal container). Results are available same day as receipt.

6.13.17 URINE ANTIGEN TESTING – LEGIONELLA PNEUMOPHILA AND STREP. PNEUMONIAE

In cases of severe pneumonia requiring intensive care a urine sample should be sent for pneumococcal and legionella antigen testing in a 60 ml silver topped container. Tests for Urinary antigens are performed daily Monday to Friday and as such results should be available within 24 hours of receipt. These tests are not performed routinely at weekends. Urgent requests for urinary antigens should be telephoned directly to Microbiology.

6.13.18 FAECES

Collect into the blue-lidded plastic universal container. Ensure that there is adequate specimen for all investigations required.

Negative results take a minimum 2 days. Faecal clearance results available within 2-3 days. Full identification of some pathogens may require reference laboratory tests.

Ova cysts and parasites investigations are performed on request or when fulfilling particular criteria such as recent travel to high risk areas or chronic diarrhoea (>1 month).

If amoebic dysentery is suspected please contact the signing SpR/consultant to discuss the most appropriate investigation.

Clostridium difficile testing is routinely tested on all diarrhoeal stools from inpatients using ***an infectious diarrhoea form*** and all patients >65 years old in the community or when specifically requested by the clinician. The testing algorithm involves up to three different tests. From the test results, patients can be categorised into one of three groups: those with *C. difficile* infection; those with *C. difficile* carriage or those with no evidence of *C. difficile* infection. Interpretative comments indicating these categories are on all reports.

Negative patients are retested daily if faeces specimens are received in the laboratory and positive patients are not retested within a 28 day period.

Patients who have been in hospital for >3 days will only be tested for *C. difficile;* exceptions include children, patients on McEntee ward, Allingham ward and Oncology wards, patients with diarrhoea on admission, patients involved in ward outbreaks and when a specific organism is being screened for.

6.13.19 TISSUE AND BIOPSIES

Send dry in a silver topped sterile container or in the case of small fragments, place in a few ml of sterile saline.

NEVER put specimens for microbiological investigations into fixatives i.e. formalin.

Microscopy results are available on the day of receipt, culture results 2 – 3 days. Some specimens may have prolonged incubation in which case a result will be issued in 5-7 days.

6.13.20 OPHTHALMOLOGY SPECIMENS

Culture plates and slides for direct inoculation of corneal scrapes are always available in Pathology Central Reception fridge. (Ground Floor, Jenner Wing).

These samples should NEVER be placed in the fridge after collection. Please place in the incubator in Pathology Central Reception (Ground Floor, Jenner Wing). Microscopy results are available the same day as receipt, culture in 2 – 3 days.

Molecular testing is available for *Chlamydia trachomatis* investigation. Please contact Microbiology for advice on specimen collection.

Samples of contact lens solution should be sent directly to the laboratory for analysis. If investigation for Acanthamoeba is required then please contact the Signing Microbiology SPR or consultant. Culture results for acanthamoeba are available in 5-7 days.

6.13.21 PUS, FLUID AND ASPIRATES

Send in a dry sterile bottle such as a universal or 60 ml silver top container Microscopy results available same day as receipt, culture 2 – 3 days. Some specimens may have prolonged incubation in which case a result will be issued in 5-7 days.

All pus samples, joint aspirates and ascitic fluid will have a Gram stain performed. A WBC differential will be done on all ascitic fluid with a raised WBC > 250/µl.

6.13.22 SWABS (COLOUR CODED)

Guidance for swab sample collection

1. **Wash hands with soap and water. Rinse and dry.**
2. **Pull the cap with attached swab from the tube. Do not touch the soft tip or lay the swab down. If you touch or drop the swab tip or the swab is laid down, discard the swab and request a new swab.**
3. **Hold the swab by the cap with one hand so that the swab tip is pointing toward you.**
4. **Rotate the swab for 10 – 15 s.**
5. **Withdraw the swab without touching the skin. Place the swab in the tube and cap securely.**
6. **After collection, wash hands with soap and water, rinse, and dry.**
7. **Label with patient information and date/time collected.**
8. **Transport to laboratory as soon as possible.**

Transwabs (blue tops, clear transport medium or black tops with charcoal transport medium) for general use; results available 3 - 4 days.

ENT swabs (orange top, clear transport medium) fine wire swab for use in the ear; results available 3 - 4 days.

Pernasal swab (turquoise top, black transport medium) fine wire swab for possible whooping cough. Culture takes up to 7 days.

Virocult swab (green top) for virology specimens only. **NOT** to be used for bacteriology or chlamydia because the transport medium contains antibiotics.

The site of the swab must be stated on request to ensure the swab is processed correctly.

6.13.23 INFECTIONS OF THE FEMALE / MALE GENITAL TRACT

Organism	Site Of Swab To Be Taken	Time To Result
Yeast/Bacteria	Genital swab	Microscopy – same day as receipt Culture 3 – 4 days
Trichomonas sp.	Genital swab	Microscopy – same day as receipt
Bacterial vaginosis	Vaginal/cervical swab	Microscopy – same day as receipt

N.gonorrhoeae	Endocervical swab +/- urethral, rectal and throat swabs	Culture 3 – 4 days
N.gonorrhoeae (GC NAAT) *	Endocervical swab +/- vaginal, urethral, rectal and throat swabs. Male urine	Molecular test 2 – 4 days
***Chlamydia trachomatis* (CT NAAT) ***	Endocervical swab +/- vaginal, urethral, rectal and throat swabs. Male urine	Molecular test 2 – 4 days

Outreach clinic can use Trichomonas culture broth for culture of *Trichomonas vaginalis*. These are available from the Microbiology department on request. Result available in 2-3 days.
Molecular screening for CT and GC in throat and rectal swabs using the BD CT/GC amplified DNA assay or the Abbott M2000 assay can be performed. However, these techniques are not validated for the processing of swabs from these sites.

*** Please use the specific collection devices listed below:**

- Urine collected in the Urine Preservative Transport (UPT) kit for the BD CT/GC Q^X amplified DNA assays
- Female endocervical specimen collection kit for the BD CT/GC Q^X amplified DNA assays
- Female vaginal specimen collection kit for the BD CT/GC Q^X amplified DNA assays
- Male urethral specimen collection kit for the BD CT/GC Q^X amplified DNA assays.

- Nucleic acid amplification is used for the detection of *Chlamydia trachomatis* and *N.gonorrhoeae* from genital samples at Kingston Hospital.
- Sample requirements:
- Females: Endocervical swab using chlamydia swab (Abbott orange multi-collect tubes). Swabs are available from Pathology stores.
- Males: First catch urine sample (approximately 15 ml) sent to the laboratory on the day of collection, preferably in an orange cap multi-collect tube.
- Other sites such as eye, rectal, and throat may be tested, however these sites are not validated and results will have to be interpreted with caution. Please send samples in an orange cap multi-collect tube.

6.13.24 CAPD PERITONITIS

If CAPD peritonitis is suspected please send the *whole* cloudy CAPD bag to microbiology for processing. Clear bags should not be sent.

Gram stains are performed on all CAPD specimens, regardless of the cell count. Abnormal cell counts of more than 100 WBC/μl are telephoned to the clinical team. All microscopy results are available on EPR as soon as processed and positive microscopy and culture results are routinely telephoned out to the clinical team looking after the patient.

CAPD microscopy is available day of receipt of sample; culture results take to 2- 6 days.

6.13.25 MRSA SCREENING

Routine screening for MRSA is performed by culture. Please refer to the Trust's Infection Control Policy for specific protocols regarding screening on inpatient wards.

Nose and groin swabs (blue-topped) are normally processed for MRSA culture for St George's Hospital patients.
Nose, throat and groin (black-topped) are normally processed for MRSA culture for Kingston Hospital patients
Culture results are available within 48 – 72 hours.

6.13.26 ENDOSCOPY WATERS AND BREAST MILK

Please refer to the specific Trust protocols which provide guidance regarding culture of endoscopy waters and expressed breast milk from the SGH milk bank.

6.13.27 BONE MARROW

Bone marrow samples should be inoculated into a TB Blood culture process bottle (black top), LJ slopes (x2) and Kirschners medium. These sets with instructions are available for collection from the Microbiology Department. Please contact the Department if required.

6.13.28 MYCOLOGY

Specimens for Mycology investigation (skin, hair or nail clippings) should be sent to the Department in a MycoPak or sterile universal. Microscopy results are available 48-72 hours after receipt. Culture results are available after 3 weeks or earlier if positive.

6.13.29 PROSTATITIS

Diagnosis is made by examining voided and midstream urine as well as expressed prostatic secretions. According to Meares & Stamey methods, the following samples should be sent:

- Urethral urine (VB1)
- Midstream urine (VB2)
- Prostatic secretions by massage (EPS)
- Urine voided after massage (VB3)

Specimens should be sent in a sterile universal container.

Microscopy results are available on day of receipt, culture results available in 2-3 days.

6.13.30 HELICOBACTER PYLORI CULTURE

Specimens of gastric biopsy should be collected into a sterile universal container and sent to the laboratory as soon as possible. If the specimen is small it should be placed in sterile water to prevent desiccation. Ensure that specimen is not placed in fixatives i.e. formalin.

Microscopy results are available on the day of receipt, culture results available in 4-10 days. It is advisable to contact the signing SpR/consultant prior to sending specimens for this investigation.

For *H pylori* faecal antigen please see faecal Antigen Section in the Virology Guide.

6.13.31 RESISTANCE SCREEN (OTHER THAN MRSA)

Screening for multiple antibiotic Gram negatives are done routinely for some wards/organisms including, multidrug resistant pseudomonas on GICU and multidrug resistant coliforms on NNU. Other resistance screening such as VRE (GRE) are available on discussion with the Infection Control Team.

Culture results are available within 48-72 hours.

6.13.32 MYCOBACTERIAL CULTURE

Culture for Mycobacteria on specimens other than blood, respiratory specimens and urine (see section 6.13.1, 6.13.5, 6.13.6 respectively) will be performed either when requested or when clinical details indicate so. Microscopy results are available within 24 hours and positives are telephoned. Culture results are available as soon as positive (and telephoned) and at 42 days if negative.

6.13.33 VASCULAR CATHETER AND OTHER TIPS

All vascular catheter tips from Intensive Care Units at St George's are cultured, these include:
GICU
CTCCU
NICU
NNU
PICU
All other tips will only be processed if a blood culture has been received within 2 days of line removal. Specimens not processed will be retained for 2 weeks and can be processed if the laboratory is contacted.
Kingston Hospital: all tips are cultured except urinary catheter tips
External Ventricular Drain tips and PD catheter tips are always processed.
Urinary catheter tips are not processed.
For advice regarding other tips please contact the signing SpR/consultant.
Culture results are available in 2-3 days.

6.13.34 MOLECULAR REQUEST

Specimens for molecular diagnosis such as 16S ribosomal DNA detection or specific targeted PCR can be requested on discussion with the laboratory. These will be referred to the appropriate reference laboratory. Please contact the signing SpR/consultant.

6.13.35 INVASIVE MEDICAL DEVICES

Invasive medical devices such as IUCD, pacing wire, pacemakers etc may be sent to the laboratory if an infection is suspected. Send in a sterile 60 ml universal container.

Microscopy if indicated will be available on day of receipt, culture will be available in 2-10 days.

For advice regarding other devices please contact the signing SpR/consultant.

6.13.36 BORDETELLA INVESTIGATION

Please follow chart below for Bordetella testing:

Age	<2 week cough	>2 week cough
<1 year - hospitalised	• Nasopharyngeal Aspirate/Per-nasal swab for PCR (sent to RSIL Reference Laboratory) • Per-nasal swab for culture	• Nasopharyngeal Aspirate/Per-nasal swab for PCR (sent to RSIL Reference Laboratory) • Per-nasal swab for culture • Serum for serology (sent to RSIL Reference Laboratory)
<1 year - community	• Per-nasal swab for culture	• Serum for serology (sent to RSIL Reference Laboratory)
>1 year to 5 years	• Per-nasal swab for culture	• Serum for serology (sent to RSIL Reference Laboratory)
6-15 years	• Per-nasal swab for culture	• Serum for serology (sent to RSIL Reference Laboratory)
>15 years	• Per-nasal swab for culture	Serum for serology (sent to RSIL Reference Laboratory)

For serology tests the date of onset of symptoms and pertussis vaccination history must be included to aid interpretation of the result

The South West London Health Protection Unit have introduced oral fluid testing for suspected pertussis infection in those aged 8-16 years (<17 years) only.

An oral fluid test kit can be requested by GPs and others:

- where the onset of cough is more than 2 weeks **AND**
- has not already been testing for laboratory evidence of pertussis **AND**
- the person has no known pertussis vaccination in previous year

The test kit is available from the SWLHPU (020 8812 7850). There are instructions in the test kit on how to take the sample and how to return the swab for testing.

Tests are undertaken by Respiratory and Vaccine Preventable Bacteria Reference Unit (HPA Colindale). Swab results will go back to the GP usually within three weeks of receiving the sample and cases are requested to contact the GP surgery for the result.

6.14 BACTERIAL AND VIRAL SEROLOGY

6.14.1 SERVICES PROVIDED

Send two 5-10 ml large gold**/yellow** topped bottles of clotted blood. Some tests are sent to specialist laboratories, hence there may be some delay in receiving the results.

A second specimen 7-14 days after the first may be required for demonstrating sero-conversion or rising titres.

Inclusion of appropriate clinical details including **date of onset is vital**. Requests without such information may not be processed.

6.14.2 SEROLOGICAL TESTS DONE AT ST. GEORGE'S

ASO and anti-streptococcal DNAse B	HIV type 1/2 (antibody, antigen)
Mycoplasma Gel Agglutination Test	Hepatitis A virus (IgM, Total antibody)
Syphilis (RPR, antibody)	Hepatitis B virus (HBsAg, antiHBs, HBeAg, antiHBe, antiHBc (IgM, Total antibody)
Toxoplasma (IgM, IgG)	Hepatitis C virus (antibody, antigen)
Borrelia burgdorferi (IgM, IgG)	Hepatitis E virus (IgM, IgG)
Legionella and Pneumococcal (antigen in urine)	Cytomegalovirus (IgM, IgG, IgG avidity)
Measles virus (IgG)	Epstein-Barr virus VCA (IgM, IgG)
Mumps virus (IgG)	Epstein-Barr virus EBNA (IgG)
Rubella virus (IgM, IgG)	Herpes Simplex virus (IgG)
Parvovirus (IgM, IgG)	Varicella Zoster virus (IgG)
HTLV type1/2 IgG	

Test requested	Turnaround Time (TAT)	Sample Type
Streptococal ASO and ADB	1-7 days	Yellow (clotted blood)
Mycoplasma	1-7 days	Yellow (clotted blood)
Syphilis screening and confirmation	1-3 days	Yellow (clotted blood)
Toxoplasma	1-3 days	Yellow (clotted blood)
Borrelia serology	1-3 days	Yellow (clotted blood)
Legionella and pneumococcal urine antigen test	1 day	Urine
Measles/Mumps	1-7 days	Yellow (clotted blood)
Rubella	1-3 days	Yellow (clotted blood)
Parvovirus	1-3 days	Yellow (clotted blood)
HTLV	1-3 days	Yellow (clotted blood)
HIV screening and confirmation	1-3 days	Yellow (clotted blood)
Hepatitis Serology (including HEV, HCV Ag and quantitative HBV surface Antigen)	1-3 days	Yellow (clotted blood)
EBV/HSV/VZV/CMV (including CMV avidity)	1-3 days	Yellow (clotted blood)

Urgent HIV, HBsAg, HCV and VZV results are usually available within 2-3 hours of receiving the specimen in the laboratory.

6.14.3 REQUESTS FOR SEROLOGY FOR HUMAN IMMUNODEFICIENCY VIRUS (HIV)

Requests for Serology for Human Immunodeficiency Virus (HIV) infection are accepted on the understanding that the patient has been properly counselled, and the result will be returned, under confidential cover, to the Consultant whose name is on the request form as having requested the test, or to a designated Counsellor.

Same day HIV testing is provided as a service to patients attending GUM clinic on Mondays and Thursdays. All other HIV test requests should have a result available within 24-48 hrs after receipt of the sample in the lab.

6.14.4 EMERGENCY PROCEDURES

Tests are available out of normal laboratory hours after discussion with the Consultant Virologist or KH consultant.

6.14.5 ORGAN TRANSPLANTATION

Hepatitis B virus surface antigen (HBsAg)
Human immunodeficiency virus (HIV) Antibody / Antigen
Antibody to hepatitis C virus (HCV)

6.14.6 PATIENTS ON HAEMODIALYSIS WHEN THE STATUS IS UNKNOWN

HBsAg
HCV antibody
HIV antibody / antigen

6.14.7 PATIENTS ON LABOUR WARD / DELIVERY SUITE WHEN THE STATUS IS UNKNOWN

HBsAg
HIV antibody / antigen

6.14.8 NEEDLE STICK INJURIES

The source patient is tested for **HBsAg, HCV and HIV antibody: ALL with informed consent.**

For injured person (staff) – take blood for long-term storage in the laboratory.

6.15 VIROLOGY

6.15.1 PHARYNGEAL WASHINGS/ASPIRATE/SWAB

Washings or a nasopharyngeal aspirate in the case of infants are better than swabs for recovering viruses from the throat; moreover columnar epithelial cells in an aspirate can be directly examined by immunofluorescence (IF) with specific antibodies for rapid diagnosis.

6.15.2 PHARYNGEAL WASHINGS

Ask the patient to gargle with about 5 mL of sterile water for 10-15 seconds then spit into a sterile container.

6.15.3 NASOPHARYNGEAL ASPIRATE

For lower respiratory tract infection of infants:

Attach a soft catheter to a mucus trap and introduce the tip into the nasophraynx; aspirate rapidly from the posterior pharyngeal wall using a vacuum line (50mm mercury, maximum); flush the contents of the catheter into the trap with a few mL of sterile saline – if the specimen is satisfactory it should appear opalescent due to the presence of good numbers of desquamated cells – **send immediately to the laboratory.**

6.15.4 VIROCULT SWABS (GREEN TOP) AS FOR THROAT, EYE AND LESION SAMPLES

Virocult Swabs (Green Top) must be used as they contain antibiotics to suppress bacterial overgrowth. Ensure swabs have not expired before use.

6.15.5 BAL OR SPUTUM

Bronchial lavage and Sputum should be sent in a sterile 60 mL container.

6.15.6 FLU INVESTIGATION

Nose / throat swabs, NPA, BAL and sputum samples are all acceptable as described above. Same day molecular testing is available if required. Contact Microbiology to discuss.

6.15.7 CEREBROSPINAL FLUID

Specimens sent to Virology include:

1. Meningitis cases
2. CNS system disease
3. WBC > 5
4. All CSFs where Virology is specifically requested

Please see below for details of viral PCR, including targets, test frequency and expected TAT.

Please note that for the investigation of encephalitis, serum and CSF

are required.

6.15.8 FAECES

A faecal sample is always preferable to a rectal swab. The specimen should be collected and transported in a plastic container. No transport medium is required.

In the case of suspected poliomyelitis the laboratory should be contacted immediately, a faecal specimen must be taken, together with other specimens e.g., throat swab, CSF and clotted blood.

a) Faecal Antigen Testing

The faeces specimen should be collected and transported in a plastic container to the Laboratory as quickly as possible as the sample should be tested within 72 hr of collection. Results will take 1-3 days.

The following faecal antigen tests are provided –

Helicobacter pylori
Rotavirus and Adenovirus

b) Norovirus Testing

A same day molecular testing service is available for the investigation of outbreaks during the winter months of October to March. Contact the Infection Control team immediately if Norovirus is suspected.

6.15.9 CONJUNCTIVAL SPECIMENS

6.15.10 CHLAMYDIAL EYE INFECTION

Molecular testing is available for *Chlamydia trachomatis* investigation. Please contact Microbiology for advice on specimen collection.
Please note these tests are not validated.

6.15.11 FRESH TISSUE AND BIOPSIES

For virus isolation and direct immunofluorescence place in a sterile container – small pieces that may dry out quickly should be covered with a little sterile saline.

6.16 AMNIOCENTISIS AND CORDOCENTESIS SPECIMENS

Notify the laboratory **1-2 days in advance** if possible and send direct to the laboratory by the quickest means possible (by hand, taxi).

6.17 MOLECULAR MICROBIOLOGY

6.17.1 PCRS

PCR's for respiratory (RPCR) and CSF Viral screens (VMPCR) are performed daily. In order to ensure a same day result, specimens should be received in the

microbiology laboratory by 9:30am for RPCR and 11am for VMPCR. Norovirus samples are processed daily Oct-Mar each year, with same-day results provided samples are received by 11am. Throughout the remainder of the year, Norovirus PCR screening is performed ad hoc as demand requires it.

Eye PCR is performed on Tues/Thurs and PCR screening for vesicular rash on Mon/Weds/Fri.

HSV and CTGC PCRs are performed daily, though TAT's can vary depending on batch size and whether confirmatory tests are required.

6.17.2 MOLECULAR TESTS

Test requested	Turnaround Time (TAT)	Sample Type
Norovirus PCR	Same day (Oct – Mar)	Stool
Respiratory multiplex PCR (21 targets including *Mycoplasmsa pneumoniae*)	Same day	NPA, BAL, ETT, Nose/throat swab
CSF Viral PCR (includes: HSV, VZV, Parechovirus, Enterovirus, Mumps)	Same day	CSF
Vesicular Rash (HSV/VZV)	1-3 days	Skin, vesicle, rash swabs (Green)
Eye PCR (HSV, VZV, AdV, *C. trachomatis*)	1-3 days	Eye swabs (Green)
EBV/CMV/Adenovirus multiplex PCR (EBV/CMV quantitative)	1-2 days	EDTA Blood (Purple)
Chlamydia/Gonorrhoea PCR	1-3 days	BD NAAT swab
HSV (genital)	1-3 days	BD NAAT swab (or green viral swab)
Quantitative HIV, HCV, HBV viral loads	1-3 days	EDTA Blood (purple)
HIV resistance sequencing	1-3 weeks*	EDTA Blood (purple)

- HIV viral load: 2 EDTA tubes only. No need to send a clotted blood sample unless serology required as well. If resistance testing required please send a third EDTA blood.
- HCV viral load: 2 EDTA tubes only. No need to send a clotted blood sample unless serology required as well. If genotyping required please send a third EDTA blood.
- HBV viral load: 2 EDTA tubes only. No need to send a clotted blood sample unless serology required as well. If genotyping required please send a third EDTA blood.

Ensure the samples reach the laboratory within 24 hours of collection. Serum or plasma will be separated from the primary viral load sample within 24 hours of receipt. Results will be available within 2-3 days (viral load) or 2-10 (resistance) days.

Any other viruses for molecular testing please consult the Laboratory to ensure appropriate samples are collected. Generally EDTA blood is the sample of choice.

Many tests are referred to the Reference Laboratories so may take up to 2-3 weeks for a result to come back.

Emergency results are usually available within 2-3 hours after receiving the specimen.

The repertoire of tests and sample volumes required may change in line with service developments and clinical need.

6.18 INFECTION CONTROL

6.18.1 CONSULTANTS AND SENIOR STAFF

Dr M. Laundy	Infection Control Doctor	Ext. 5673
Dr P. Riley	Deputy Infection Control Doctor	Ext. 2683
Ms S. Mehdi/Ms R. Law	Lead Nurses	Ext. 5728
Mrs J Callaway	Senior Nurse	Ext. 5675 Bleep 7898
Ms A. Floresca	Infection Control Nurse	Ext. 4081 Bleep 6797
Ms J. Kotey	Infection Control Nurse	Ext. 2646 Bleep 6312
Ms K. Hager	Infection Control Nurse	Ext. 2458 Bleep 6736
Ms M. Farragher	Infection Control Nurse	Ext. 0591 Bleep 6616
Vacant	Infection Control Nurse	Ext. 1464 Bleep 8447
Mrs H. Graham	PA	Ext 2459
Vacant	Audit and Surveillance Nurse	Ext 6316

6.18.2 LABORATORY WORKING HOURS

The Infection Control Team are available for advice and support on all aspects of hospital acquired infection and outbreak control between the hours of 08:30 and 17:30 Monday – Friday (Bleep 6798 between 16:30-17:30).

During working hours, please contact extension 2459 in the first instance.

6.18.3 OUT OF HOURS

For out of hour's enquiries, please contact the Microbiology SpR or Consultant via the Hospital Switchboard on 1000 (SG 395 and SG 624 respectively)

6.18.4 OUTPATIENT PARENTERAL ANTIBIOTIC TREATMENT (OPAT)

REFERRALS

Outpatient parenteral antibiotic treatment (OPAT) referrals can be made by contacting the following personnel after completion of a Reference form:

OPAT Nurse – Bleep 8170
OPAT SpR or Consultant – Page SG 278

Reference forms can be obtained from the OPAT webpage on the Trust Intranet. The forms can then be faxed to 5694.

7 PROTEIN REFERENCE AND IMMUNOPATHOLOGY UNIT

7.1 CONSULTANTS AND SENIOR STAFF

Dr J. Sheldon	SDU Leader, Consultant Clinical Scientist	5752
Mrs J.Harper	Senior Clinical Scientist	1918
Dr S. Linstead	Clinical Scientist	0025
Dr.Rachel Wheeler	Clinical Scientist	0025

7.2 LABORATORY WORKING HOURS

MON	TUE	WED	THU	FRI	SAT	SUN	BH
←		0800 – 1600		→	-	-	-

Note that all results are posted on the EPR/Order Comms as soon as analysis is complete. Results are best viewed this way rather than phoning the laboratory.

7.3 OUT OF HOURS

No out of hour's service available.

7.4 ENQUIRIES - WORKING HOURS

Reception/Results	0025
Clinical Advice & Interpretation	5752/0025

7.5 ENQUIRIES - OUT OF HOURS

No out of hours service is available.

7.6 LABORATORY SERVICES

This unit provides both a local and a national service for the investigation of autoimmune diseases, immunodeficiency, B cell malignancy, allergy and hypersensitivity.

7.7 REPORTS

Report production is computerised. Age-specific reference ranges are printed on the report; it is essential that the patient's date of birth is given. Clinical comments or interpretations will be provided where appropriate.

7.8 RESULTS

Most pathology reports are available via the electronic patient record (EPR) and Cerner as soon as they are authorised. In addition, hard copy reports are distributed from Pathology on weekdays.

7.9 SPECIMEN REQUIREMENTS

Most tests are done on **serum**, please use the PLAIN (no additive) tubes. One 7mL serum sample will usually do a number of tests but for advice on sample volume requirements please call the laboratory.
Urine specimens should preferably be EMU. Urine specimens should **NOT** be collected into Universal tubes containing **Boric Acid** as this will interfere in the analysis of protein concentrations. (Continued…)
Matched **serum and CSF** samples should be taken for oligoclonal bands.

Small **faecal** samples ('pea' sized is approximately 1g) should be sent in blue plastic screw-top container. After placing the sample in the container with the small plastic spoon, clean the outside if necessary and place the container in a plastic bag. Please ensure that these samples are properly labelled and are transported to the laboratory as soon as possible. Time and date of collection **MUST** be indicated on all specimens to avoid rejection. Samples should reach the laboratory within 24 hours of collection.

Samples requiring **Tryptase** for the investigation of potential anaphylactic reaction should be taken at the time of reaction (t=0hrs), 1hr, 2hrs, 3hrs, 6hrs, 12hrs and 24 hours post reaction. The sample should be sent to the laboratory immediately (within 3hrs).

Samples for **Cryoprotein** investigation require collection of serum and plasma to be taken into warmed tubes which the laboratory will supply. Please contact the laboratory when this test is required and a member of staff will attend the ward/clinic/blood room as required. If taking blood on the ward it is imperative that the requesting doctor remains available to bleed the patient into the sample tubes provided.

CSF samples for **TAU A/beta ratio** should be arranged directly with the laboratory and should be taken before 3pm. The CSF samples must be taken into 30mL opaque polypropylene Universals.

7.10 TURNAROUND TIMES

All common tests are run daily; less frequently requested tests are run at least weekly (see tables).

7.11 URGENT REQUESTS

Some investigations can be done urgently by arrangement with a senior member of the department staff. Samples for urgent analysis must reach the laboratory before 12 noon. Investigations included in this context include:-

- Anti-neutrophil antibody (ANCA)
- Glomerular Basement membrane antibody
- Paraprotein and Urine Bence Jones Protein investigation
- Tryptase
- TAU protein
- Myoglobin

A doctor must make all requests for urgent analysis. Results of tests on all urgent requests will be telephoned to the doctor as soon as they are available, provided the appropriate contact number is entered on the request form.

7.12 ADDITIONAL TESTS

Tests may be added to outpatient, primary care, and paediatric samples if a suitable sample is available (samples are stored for approximately 1 month).

7.13 REPEAT REQUESTS

Due to increasing numbers of inappropriate repeat requests for Immunology tests, the laboratory has implemented automatic blocking of repeat testing for the following tests on inpatients and outpatients:

Immunoglobulins (except monitoring B cell malignancy and immunodeficiency): No repeat within 1 year
IgG subclasses: No repeat
Thyroid antibodies: No repeat
CCP Antibodies: No repeat

Requests that are not immediately processed will be entered onto the computer with a comment describing the reason that the test has not been processed and asking the requesting physician to contact the laboratory if they have strong indications, clinical or otherwise for that request to be processed.
Samples are stored for approx. 6 weeks during which time a request can be reinstated with appropriate justification.

8 PROTEIN REFERENCE AND IMMUNOLOGY UNIT TABLES

The following table lists the major tests available and the main indications for their use. Request the tests in **bold type** as appropriate and depending upon the result we will do the follow-up investigations.

TEST/REQUEST	POSSIBLE CLINICAL ASSOCIATION	Assay Frequency (Turnaround time/days)	COMMENTS
Autoimmune rheumatic diseases - SLE, Rheumatoid arthritis			
Rheumatoid Factor	Rheumatoid arthritis	Daily (1day)	• Low concentrations may be seen in the elderly and in patients with chronic infections • Lacks sensitivity for monitoring R.A. - use CRP
Anti-cyclic citrillunated peptide (ccp)	Early Rheumatoid Arthritis	Weekly (5days)	• Used as a one-off marker for early stages of the disease.
Anti-nuclear antibodies (ANA)	Connective tissue disorders	Daily (2days)	• Low titre ANA may be seen in the elderly and associated with viral infections
Specimens showing a positive ANA will be tested for antibodies to appropriate specific antigens; homogeneous patterns will typically be tested for antibodies to double stranded DNA and speckled patterns will typically be tested for antibodies to the extractable nuclear antigens (RNP, Sm, SSA, and SSB). Other antigen specificities will be tested depending upon the clinical details or if specifically requested.			
double stranded DNA (dsDNA)	Diagnosis and monitoring of SLE	Weekly (5days)	
Ribo-nuclear protein (RNP)	Mixed connective tissue disease	Weekly (5days)	
Sm	S.L.E.	Weekly (5days)	
SSA (Ro)	Sjogrens syndrome S.L.E.	Weekly (5days)	• Associated with neonatal heart block
SSB (La)	Sjogrens syndrome S.L.E.	Weekly (5days)	
Scl-70	Systemic sclerosis	Weekly (5days)	
Jo-1	Polymyositis	Weekly (5days)	
Centromere pattern	CREST syndrome	Weekly (5days)	
Anticardiolipin antibodies (IgG & IgM) **B2 glycoprotein antibodies**	Antiphospholipid syndrome (recurrent thrombotic events, recurrent miscarriage)	Weekly (5days)	• May be primary or secondary to disease e.g. SLE
Complement C3 and C4	Immune complex diseases	Daily (1day)	• May predict lupus nephritis

TEST/REQUEST	POSSIBLE CLINICAL ASSOCIATION	Assay Frequency (Turnaround time/days)	COMMENTS
Autoimmune endocrine disease			
Polyglandular autoimmune endocrine disease may show antibodies against more than one endocrine gland			
Adrenal antibody	Autoimmune Addison's Disease	Weekly (5days)	
Pancreatic Islet cell antibody	Insulin Dependent Diabetes Mellitus	Weekly (5days)	
Glutamic acid decarboxylase antibody (GAD)*	Insulin Dependent Diabetes Mellitus Stiff Man syndrome		
Insulin Antibody*	Insulin Dependent Diabetes Mellitus	Referred (14days)	
Thyroid diseases (hyper- or hypo- thyroid)			
Autoimmune thyroid diseases show marked overlap in their serum antibody patterns.			
Thyroid peroxidase antibodies	Autoimmune thyroiditis	Weekly (5days)	
TSH receptor antibodies	Thyrotoxicosis, Grave's disease	Weekly (5days)	Neonatal hyperthyroid
Liver diseases			
Liver antibodies includes testing for mitochondrial antibodies**,** smooth muscle antibodies and liver-kidney microsomal antibodies. Low concentrations of these antibodies may be seen transiently post viral infection			
Mitochondrial antibodies	Primary biliary cirrhosis (PBC)	Daily (2days)	M2 subtype associated with PBC*
Smooth muscle antibodies	Chronic active hepatitis	Daily (2days)	
Liver-kidney microsomal antibodies	Chronic active hepatitis	Daily (2days)	
α1 anti-trypsin concentration phenotype	Liver disease	Daily (1day) Weekly(5days)	obstructive pulmonary disease
Gut diseases			
Gastric parietal cell antibodies (GPC)	Atrophic gastritis Pernicious anaemia	Daily (2days)	
Intrinsic factor antibodies	Additional test for pernicious anaemia	Weekly (5days)	
Endomysial antibodies (IgG & IgA)	Coeliac disease	Daily (2days)	In the presence of IgA deficiency only IgG antibodies may be present.
IgE and specific IgE (please specify allergens)	Presence of IgE to specific allergens can be associated with diarrhoea, vomiting, abdominal pain and anaphylactic reactions. Please contact lab for information on available allergens.	Weekly (5days)	

TEST/REQUEST	POSSIBLE CLINICAL ASSOCIATION	Assay Frequency (Turnaround time/days)	COMMENTS
Skin diseases			
Skin abs.			
Intercellular cement antibodies	Bullous pemphigus	Weekly (5days)	
Basement membrane antibodies	Bullous pemphigoid	Weekly (5days)	
IgE and specific IgE (please specify allergens)	Presence of IgE to specific allergens (both food allergens and inhaled allergens) can be associated with eczema or other allergic skin diseases	Weekly (5days)	
Renal diseases (and vasculitis)			
Glomerular basement membrane antibodies (GBM)	Goodpasture's syndrome	As required	
Anti-neutrophil cytoplasmic antibodies (ANCA)	Specimens showing a positive ANCA pattern will be tested for antibodies to specific antigens	Daily (2days)	
c- ANCA (proteinase III antibodies)	Wegener's	Weekly (5days)	Useful in monitoring disease
p-ANCA (myeloperoxidase antibodies)	Microscopic polyangiitis, Churg-Strauss syndrome, Polyarteritis nodosa	Weekly (5days)	Useful in monitoring disease
Paraprotein studies (serum and urine)	Presence of paraproteins (particularly Bence Jones protein) may be associated with renal disease.	Daily (2days)	
C3 nephritic factor*	Mesangio-capillary nephritis, partial lipodystrophy	Referred (14days)	

TEST/REQUEST	POSSIBLE CLINICAL ASSOCIATION	Assay Frequency (Turnaround time/days)	COMMENTS
Immunodeficiency and infection			
Immunoglobulins (IgG, IgA & IgM)	May be isolated immunoglobulin deficiency or affect all the immunoglobulin classes.	Daily (2days)	• Used to monitor γ-globulin replacement therapy
IgG subclasses	Indicated in patients with recurrent infections.	Weekly (5days)	
Functional antibody titres (Haemophilus Influenza B, tetanus, pneumococcus – 23 valent) Pneumococcal serotypes*	Indicated in patients with recurrent infections particularly if IgG and IgG subclasses concentrations are within reference range.	Weekly (5days)	Pre- and post-vaccination (6 weeks)
Complement (CH50)	Used to exclude deficiencies of the classical complement cascade.	Weekly (5days)	
Alternative Pathway (AP50)*	Used to exclude deficiencies of the alternative complement cascade	Referred (21days)	
Mannose Binding Lectin (MBL)*	Indicated in patients with recurrent infections.	Referred (14days)	
Neopterin	Marker of viral infection and GVHD		
NitroBlue Tetrazolium (NBT)*	Test for neutrophil function - defective in chronic granulomatous disease.		Samples referred directly to Immunology,Great Ormond St Hospital
8.1.1 LYMPHOCYTE SUBSETS	Performed by Haematology - St George's Hospital		

TEST/REQUEST	POSSIBLE CLINICAL ASSOCIATION	Assay Frequency (Turnaround time/days)	COMMENTS
Allergy and hypersensitivity **IgE and specific IgE (the following list shows suggested allergen panels for groups of symptoms)**			
Symptoms	**Suggested specific IgE panel**	Weekly (5days)	
Asthma, all year	HDM, cat, dog		
Asthma, all year worse at night	HDM, cat, dog, mixed feathers		
Seasonal rhinitis,	HDM, cat, dog, mixed grass (trees and weeds available on request)		
Eczema	HDM, mixed foods		
Food allergy screen	Mixed foods (includes egg, milk, wheat, peanut, soya, cod fish; available individually if specified)		
Peanut allergy	Mixed nuts, peanut		
Insect venom anaphylaxis	Bee venom, wasp venom		
Penicillin allergy	Penicillin G and V		
Wheat intolerance	Wheat + anti endomysial antibodies		
Individual allergens:	We have a large number of other allergens please telephone to check availability		
Tryptase	Potential anaphylactic reactions; samples should be taken immediately,1hr, 2hrs, 3hrs, 6hrs, 12hrs and 24 hours post reaction	Weekly (5days)	
C1 esterase inhibitor (Ag concentration & functional activity)	Hereditary angioedema Anaphylactic type reactions	Weekly (5days)	
Neurology			
Acetyl choline receptor Ab.	Associated with myasthenia gravis	Weekly (5days)	• correlates with disease • neonatal MG
MUSK Ab*	Associated with seronegative myasthenia gravis	Referred (21days)	
Oligoclonal Bands	Associated with multiple sclerosis	Weekly (5days)	
Paraneoplastic Ab* (Neuronal, Purkinje)	Associated with malignancies	Weekly (5days)	
Ganglioside Ab* GM1, GD1b GQ1b	Associated with Guillain-Barre syndrome Associated with Miller Fisher syndrome	Referred (21days)	
Voltage-gated K^+ channel Ab*	Associated with acquired neuro mytonia (NMT)	Referred (21days)	
Voltage-gated Ca^+ channel Ab*	Associated with Lambert-Eaton syndrome (LEMS)	Referred (21days)	
Myelin-associated glycoprotein Ab*	Associated with IgM paraproteins	Referred (21days)	

TEST/REQUEST	POSSIBLE CLINICAL ASSOCIATION	Assay Frequency (Turnaround time/days)	COMMENTS
B-cell Malignancy			
Paraprotein studies (Serum)	B cell malignancies e.g. myeloma, Waldenstroms macroglobulinaemia, lymphoma.	Daily (2days)	• Used for diagnosis and monitoring • Paraproteins can occur incidentally without associated B cell tumours, particularly in the elderly.
Bence Jones protein (urine)		Daily (2days)	• May be the only marker of the malignancy (approx. 20% of myeloma)
Immunoglobulins	Monitor secondary immune deficiency associated with B cell tumours	Daily (2days)	
β2 microglobulin	Prognostic marker in myeloma	Daily (2days)	
Miscellaneous			
Anticardiolipin abs. B2glycoprotein abs	Antiphospholipid syndrome (recurrent thrombotic events, recurrent miscarriage)	Weekly (5days)	May be primary or secondary to disease e.g. SLE
Cryoprotein investigation	Vasculitis, Raynauds	Daily (2days)	Please call laboratory - special specimen collection ESSENTIAL
TAU protein	Investigation of CSF leakage	Daily (1day)	
Myoglobin	Investigation of rhabdomyolysis	Daily (1day)	

*** All tests indicated are referred to other laboratories with specialist interest in these proteins/antibodies. For information regarding these tests and the laboratories used please apply to the Immunology Laboratory.**

9 PNEUMATIC (VACUUM) TUBE SYSTEM - VTS

The Pneumatic Tube System is only to be used for sending pathology samples to the laboratories and sending urgent drug requests to Pharmacy.

DESTINATION ADDRESS	CODE NUMBER (+E)
Central reception (for Chemical Pathology, Haematology/Blood Transfusion)	101 , 3, 103, 1012 or 1032
Microbiology	111 or 2
Cellular Pathology	104 or 5
Pharmacy	301 or 6

- **DO NOT DROP LOOSE SAMPLES INTO THE SYSTEM**
- **DO NOT SEND BLOOD CULTURE BOTTLES OR GLASS SAMPLE CONTAINERS IN THE SYSTEM.** SEND THESE VIA PORTERING SERVICES FOR COLLECTION OR DELIVER DIRECTLY TO THE LABORATORY YOURSELF.
- **IF YOU ARE AT ALL UNSURE OF HOW TO USE THIS SYSTEM CORRECTLY… STOP!!! DO NOT PROCEED.**
- **ASK SOMEONE TO SHOW YOU THE CORRECT PROCEDURE OR CALL FOR A PORTER TO COLLECT THE SAMPLE.**
- **ALTERNATIVELY, IF THE SAMPLE IS URGENT, TAKE IT TO THE APPROPRIATE LABORATORY YOURSELF.**

9.1 PATHOLOGY SAMPLES

All samples MUST be placed in a sample transport bag and sealed, along with the appropriate request form(s), and then placed into the VTS carrier ensuring it is closed securely at both ends.
It is essential that forms and specimens carry:

1. Patients full name
2. Hospital number
3. Time & date of sampling
4. Sex
5. Date of birth
6. A clear destination for the report

Specimens and forms without this information may be returned causing a delay to the patient!

9.2 TO SEND A SAMPLE

WAIT UNTIL THE GREEN LIGHT HAS EXTINGUISHED BEFORE LOADING ANOTHER CARRIER!

1. Load the samples, with request forms, into a carrier and close the lid, making sure that both ends are securely shut. **(Partly open carriers may cause system shutdown)**
2. Enter the carrier into the air tube station port.
3. Enter the destination address (see list under main heading 'Pneumatic Transport System')
4. Use '*' key to change input. When the corrected address is displayed confirm by pressing 'E' key. If display shows (destination accepted), the carrier will leave automatically when the system is free.

NEVER remove a carrier after pressing the E button. The system will waste time looking for the carrier you have taken out.

NEVER try to send two carriers at once or, stand one on top of another.

9.3 PROHIBITED SAMPLES

The majority of Pathology specimens can be sent through the Air Tube System. However, you must never send blood culture bottles or glass specimen containers via this system. Collection of these samples can be arranged by telephoning the Porter on duty.

9.4 UNDERSTANDING DISPLAYED MESSAGES

Always read the LCD message display before sending a sample. It can tell you a lot about the current status.

9.5 COLOUR OF INDUCTION LIGHTS

These need to be interpreted in conjunction with the displayed message.

a) No light showing - The usual state of the station when ready to use.

b) Green light - A carrier has been accepted and is ready to depart.

c) Yellow light - A yellow light means that a carrier is about to arrive. You will still be able to address a carrier, but it will not leave until the other one has arrived.

d) Red light - There is a fault – the system cannot be used for the moment.

9.6 MESSAGE SCREEN

a) Normal message

These are not fault messages but indicate the status of your own or another station.

"Address accepted"

This is displayed after the system has accepted the address but before the carrier departs. The green light will also be on. You will need to wait for this carrier to go before you can load another one.

"Address invalid"

You have entered a number, which the system does not recognise.
Press the '*' button to re-enter the correct number.

b) Fault messages

Any of the five displays below, which are usually accompanied by a red light, indicate that there is a fault in the system and that attempts are being made to rectify it. You cannot use the system nor do anything to rectify the fault. It should be back in use within a few minutes.

"System in Freerun"
"Test Equipment"
"Address is not in use"
"Programming in Progress"
"Transport Impossible"
"Address blocked"

The common cause of the last message is a build-up of returned carriers in your station cabinet or basket. It is possible for the empty carriers in your station to fall in such a way that they block other carriers from returning. If you notice this message removes the carriers from the lower cupboard/basket and place to one side.

In the event of a problem with the system, please contact bleep 6354 or extension 2651 during weekdays between 09:00 and 16:30 hrs. or bleep 6407 out of hour and at weekends.

9.7 SOME COMMON QUESTIONS

What happens if there are no carriers?

Then you can't use the system for the moment! (Check for spare carriers in your ward or department)
Send samples in groups rather than individually at busy times. Otherwise you will soon run out of carriers!

What happens if there is already a carrier in the station?

If the green light is on the system is probably waiting for a path to become available. Do not remove it, but try sending the carrier again in a few minutes.

What happens if the carrier doesn't move?

The system will be waiting for a path to become available and this may take several minutes at very busy times, but if the green light is on the carrier will go.

What happens if I enter the wrong address?

Nothing; unless you press the 'E' key; Just press the '*' key to clear your last entry and start again. Check that the correct address is displayed and then press the 'E' key. If you have entered the wrong address and pressed 'E', leave it, and do not remove the carrier. Let it go and contact the receiving station.

What happens if I realise a sample has gone to the wrong place?

Telephone the department concerned and tell them what has happened. This is especially important as there is a possibility that an urgent sample will be ignored if no one knows it is there.

What happens if the contents of a carrier are damaged?

Telephone the sender to explain the nature of the problem and seek advice on what to do next. Do not send damaged materials or carriers through the system.

What happens when a carrier returns?

The system will not send any carriers if the carrier is being returned to the station. On return it will simply drop into the basket below. Always ensure that these carriers do not get trapped in such a way as to block the station.

What happens if the system is contaminated?

If the contamination affects just the carrier take it to central reception. Do not send it through the Air Tube System.

If the outside of the carrier is contaminated or you think the tubing it may be affected, contact the shift Technician, during normal working hours on Bleep no. 6354. Out of hours Bleep is 6407.

9.8 CORRECTING FAULTS

The system will correct many faults automatically. If there is a fault that you think has not been corrected contact the Shift Technician on bleep number to 6354.

Outside working hours the Shift Technician may be contacted on bleep number 6407.

9.9 ALTERNATIVE TRANSPORT ARRANGEMENTS

Most faults are corrected quickly and no alternative transport system will be available. Porters will not respond to requests in this situation.

If a breakdown is more serious than the portering staff will be informed of the position and will be ready to accept requests to collect urgent specimens.

9.10 CABINET DOORS AND SECURITY

Confidential patient data and potentially hazardous clinical material will be sent through the air tube. It is therefore essential that only authorised personnel have access to the system and not members of the public. The nurse manager on each ward will provide the appropriate PIN number to those who need access to the station cabinet. The cabinet doors **MUST** be kept locked and the security **PIN** number used responsibly.

There is no link between the digital lock on the cabinet door and the rest of the Air Tube System.

Please do not use the Air Tube System unless you have received the proper training. For further instructions please contact:

The Phlebotomy Supervisor on extension 1733 or bleep number 6500.