Lancashire Teaching Hospitals
NHS Foundation Trust

PATHOLOGY USER GUIDE
Directorate of Pathology

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Find us

ROYAL PRESTON HOSPITAL

Department of Pathology, Royal Preston Hospital, Sharoe Green Lane, Fulwood, Preston PR2 9HT

Tel: 01772 – 522607

FROM THE MAIN ENTRANCE

Go past the Main Outpatients Reception Desk down the long corridor. Turn right at the second crossroad. Pathology is clearly signposted ¾ way down this corridor on the right.

CHORLEY & SOUTH RIBBLE HOSPITAL

Department of Pathology, Chorley and South Ribble Hospital, Preston Road, Chorley, PR7 1PP

Tel: 01257 – 245255

FROM THE MAIN ENTRANCE (LEVEL 2)

Go past the main hospital reception desk and turn right.
Take the lift or stairs up one floor to Level 3
Exit left and proceed approximately 100 metres down the corridor. Pathology Reception is on the left-hand side. All directions are clearly signposted.
(For information on Pathology Services at Chorley & South Ribble Hospital, see page 72 onwards.)

Introduction

Pathology Services are offered at laboratory sites on Royal Preston Hospital and Chorley & South Ribble Hospital and are part of the Lancashire Teaching Hospitals NHS Foundation Trust. www.lancsteachinghospitals.nhs.uk

The laboratories provide a range of analytical and advisory services for The Trust, both inpatients & outpatients, General Practitioners and offer diagnostic services to a range of other health care providers. As would be expected of a large hospital, the service is backed up with training and research designed at improving patient care.

Apart from Point of Care Testing & Andrology, all departments in the laboratory are accredited by UKAS to standard ISO 15189: 2012. Users may use the links provided on the individual department sections of this guide to access the accredited test schedules on the UKAS website.
Any subsequent changes will be communicated via the GP Share Point or updates to this User guide.
The UKAS logo is not used on reports but will appear on letters & communications as appropriate.

Turnaround times, which are set by The Royal College of Pathologists or according to clinical requirements, are monitored and reviewed regularly at departmental quality meetings. There is regular clinical audit, and the Pathology Laboratory is proactive in continual improvement.

Most departments are involved in various research projects, both academic and commercial. If you are considering undertaking any research or trial work, please contact the individual department.

The Pathology Directorate is made up of the department of:

Blood Sciences comprising-	**Cellular Pathology** comprising:	**Microbiology** comprising:
• Clinical Biochemistry • Haematology, including coagulation. • Blood Transfusion • Immunology • Point of Care & Rapid Testing • Anticoagulant Service • Phlebotomy	• Histopathology • Cytopathology • Neuropathology • Immunocytochemistry & Electron Microscopy • Mortuary	• Virology/Serology • Bacteriology • Molecular • OPAT • Andrology

Each provides a full range of services including specialist medical and scientific advice from its consultants & scientists. The departments are clinically led, being staffed by around 300 scientific, technical, clerical and support staff who provide a flexible high-quality service. All departments have a high degree of equipment automation and are fully computerised.

The Pathology laboratory at Chorley deals with a limited range of urgent Clinical Biochemistry, Haematology and Blood Transfusion requests.
Haematology & Microbiology department provide services in support of the **NHS Screening programmes ANNB (Antenatal and newborn screening) & IDPS (Infectious diseases in pregnancy screening)** respectively.

General Information

CLINICAL BUSINESS UNIT MANAGER

Dorothy Walmsley is the Clinical Business Unit Manager for the Diagnostic Division and has overall responsibility for the Pathology Laboratories at the Lancashire Teaching Hospitals Trust.

SPECIALIST BUSINESS MANAGER

April Hoodless is the Specialist Business Manager (Acting) for Pathology.

CLINICAL DIRECTOR

Dr David Orr is the Clinical Director for the directorate of Pathology.

COMMUNICATION WITH USERS

Pathology is involved in numerous Trust meetings with clinicians both within the Directorate and with other Directorates. The Specialist Business manager and the Governance Manager represent Pathology at the Divisional Governance and or Safety & quality meetings to ensure the compliance to trusts policies (PSIRF, Duty of Candour, risk management policy, etc.) The Duty of Candour policy entails disclosure to patients, users and any other relevant persons regarding incidents that resulted in harm. The directorate offers all patients opportunity to receive a copy of the report of any such incident investigation and encourages participation of all users in the investigation and documentation of learning.
There is regular communication with GPs through the GP Liaison Groups & Practice Managers Meetings chaired by the clinical or laboratory director. Senior management attend relevant Trust meetings & regular meetings are held with CCGs. Senior staff are happy to visit GP practices to discuss Pathology services at any time.

For visitors to the department at Preston, parking is usually possible in the Main Visitors Car Parks.
Feedback regarding the quality of Pathology services is audited regularly and all the above-mentioned meetings or interactions offer patients and service users the opportunities to provide helpful information to aid in the selection of examination methods and or review them. The feedback is utilised to improve the quality of the pathology service.

Members of staff from the Pathology Directorate will be pleased to visit any GP Practice, hospital or department for service discussion and would welcome the opportunity to discuss the service as required.

COMPLAINTS

Complaints are handled promptly in line with the Trust policy with local resolution where possible.
Customer Care & PALS policy & Procedure.
Patient concerns or complaints should be directed to our Patient Experience and PALS Team who are available by emailing **PALS@lthtr.nhs.uk** or by calling 01772 522 972. Complaints are acknowledged within 3 working days of receiving it and must be made withing 12 months of date of the circumstances being complained about/happened or the date the person raising the complaint found out about it, whichever is the later date. The directorate is committed to maintaining confidentiality and protecting privacy throughout the process and only collect/disclose information to those staff that are deemed as involved in the consideration of the complaint.

DEMAND MANAGEMENT

Each department has quality objectives which include demand management. Activity is monitored departmentally. When significant changes are noted, audits are undertaken to reduce the number of unnecessary tests and to help ensure that appropriate tests are used.

SPECIMEN CONTAINERS

Please note that pathology directorate currently uses Sarstedt Monovette blood specimen containers. Stocks can be obtained via Pathology Reception using the appropriate order forms available from the department. Please allow 3 days for orders to be fulfilled; NB please state your location clearly.

Specimens taken using other blood collection systems may have different colour coding than those listed within this User Guide. Please contact the Pathology Reception for clarification.
Where possible collect the volume stated on the sample container, e.g., 7.5mL for gel tube. For coagulation studies, the tube MUST be filled to the correct volume. In case of difficulty with collection of the required volume contact the laboratory for advice.

HEALTH & SAFETY
The laboratory has a Health & Safety Committee, which is led by the directorate H&S Responsible Officer. This group meets regularly, and minutes of the meetings are recorded. This group also liaises with the hospital Health & Safety Committee to implement Trust procedures.

INFORMATION GOVERNANCE
The Pathology department is committed to meeting all information security obligations to meet the needs of users, clients, patients, and staff and protect personal information. All systems that hold patient identifiable information are managed in accordance with the trust IM&T policies ensuring compliance with national standards for Information Governance and data security. All systems and processes are risk assessed and audited at regular intervals to ensure this compliance is maintained.

POINT OF CARE & RAPID TESTING
Point of Care/Rapid testing including point of care devices, tests & requests are managed by the Rapid/Point of Care Lead BMS. POCT is managed in line with the POCT Trust policy. P16 Point of Care Testing Policy

LABORATORY HOURS
Haematology, Blood Transfusion & Clinical Biochemistry on both sites are open 24 hours a day, 7 days a week. Routine work is accepted between 8.30 a.m. & 5.00 p.m. Monday to Friday & 8.30 a.m. to 12.00 p.m. Saturday & Sunday. Urgent analysis is available for any hospital requests and GPs at any time during this period if the Laboratory is contacted and test arranged by prior notification.
The departments of **Histopathology, and Immunology** are open from 9 a.m. to 5 p.m. Monday to Friday.

Microbiology Routine specimens are accepted between 8.30 a.m. and 5.00 p.m. on Monday to Friday, 8.30 a.m. to 12.00 p.m. on Saturdays. On Sunday urgent in-patient specimens will be accepted until 12.00 p.m. Outside normal laboratory hours, urgent in-patient specimens will be handled by the Biomedical Scientist (BMS) on call, who must be contacted directly via the hospital switchboard on telephone 01772-716565. There is always a medical Microbiologist on call for clinical advice and can be contacted via the hospital switchboard. PLEASE DO NOT LEAVE AN ANSWERPHONE MESSAGE FOR THE ON-CALL MICROBIOLOGY BMS, we cannot guarantee these will be responded to in a timely manner.

On-call Pathology is available outside these hours, via the Royal Preston Hospital switchboard (01772 - 716565) or by directly bleeping the relevant departments. On-call Consultant advice is available 24 hours a day via the Royal Preston Hospital switchboard.

USEFUL TELEPHONE NUMBERS

Preston Pathology Reception	01772 522 607
Chorley Pathology Reception (**NOT for results)**	01257 245255
GP - Results Enquiry Line	01772 523 200
Help with Remote Access	01772 522 142
Royal Preston Hospital Switchboard	01772 716 565

QUALITY ASSURANCE

Every effort is made to ensure the correct result on the right patient is received by the requesting physician with the minimum of delay. All staff are qualified for the roles that they perform & competency assessed at regular intervals. There is an audit schedule in place which ensures continual monitoring of quality within the department.

Long term stability of methods is ensured by employing extensive Internal Quality Control and External Quality Assurance processes. All departments participate in UKAS accredited EQA schemes if available or inter-laboratory comparisons.
Performance is reported to the laboratory director via the departmental quality assurance meeting.
Additionally, all Pathologists and Clinical Scientists participate in relevant interpretive External Quality Assurance schemes where available.
Each laboratory is accredited by United Kingdom Accreditation Service (UKAS) in accordance with the recognised International Standard ISO 15189:2012 (with the exceptions of Point of Care Testing and Andrology). This accreditation demonstrates technical competence for a defined scope and the operation of a medical laboratory management system.

TEST RESULTS ACCESS

The directorate will only issue out results to healthcare staff who are involved in the care of the patient. Patients and/or relatives of patients are requested to contact their GP or consultant to get information, updates and results
GPs can view Pathology results for patients registered at their surgery via their clinical system or the Sunquest ICE system. For access to ICE, please contact the Pathology IT department pathologyit@lthtr.nhs.uk

Each department produces electronic results for patients on the Harris Flex system and via GP links. Printed reports (paper copies) can be made available on request.

Identified critical results will be phoned to GP locations during routine hours and out of hours results will be passed onto to out of hours primary care service for review and action.
It is the responsibility of the requesting consultant/GP in charge of the patient to review, acknowledge and take appropriate action following issue of results.
Analytical methodology is available on the printed report or is stated within the UKAS schedule for accredited departments. Links are embedded in the relevant sections of this guide.
Only results for the monitoring of anticoagulation therapy are communicated directly to patients.

SPECIMEN COLLECTION AND TRANSPORT

All users are expected to transport samples and requests to the laboratory as soon as possible or at the very least on the day of collection. This will ensure timely and safe transportation to keep the time between collection and receipt in the laboratory appropriate, which will prevent deterioration of sample integrity and provide reliable results. The laboratory undertakes audits for monitoring the temperature, transport times and adequacy of transport systems.

From General Practitioners
Transport is provided for all General Practitioners served by the Laboratory for the collection of specimens and delivery of reports. For further information on this service, please contact Lisa McKee, Pre-Analytics Manager on 01772 528305

When the Laboratory is closed, specimens can be delivered to the specimen hatch situated at the front door of the laboratory on Main Street and the bell(siren) operated. The bell should be pressed briefly to alert staff. Transport boxes from other sites may be delivered to switchboard out of hours. These will be collected by a porter & delivered to the Pathology Reception desk.

Public Holidays – Information regarding arrangements is provided by Pathology prior to each holiday period.

REQUESTING PATHOLOGY WORK

Within the hospital
Whenever possible, requests for Pathology tests should be made electronically. In the event of Harris Flex downtime **only**, white downtime forms can be used. The sample collector & date time of is recorded electronically when Harris Flex is used & must be provided on the request form during downtime. For those areas that do not have access to electronic ordering, forms for Clinical Biochemistry & Haematology are combined. The other departments have separate request forms. Please use the correct form for the test required. The sample collector & date/time of collection MUST be provided on handwritten forms.

General Practitioners
For General Practitioners, the ICE electronic requesting system should be used wherever possible. The sample collector & date/time of collection MUST be supplied on ICE forms. If not available, there is a single request form for all routine Clinical Biochemistry, Haematology, Immunology, Histology and Microbiology Services. All other Pathology departments have their own request forms. Again, sample collector & date/time of collection MUST be provided.
Whichever form you use, there are minimum data sets required and relevant clinical details should be added to ensure appropriate test selection. 3 patient identifiers are required on the request form, 2 of which must be present on the specimen label. Failure to fill in the form correctly will result in delays and may result in the specimen not being processed.

a. Patient's full name
b. Date of birth
c. NHS number (Where available)
d. Date & time of collection
e. Patient's Consultant/G.P. code
f. Test requirements
g. Valid signature
h. Location
i. Identify **URGENT** requests clearly

For the supply of request forms please complete the appropriate order form and send to Pathology Specimen Reception at Preston.

All specimens should be placed in a sealed bag prior to transporting to the laboratory.

High Risk Specimens
The sender **MUST** ensure that clinical details supplied on specimen and request forms contain clear information regarding the nature of test being requested and sufficient detail to inform laboratory staff upon the safety precautions they need to take in order to process the specimen without risk of infection.
Medical staff should ensure that appropriate information, including relevant travel history, is provided in order to alert laboratory staff of potential dangers.

Specimen Volume
It is important to ensure that, wherever possible, sufficient specimen is supplied for all of the tests requested.
General advice for blood tubes is to collect the volume indicated on the Sarstedt Monovette tube. For some tests, e.g., Coagulation Screen, the blood tube **MUST** be filled to the line indicated on the tube or the test cannot be performed.
If insufficient volume is present for all tests requested to be performed, the laboratory will usually determine which shall be reported.
For advice, please contact the laboratory.

Specimen Rejection
Failure to comply with the requirements above may result in the request not being processed.
When a request is rejected prior to analysis, in the case of labeling errors or minimum data set failure either an electronic report is issued to the requester as soon as is practically possible or the requesting location will be contacted verbally where feasible. When the specimen is precious or unrepeatable the responsible department will make every effort to contact the requesting physician to determine whether the specimen may be safely analysed. Other rejected requests will be reported via the Pathology reporting processes.
For more information, please refer to the Pathology Specimen Rejection policy available on the intranet.

Clinical Biochemistry Department

GENERAL INFORMATION

The Clinical Biochemistry Department provides a comprehensive diagnostic service and some specialised services.

The Department is UKAS accredited to ISO 15189: 2012 Medical Laboratory No. 8549, the schedule of accreditation & analytical methodology can be found using the link.

Clinical Biochemistry Schedule of Accreditation

8549

A summary of the more common tests routinely performed, including reference ranges and collection details is given on pages 15 to 23. Details on more specialised tests undertaken are available via the Duty Clinical Biochemist.

All specific enquiries regarding clinical advice and interpretation, should be made to the duty Biochemist.

The department is pleased to answer enquiries about the interpretation of test results, where appropriate, comments are made on the reports.

URGENT REQUESTS

All in-patient work is given priority and is analysed for any of the range of tests listed below, as soon as reasonably possible after receipt. However, in genuine emergencies, from Inpatients or General Practice, the requesting clinician **must** contact Clinical Biochemistry via switchboard to give details of the urgent request. If there is no reply after a reasonable period, ask switchboard to contact the Biomedical Scientist on duty via Bleep.

Tests available:

- Urea and Electrolytes (sodium, potassium, urea, creatinine)
- Bone Profile
- LFT
- Glucose
- Amylase
- Paracetamol & Salicylate
- Troponin T
- HCG (requests made at Chorley will be referred to Preston))
- Blood gases
- Bicarbonate
- Osmolality
- Lithium (requests made at Chorley will be referred to Preston)
- Magnesium
- Iron (requests made at Chorley will be referred to Preston)
- CK
- Lactate
- Ammonia
- CRP
- BHBD (requests made at Chorley will be referred to Preston)
- Carboxyhaemoglobin
- Gentamicin, Amikacin & Vancomycin levels
- IL6 (Interleukin 6) (requests made at Chorley will be referred to Preston)
- Insulin & C-Peptide (requests made at Chorley will be referred to Preston)
- Procalcitonin (requests made at Chorley will be referred to Preston)
- CSF Protein (requests made at Chorley will be referred to Preston)
- CSF Glucose (requests made at Chorley will be referred to Preston)
- CSF Xanthochromia (requests made at Chorley will be referred to Preston)
- Other tests may also be available, by special arrangement.

MEASUREMENT UNCERTAINTY AND REFERENCE CHANGE VALUES

All biochemical results are subject to a degree of measurement uncertainty. This may be due to a range of factors including:

- Pre-analytical factors
- Biological variation within an individual
- Analytical measurement imprecision

If you require further information on the measurement uncertainty of an individual test, please contact the Duty Biochemist.

Reference change values allow us to assess the significance of differences in serial results from an individual, taking into account the biological and analytical variation of a particular test. Reference change values for all Biochemistry tests are available on request from the Duty Biochemist.

PROFILES

Common profiles are:

Profile	Tests
U & E	Sodium, potassium, urea, creatinine, eGFR
Bone	Calcium, phosphate, alkaline phosphatase, albumin, adjusted calcium
Liver	Albumin, total protein, ALT, bilirubin, alkaline phosphatase, gamma GT
Fasting lipid	Cholesterol, triglyceride, HDL, LDL
TFT	TSH will be initially measured FT4 and FT3 will be measured depending on the result and clinical information.

Adding further tests to an existing request

Under normal circumstances and for all urgent requests, a new specimen should be collected if further tests are required. Where circumstances are such that an add-on test is necessary, the following procedure must be followed.

- Complete a paper add on request, (necessary for audit) available from the intranet under Pathology services, the request must have the full *minimum data set* for requesting, the additional tests required and the laboratory ID number of the original specimen (this is the "G" number, which can be found on ward computer). This number is used to track specimens throughout Pathology from receipt to archived storage and is therefore **essential.**
- Please write clearly "Add-on Tests" in the clinical details box and the contact name and phone number of the requesting doctor. There is **no need to telephone** the laboratory, as providing there is sufficient specimen remaining and the above information is provided, the analysis will be carried out as soon as reasonably practical after the new request card is received.
- Send the add-on request form to the Laboratory, preferably via the air tube or deliver by hand.

Please note the following restrictions: -

- Tests can only be added on as routine requests, a new specimen and request form is required for urgent tests.
- Generally, tests can only be added to serum gel tube specimens for up to 24 hours after specimen collection. If the specimen is unsuitable or insufficient for the requested add-on tests this will be reported back to the user**.** LDH is unsuitable for add-on tests.
- Contact the duty biochemist with the details if you wish to discuss a particular problem.

Advice on Interpretation and Investigations

During normal working hours, Clinical Biochemists are available to give advice on appropriate testing and the interpretation of results. Urgent out of hours' advice is also available. Please contact the switchboard at Royal Preston Hospital.

Dynamic Function Tests

Interpretation, advice and protocols on dynamic function tests such as Synacthen tests, assessment of renin and aldosterone etc. and requirements for special investigations such as insulin or gut hormones are available from the department. It is always advisable to contact the laboratory prior to undertaking any of these tests to ensure appropriateness of specimen, transport and storage. As some specialist tests are sent away for analysis, the result may take up to two weeks or longer to be produced. The laboratory will be able to advise on this.

Nutrition
Members of Clinical Biochemistry department are involved with the Trust Nutrition Team. Please contact Dr Myers or Miss R Allcock for advice.

APPROXIMATE TEST RESULT AVAILABILITY (Routine)

The times quoted exclude any transport time & relate to time of receipt in the laboratory, to result.
The complexity and time taken to perform an assay, along with availability of equipment and staff, are the main limitations on the frequency of analysis. Other factors are clinical demand, cost-effective batch size, time effective batch size and in-use reagent stability. However, the tables on pages below provide guidance on the result availability of the common analytes. Certain tests are sent away for analysis and, whilst performance of these laboratories is monitored, the turnaround time is out of our control. Please contact the laboratory if further information is required on turnaround times or result availability.

SPECIMEN CONTAINERS

For blood tests. the appropriate Sarstedt Monovette tube should be used. For LTHTr locations & GP Practices, these are available from Pathology reception using the appropriate order form. Paediatric tubes are available on request. Please allow 3 days for delivery
For random urinalysis, the Sarstedt Urine Monovette MUST be used wherever possible, ordered from NHS supply Chain, order number **KTH124**. This will ensure an efficient delivery of the required result & eliminates the need for using sharps when collecting catheter urine.

Requests for Protein/Albumin analysis on body fluids such as Pleural fluid, Ascitic Fluid etc. require a 7.5ml brown capped Sarstedt Monovette container. Requests for glucose analysis require a 2.7ml Fluoride EDTA Sarstedt Monovette container. Specimens not received in these containers will be rejected.
NB: The above advice relating to body fluids does **NOT** relate to CSF. CSF should be in a clear universal container; a minimum of 0.5ml in each vial supplied will enable analysis to be completed (1.0ml for Xanthochromia)

Analysis for faecal occult blood requires a FIT kit. N.B. This test is only available if patients do not have rectal bleeding and fall within the NICE guidelines NG12.

Tests analysed daily:

Test name	Result Availability	Specimen container
AFP	Usually same day	Gel Tube
Ammonia*	Usually same day	Grey or Red capped EDTA on ice *
Amylase	Usually same day	Gel tube
Anti-convulsant drugs	Usually same day	Gel tube
BHBD	Usually same day	Gel tube
Bicarbonate	Usually same day	Gel tube
Bile acids	Usually same day	Gel Tube
Blood gas*	Usually 30 minutes	Lithium heparin on ice *
NT ProBNP	Usually same day	Gel tube
Bone profile	Usually same day	Gel tube
Ca 125	Usually same day	Gel tube
Ca 153	Usually same day	Gel tube
CEA	Usually same day	Gel Tube
Cholesterol	Usually same day	Gel tube
CK	Usually same day	Gel tube
C-Peptide	Usually same day	Gel tube*
Cortisol	Usually same day	Gel tube
CSF Glucose	Usually same day	Yellow Fluoride EDTA
CSF Protein	Usually same day	Clear Universal container
CSF Lactate**	Usually same day	Clear Universal container **
Cystatin C	Usually same day	Gel tube
Digoxin	Usually same day	Gel tube
Direct LDL	Usually same day	Gel tube
FSH and LH	Usually same day	Gel tube
Gentamicin / Vancomycin / Amikacin levels	Usually same day	Gel tube NB: Analysed on behalf of Microbiology
Glucose	Usually same day	Yellow Fluoride EDTA
HCG	Usually same day	Gel tube
Insulin	Usually same day	Gel tube*
IL 6 (Interleukin 6)	Usually same day	Gel tube
Iron/TIBC	Usually same day	Gel tube
Lactate*	Usually same day	Lithium heparin on ice*
LDH	Usually same day	Gel tube
Lipid profile	Usually same day	Gel tube
Lithium	Usually same day	Gel tube
Liver function test	Usually same day	Gel tube
Magnesium	Usually same day	Gel tube
Oestradiol	Usually same day	Gel tube
Osmolality	Usually same day	Urine Monovette/Gel tube
Paracetamol/Salicylate	Usually same day	Gel tube
PBG screen	Usually same day	Urine (Protect from light)
Porphyria screen (urine)	Usually same day	Urine (Protect from light)
Pre-Eclampsia Markers	Usually same day	Gel tube
Procalcitonin	Usually same day	Gel tube
Progesterone	Usually same day	Gel tube
Prolactin	Usually same day	Gel tube
PTH	Usually same day	Gel tube
PSA	Usually same day	Gel tube
Renal profile	Usually same day	Gel tube
Testosterone	Usually same day	Gel tube
Theophylline	Usually same day	Gel tube
Thyroid function	Usually same day	Gel tube
Troponin T	Usually same day	Gel tube
Urate	Usually same day	Gel tube

Urea & Electrolytes	Usually same day	Gel tube
Xanthochromia (CSF)	Usually same day	Universal container (4th tube,1ml min) Must be protected from light
Vitamin D	Usually same day	Gel tube

*Must arrive in the lab within 15 minutes of collection **Stable for 3 hours at 15 to 25°C

Tests analysed weekdays only:

Test name	Frequency	Average result availability (excluding transport and postal time)	Specimen container
ACE	Mon, Thurs	5-7 days	Gel tube
HbA1c	Mon - Fri	Usually next day	Grey capped EDTA
Albumin creatinine ratio	Mon - Fri	Usually next day	Urine Monovette/Plain urine container Random urine or timed overnight collection
Creatinine clearance*	Mon - Fri	Usually next day	Gel tube & 24-hour urine
Faecal Calprotectin	Tues, Weds	10 Days	Faeces container. Deliver to laboratory ASAP
Urine Protein	Mon - Fri	Usually next day	Plain urine container
Urine calcium	Mon - Fri	Usually next day	24-hour urine with acid
Urine phosphate	Mon - Fri	Usually next day	24-hour urine (plain)
Urine urate**	Mon - Fri	Usually next day	24-hour urine (plain)
Copper and zinc	Twice Weekly	< 2 weeks	Gel tube
Cyclosporin	Mon, Wed, Fri	<4 days	Grey capped EDTA
Drugs of abuse	Weekly	< 2 weeks	Urine (random)
Faecal Occult Blood	Mon - Fri	Usually next day	FIT kit
5-HIAA	Weekly	2 weeks	Urine (24 hour collection in acid-protect from light)
Glucose Tolerance Test (by appt.)	Mon-Fri	Usually same day	Yellow Fluoride EDTA (timed collections)
Catecholamines (Urine)	Weekly	2 weeks	24-hour urine with acid
Cortisol (Urine)	Weekly	1-2 weeks	24-hour urine (plain)
Growth hormone and IGF-1	Weekly	< 2 weeks	Gel tube
Sweat test (by appointment)	Thurs	Usually same day	
Tacrolimus (FK506)	Mon, Wed, Fri	< 4 days	Grey capped EDTA
FV Leiden	Fortnightly	Usually within 3 weeks	Whole Blood (EDTA)
Prothrombin Gene Variant	Fortnightly	Usually within 3 weeks	Whole Blood (EDTA)
Renin/Aldosterone	Weekly	Usually within 3 weeks	Red (EDTA) 7.5ml

*Requests for Creatinine clearance must include a 24-hour Urine and a blood specimen for U&E collected at the beginning or the end of urine collection. It is essential that the NHS number is written on the form. Creatinine clearances will not be calculated if there is more than 2 days difference between blood and urine collection as the results are unreliable.
**Urine urate collections should not be stored in the fridge during or after collection

- Measurements of certain analytes in fluids such as ascitic and pleural fluid are not UKAS accredited as UKAS accreditation is not possible at this time for tests in these types of fluid.
  However, the analyses are supported by local Quality Assurance measures. These include albumin, amylase, bicarbonate, calcium, creatinine, glucose, LDH, potassium, sodium, triglyceride, total protein, and urea in pleural and ascitic fluid. For further information please contact the laboratory.

For information on other tests or methods (including measurement principles) used in Clinical Biochemistry please contact the Duty Biochemist via switchboard.

Tumour Markers

Tumour markers **should not** be used for screening in non-specifically unwell patients. They are primarily markers of an identified tumour but can be useful as an addition to other clinical and diagnostic procedures**.**

Standardisation of tumour marker measurement

The measured tumour markers in a patient's sample can vary depending on the method used. Tumour markers measured at Lancashire Teaching Hospital cannot be directly compared with laboratories if they are using different methods as this could cause erroneous medical interpretation. Ideally, for continuity of patient care, the same method should be used when monitoring a patient.

Send Away Tests

Certain specialised tests are sent away for analysis. The turnaround time for these tests can be variable. Please contact the department for further information.

Outpatients Tests

Sweat Tests

These are performed on Thursdays on Ward 8 at the Royal Preston Hospital site. Requests for appointments should be made in writing to the Duty Biochemist and sent to the laboratory.

ADULT REFERENCE RANGES

Reference ranges are always available on the printed result. Common reference ranges are listed below. Interpretative comments are added to the results where necessary. If further interpretation is required, please phone one of the Clinical Biochemists.

Plasma/Serum Constituent	Reference Range	Notes
Albumin	35-50 g/L	
Alkaline phosphatase – total	30-130 U/L	Varies with age
Ammonia (whole blood)	10-47 μmol/L	
Alanine transaminase	<41 U/L	
Amylase	28-100 U/L	
Aspartate transaminase	<45 U/L	
Bicarbonate	22-29 mmol/L	
Bilirubin - total	<21 μmol/L	
Bilirubin - conjugated	<6 μmol/L	
Calcium - adjusted	2.20-2.60 mmol/L	
Chloride	95-108 nmol/L	
C-Peptide	190-990 pmol/L	
Cholesterol	<5.01 mmol/L	
Creatinine	59-104 μmol/L (male) 45 – 84 μmol/L (female)	Varies with age
Creatine Kinase	40-320 U/L (male) 25-200 U/L (female)	
Direct LDL	< 3.90 mmol/L	
Glucose (fasting)	3.6-6.0 mmol/L	Normal
ϒ-Glutamyl transferase	<71 U/L (male) <42 U/L (female)	
HBA1C	20 – 42 mmol/mol	
IL 6 (Interleukin 6)	0-7 pgl/ml	
Iron	10-30 μmol/L	at 0800 hrs
Lactate dehydrogenase	<250 IU/L	
Magnesium	0.7-1.00 mmol/L	
Osmolality	275-295 mmol/Kg	
Phosphate	0.8-1.5 mmol/L (adult only)	
Potassium	3.5-5.3 mmol/L	
Procalcitonin	0-0.24 ng/ml	
Protein – Total	60-80 g/L	
Sodium	133-146 mmol/L	
Triglycerides	<1.71 mmol/L	Fasting

Troponin T	0 – 14 ng/L	
Urate	200-430 µmol/L (males) 140-360 µmol/L (females)	
Urea	2.5-7.8 mmol/L	
Zinc	10-21 µmol/L	

Reference ranges are given for adults, where "adult" is stated age related reference ranges are available. Please contact the laboratory if paediatric reference ranges are required.
The source of reference ranges can be obtained by contacting the laboratory.

THERAPEUTIC DRUG MONITORING

Unless stated, pre-dose specimens should be taken.

Drug	New Units	New Target Range		Concern Level	Conversion Factor	Notes
		Lower limit	Upper limit			
Carbamazepine	mg/L	4.0	10.0	25.0	µmol/L x 0.236 = mg/L	Severe toxicity likely if level > 40.0 mg/L
Cyclosporin	µg/L	Depends on indication		400	Not applicable	
Digoxin	µg/L	0.5	2.0	3.0	nmol/L x 0.781 = µg/L	Specimens should be taken at least 6h post dose. Desirable to interpret with potassium result. Target range in heart failure is 0.5-1.0 µg/L
Lithium	mmol/L	0.4	1.0	1.4	Not applicable	Target range applies at 12h post dose. Severe toxicity likely at >2.0 mmol/L.
Paracetamol	mg/L	Not applicable		See notes	mmol/L x 151 = mg/L	Refer to BNF diagram post overdose: usual concern levels (lower if high risk) in mg/L: 200 @ 4h, 100 @ 8h, 50 @ 12 h.
Phenobarbital	mg/L	10.0	30.0	75.0	µmol/L x 0.232 = mg/L	Target range ill defined due to 'tolerance'
Phenytoin	mg/L	8.0	15.0	20.0	µmol/L x 0.252 = mg/L	Severe toxicity likely if level > 40.0 mg/L.
Salicylate	mg/L	Not applicable		350	mmol/L x 138 = mg/L	Concern level 280 mg/L if age < 5 years. Severe toxicity likely if level > 500 mg/L
Tacrolimus	µg/L	Depends on indication		25.0	Not applicable	
Theophylline	mg/L	10.0	20.0	20.0	Not applicable	Lower levels ≥ 5.0 mg/L may be effective. Concern level 14.0 mg/L if age < 3 months. Severe toxicity likely if level > 60.0 mg/L.

TUMOUR MARKERS

Tumour Marker	Reference Range	Notes
AFP	up to 10 kU/L	
Ca 125	up to 35 kU/L	
Ca 15-3	<30 kU/L	
Ca 19-9	<35 kU/L	
CEA	up to 7 ug/L	
HCG	up to 2 IU/L	
PSA	≤3.0 µg/L	Age 50 to 59 years
PSA	≤4.0 µg/L	Age 60 to 69 years
PSA	≤6.5 µg/L	Age 70 to 84 years

The method details of tumour markers reported by Lancashire Teaching Hospitals are as follows:
AFP – Measured by Roche electrochemiluminescence immunoassay, standardized against the 1st IRP WHO Reference Standard 72/225.

CA125 - Measured by Roche electrochemiluminescence immunoassay, standardized against the Enzymun-Test CA 125 II method, that is standardized against the CA 125 II RIA from Fujirebio Diagnostics.

CA15-3 – Measured by Roche electrochemiluminescence immunoassay, standardized against the Enzymun-Test CA 15-3 metho and CA15-3 radioimmunoassy by Fujirebio Diagnostics

CA1909 - Measured by Roche electrochemiluminescence immunoassay, standardized against the Enzymun-Test CA 19-9 method.

CEA - Measured by Roche electrochemiluminescence immunoassay, standardized against the 1st IRP WHO Reference Standard 73/601.

HCG - Measured by Roche electrochemiluminescence immunoassay, standardized against the 4th International Standard for Chorionic Gonadotropin from the National Institute for Biological Standards and Control (NIBSC) code 75/589

PSA - Measured by Roche electrochemiluminescence immunoassay, standardized against the Stanford Reference Standard/WHO 96/670.

For further information, please contact Dr Martin Myers

ENDOCRINOLOGY

Hormone	Reference Range	Notes
Cortisol	166 - 507 nmol/L 73.8 - 291 nmol/L	06:00-10:00 16:00-20:00
FSH	2.5 - 10.2 IU/L >35 IU/L 1.5 - 12.4 IU/L	Follicular Post-Menopausal Males
LH	2.4 - 12.6 IU/L 1.7 - 8.6 IU/L	Follicular Males
Oestradiol	90 - 716 pmol/L 243 - 1509 pmol/L 147 - 580 pmol/L <145 pmol/L <218 pmol/L	Follicular Mid cycle peak Luteal Post-Menopausal Males
Parathyroid Hormone	1.6-6.8 pmol/L	Result should be interpreted with the adjusted calcium result.
Progesterone	18-90 nmol/L < 5.0 nmol/	Mid-luteal (day 20-22) Follicular phase
Prolactin	<324 mU/L <496 mU/L	Males Females
Testosterone	<1.7 nmol/L <4.5 7.6 - 31.0 nmol/L	Adult female Free Androgen Index Adult Males
Thyroid Function Tests TSH Free T4 Free T3	 0.35 - 5.0 mIU/L 11.0 - 23.0 pmol/L 3.9 - 6.8 pmol/L	

For further information or interpretation, contact the Duty Biochemist via switchboard.

Factors affecting the interpretation of Clinical Biochemistry results

Many factors can affect test results: the time of day the specimen is taken; diet, fasting or non-fasting, stress or anxiety, pregnancy, posture when the specimen is taken, recent heavy exertion can affect some results. For example, albumin and calcium levels can increase a little when moving from lying down to an upright position. Vigorous exercise can affect levels of creatinine kinase (CK), aspartate aminotransferase (AST), and lactate dehydrogenase (LDH). All these considerations show the significance of taking blood or urine specimens in a standardised fashion for performing and interpreting laboratory tests.

Frequently Encountered Interferences in Selected Analytes

The table below, though by no means exhaustive, represents some of the common interferences encountered in tests requested in the department. Drug effects may be biological or analytical. In the former, a real in vivo change in the analyte occurs, not usually directly related to the therapeutic effect of the drug.

Test	Interference	Effect	Analytical (A) Biological (B)
Alkaline phosphatase	Anticonvulsants, barbiturates, oral contraceptives EDTA contamination	Increase Decrease	B A
Calcium	Venous stasis, Vitamin D pregnancy citrate EDTA contamination	Increase Decrease Decrease Decrease	B B B/A A
Cholesterol	oestrogens	Decrease	B
Glucose	frusemide, thiazides, corticosteroids, oestrogens, stress Vitamin C, storage	Increase Decrease	B A
gamma GT	anticonvulsants, barbiturates, alcohol	Increase	B
Potassium	insulin, corticosteroids, diuretics amiloride, antineoplastic agents haemolysis, EDTA contamination, storage	Decrease Increase Increase	B B A
Prolactin	oestrogens, MAO inhibitors, cimetidine	Increase	B

Sodium	lithium diuretics, carbamazepine lipaemia	Increase Decrease Decrease	B B A
Thyroxine	amiodarone, pregnancy, oestrogens phenytoin, corticosteroids heterophilic antibodies	Increase Decrease Decrease	B B A

Spurious Results due to inappropriate collection/storage

Problem	Common Causes	Consequences
Delays in separation of serum	Overnight storage Delay in transit	Increased K^+, PO_4, ALT, LDH Decreased HCO_3, (Na^+ occasionally)
Storage	Storing unseparated specimen at 4^{o}C	Increased K^+ Decreased HCO_3
Haemolysis	Expelling blood through needle into tube Over vigorous mixing of specimen Storing specimen in freezer (-20^{o}C) Excessive delay in transit Leaving specimen in hot environment	Increased K^+, PO_4, Bilirubin, LDH, Iron, Mg^{2+}, CK, ALT, LDH Decreased Na^+, Cl^-, Glucose
Inappropriate sampling site	Specimen taken from drip arm	Increased drip analyte, e.g., glucose, K^+, Mg^{2+} Dilution effect
Incorrect container or anticoagulant	No enzyme inhibitor EDTA tube (red or yellow) or Transferring blood form one tube to another	Low glucose Increased K^+ Decreased Ca^{2+}, ALP, Mg^{2+}
Lipaemia	Specimen taken after a fatty meal	Decreased Na^+

Haematology Department

GENERAL INFORMATION

The Haematology Department provides a clinical and laboratory service for the diagnosis and management of blood disorders. A full list of tests available and collection details is detailed in this section. Normal ranges are printed on the report and are viewable on electronic results screens.

The Department is UKAS accredited to ISO 15189: 2012 Medical Laboratory No. 8548, the schedule of accreditation & analytical methodology can be found using the link Haematology Schedule of Accreditation

All specific enquiries regarding clinical advice and interpretation, should be made to the Haematology Consultant/Registrar who can be contacted via the switchboard at Royal Preston Hospital
The department is pleased to answer enquiries about the interpretation of test results, however where appropriate, comments are made on the reports.

Once sample bottles are labelled with the Harris Flex produced labels in the clinical areas it is not possible for laboratory staff to check that samples are accurately filled so clinical staff are requested to ensure samples are adequate for tests requested.
This is particularly important for coagulation samples as the anticoagulant in the bottle will affect results if bottles are inadequately filled and results will be invalid.
Specimens taken into coagulation specimen bottles should be received in the laboratory within 4 hours of collection. In the case of non-routine tests the plasma will then be separated and stored frozen, as these are performed as batch tests.

CONTROL OF ANTICOAGULANT THERAPY

The Haematology Department oversees the provision of oral anticoagulation therapy, performing the INR and calculating the correct dosage of anticoagulant.

For inpatients, the Haematology department will normally just perform the INR or APTT as appropriate, but advice is available as required from either the Specialist Anticoagulant Nurses or Consultant Haematologists. See anticoagulation department.

Particular care must be taken to ensure that the green capped citrate bottle for coagulation is filled to the line. Under filling or over filling will result in analyses not being performed.

ANTENATAL SCREENING SERVICE

The Haematology department supports the **NHS sickle Cell & Thalassaemia Screening programme** by providing screening of all antenatal pregnant women who are offered haemoglobinopathy screening for inherited thalassaemia's and sickle-cell traits as part of Antenatal & Newborn screening programmes

Antenatal TATs for haemoglobinopathy screening are monitored monthly and reported to the Departmental Quality Lead. The internal target for antenatal screens is 3 working days. Turnaround times are reported quarterly to the Antenatal Screening Coordinator, in Women's Health Division.

Pathology reports the turnaround time of the Haemoglobinopathy results in line with SCT SO4:
Timely reporting of Haemoglobinopathy screens within 3 working days of sample receipt.
Acceptable: ≥95 %, Achievable: ≥99% with these reported and reviewed at quarterly meetings

Please refer to Pathology Antenatal Screening Risk Management Policy (RMP-C-243) on the trust intranet for more information.

URGENT REQUESTS

All in-patient work is given priority and is analysed for any of the range of tests listed below, as soon as reasonably possible after receipt. However, in genuine emergencies, the requesting clinician **must** contact Haematology via switchboard to give details of the urgent request. If there is no reply after a reasonable period, ask switchboard to bleep the Haematology BMS on duty.
The following tests can be provided as urgent requests.

- FBC
- INR

- aPTT,
- D-DIMER
- Malaria screening
- Other tests may also be available, by special arrangement.

The Department does not routinely accept add on tests.
Under normal circumstances a new specimen should be collected if further tests are required.
There may be circumstances where it is deemed necessary to add-on test, due to a variability of factors such as specimen type, volume and age of patient, if the requesting clinician wishes for an add on test to be considered the following procedure must be followed.

- Add on requests **must** initially be made verbally by contacting the Haematology department (as for urgent tests) at which point the validity and ability to add the required test will be confirmed. This must then be followed up by completing a paper request, (necessary for audit). The request must have the full *minimum data set* for requesting, the additional tests required and the laboratory ID number of the original specimen (this is the "G" number, which can be found on ward computer). This number is used to track specimens throughout pathology from receipt to archived storage and is therefore **essential.**
- Coagulation tests (Green Citrate specimen) can **only** be added within 6 hours after specimen collection. It is not possible to do "add-ons" for D-Dimers
- Full Blood Count related tests (red EDTA specimen) can only be added within 8 hours of specimen collection.
- Vitamin B12, Serum Folate and Ferritin tests (gel tube specimen) can only be added within 3 days of specimen collection.

(**It is not sufficient to complete a biochemistry add on form and these will not be acted on.**
Note – no add on for D-Dimer to a coagulation screen will be considered as it has been proven that results are not reliable)

APPROXIMATE TEST TURNAROUND TIMES

Routine analyses are only performed Monday to Friday. Same day analysis in the following table refers to specimens received in the laboratory by 1.00 p.m.

The complexity and time taken to perform an assay, along with availability of equipment and staff, are the main limitations on the frequency of analysis. Other factors are clinical demand, cost-effective batch size, time effective batch size and in-use reagent stability. However, the tables on pages below provide guidance on the turnaround times of the common analytes. Where tests are sent away for analysis the turnaround time is indicated but is out of our control. Please contact the laboratory if further information is required on turnaround times.

Test Group	Approximate result Availability	Specimen Container
Full Blood Count	Usually same day	Red (EDTA) 3.4ml**
Film Morphology Report	4 days **For Urgent film review, please contact the Consultant Haematologist On Call**	Red (EDTA) 3.4ml**
Glandular Fever (IM) Screen	Usually same day	Red (EDTA) 3.4ml**
Reticulocytes	Usually same day	Red (EDTA) 3.4ml**
E.S.R.	Usually same day	Red (EDTA) 3.4ml**
Direct Coombs Test	Usually same day	Red (EDTA) 3.4ml**
Malarial Parasite Screen#	Usually same day	Red (EDTA) 3.4ml**
Bone Marrow Biopsy	By arrangement- Contact Consultant Haematologist.	----------
Serum Ferritin	Usually next working day	Brown (Gel)
Vitamin B12	Usually next working day	Brown (Gel)
Serum Folate	Usually next working day	Brown (Gel)
Haemolysis Screen	By arrangement- Contact Haematology Department.	----------
*Haemoglobinopathy Screen	7 days (3 days for ANC specimens)	Red (EDTA) 3.4ml**
Sickle Cell Screen	Usually Same Day	Red (EDTA) 3.4 ml**
INR	Usually same day	Green (Citrate) 2.9ml ***
aPTT	Usually same day	Green (Citrate) 2.9ml ***
D Dimer (FDP's)	Usually same day	Green (Citrate) 2.9ml ***
Coagulation Screen	Usually same day	Green (Citrate) 2.9ml***
Specialist Coagulation tests e.g. Factor VIII: c assay	If urgent –pre op By arrangement. Contact Haematology Department. Routine usually 4 weeks	3x Green (Citrate) 2.9ml ***
Thrombophilia Screening	(Usually within 4 weeks)	3x Green (Citrate) 2.9ml ***
Anticoagulant Service (INR) dosing	Usually next day	

Note: test requests requiring the same specimen container type can usually be performed from one specimen. If in doubt, please contact the Haematology Department.

* For ante-natal haemoglobinopathy screens a family origin questionnaire should be sent with the request

** For Paediatric requests a 1.2ml EDTA Monovette tube may be used

*** For Paediatric requests a 1.3ml Green capped vial may be used

Please note commercially available Rapid Diagnostic Tests are not validated for use for the detection of Plasmodium knowlesi. Although P. knowlesi may be detectable upon peripheral blood film examination, malaria may not be detectable at low parasitaemia. If there is a strong clinical suspicion, malaria testing should be repeated after 12-24 hours and a third sample 24 hours after that or if/when the patient experiences a pyrexic episode.

For information on other tests or methods (including measurement principles) used in Haematology please contact the Laboratory.

TESTS REFERRED TO OTHER LABORATORIES

Specialised tests referred to other laboratories for analysis, together with turnaround times, are detailed below:-

Test	Referral Site	Approximate Result Availability	Specimen Container
Plasma Viscosity	University Dept of Clinical Haematology, Manchester Royal Infirmary	Usually within 2 weeks	Red (EDTA) 3.4ml
vWD Multimer analysis	Molecular Biology Manchester Royal Infirmary	Usually within 1 month	X3 Green (Citrate) 3.0ml
Warfarin assay	Haemostasis Thrombosis, St Thomas's Hospital, London	Usually within 2 months	Brown (gel)
BCR/ABL transcript & JAK 2 P53, FISH,PNHCD markers, Flow Cytometry	HMDS St James University Hospital, Leeds	Usually within 6 weeks	Red (EDTA) 7.5ml
Haemoglobinopathy Diagnosis: ANC Screening	Clinical Haematology Manchester Royal Infirmary	Usually within 6 weeks	X3 Red (EDTA) 3.4ml
Serum Erythropoietin	Dept of Haematology Leeds General Infirmary	Usually within 1 month	Brown (gel) 7.5ml
PNH immunological markers	Dept of Haematology Leeds General Infirmary	Usually within 1 month	Red (EDTA) 7.5ml
Malarial Parasite Confirmation	Liverpool School of Tropical Medicine	Usually same day	Red (EDTA) 3.4ml
Bone Marrow Diagnostic Service	HMDS Leeds General Infirmary	Usually within 1 month	Only referred by consultant Haematologist
Bone Marrow Cytogenetic Service	Oncology Cytogenetics, St Marys MFT	Usually within 1 month	Specialist container required for Bone marrow. Only referred by consultant Haematologist
Factor assays G6PD Iron Stain Thrombin time	Haematology Dept Autolab Manchester Royal Infirmary	Usually within 2 days Usually within 2 days Usually within 7 days	3 x 2.9ml Green (Citrate) Red (EDTA) 3.4ml
ADAMTS-13	Liverpool Royal	Usually within 4 weeks	X3 Green (Citrate) 3.0ml
ADAMTS-13 HUS samples ONLY	Newcastle HUS service	Usually within 4 weeks	X3 Green (Citrate) 3.0ml
Urine Haemosiderin	University Dept of Clinical Haematology, Manchester Royal Infirmary	University Dept of Clinical Haematology, Manchester Royal Infirmary	70ml Sarstedt universal container

REFERENCE RANGES

Reference ranges are provided for guidance in the interpretation of results for clinical decision making. They are conventionally set to give the range of values which would be found in approximately 95% of a statistically 'Normal' population. Haematology reference ranges are selected from either:

- reference values provided by the assay provider,
- published papers providing ranges established by national and/or international consensus,
- locally established reference ranges.

The majority of routine haematology reference ranges in use at LTHTR have been re-produced from *Dacie and Lewis Practical Haematology, 12th Edition: 2016* and are in alignment with other local and regional hospitals. Coagulation reference ranges for adults have been provided by Sysmex Corporation (Sysmex UK Ltd) and subsequently validated for use locally.

Paediatric reference ranges have been supplied by Manchester Teaching Hospitals Foundation Trust, using a combination of locally derived results and results from the following-

Age dependency of coagulation parameters during childhood and puberty, IM Appel , B Grimminck et al. Journal of Thrombosis and Haemostasis 2012;10:2254–2263 and *Age dependency for coagulation parameters in paediatric populations. Results of a multicentre study aimed at defining the age-specific reference ranges, P Toulon, M Berruyer et al. Thrombosis and Haemostasis 2016;116:9-16*

When appropriate and if available, age and gender- related reference ranges are added to the report automatically by the laboratory IT system. Ranges do not take into account normal racial variation or differences between venous and capillary sample type. Adult reference ranges for common haematology tests can be found below; for paediatric reference ranges, please contact the laboratory.

FBC	Adult F	Adult M
WBC x10^9/L	4.0-11.0	4.0-11.0
RBC x10^{12}/L	3.8-5.5	4.5-6.0
Hgb g/L	115-165	130-180
Hct ratio	0.37-0.47	0.40-0.52
MCV fl	80-98	80-98
MCH pg	27.0-33.0	27.0-33.0
MCHC g/L	320-365	320-365
Retic x10^9/L	20-80	20-80
Plts x10^9/L	150-400	150-400
Neut *x10^6/L*	*1.8-7.5*	*1.8-7.5*
Lymph *x10^6/L*	*1.0-4.0*	*1.0-4.0*
Mono *x10^6/L*	*0.2-1.0*	*0.2-1.0*
Eos *x10^6/L*	*0.0-0.4*	*0.0-0.4*
Baso *x10^6/L**	*0.0-0.1*	*0.0-0.1*

Haematinics	Adult (F)	Adult (M)
B12 (ng/L)	200-900	200-900
Serum Folate (ng/ml)	4.6 - 18.7	4.6 - 18.7
Ferritin (ug/L)	12-300	20-500

Coagulation	Adult
PT (secs)	9.9-11.8
APTT (secs)	21-30
PT-derived fibrinogen/ FIB Assay (u/dL)	1.8-4.5
FII (u/dL)	78-130
FV (u/dL)	65-140
FVII (u/dL)	65-160
FVIII (u/dL)	50-170
VWAg (u/dL)	50-154
VWF Activity (u/dL)	50-160
FIX (u/dL)	60-160
FX (u/dL)	70-140
FXI (u/dL)	60-140
FXII (u/dL)	55-160
FXIII (u/dL) (SENDAWAY- only performed at MRI)	60-156
AT3A (u/dL)	79-131
Protein C (u/dL)	70-130
Free Protein S (u/dL) FEMALE	60-114
Free Protein S (u/dL) MALE	68-139
D-Dimer (ug/ml)	0-0.5

ESR	17-50 y F	17-50 y M	51-60 y F	51-60 y M	61-70 y F	61-70 y M	>70 y F	>70 y M
ESR mm/hr	Up to 12	Up to 10	Up to 19	Up to 12	Up to 20	Up to 14	Up to 35	Up to 30

Paediatric reference ranges can be obtained contacting the laboratory & are included on the report where applicable.

MEASUREMENT UNCERTAINTY

All results are subject to a degree of measurement uncertainty. This may be due to a range of factors including:

- Pre-analytical factors
- Biological variation within an individual
- Analytical measurement imprecision

Updated MOU values are calculated periodically and are held on the T-drive in the MOU folder. Reference ranges do not include uncertainty of measurement as it is not appropriate to continually amend reference ranges. If you require further information on the measurement uncertainty of an individual test, please contact the laboratory.

LABORATORY GUIDELINES FOR THROMBOPHILIA SCREENING AND OTHER NON-ROUTINE COAGULATION REQUESTS.

Paediatric thrombophilia screening is not routinely acceptable without prior consultation with a Consultant Haematologist.

Current screening tests performed by the Haematology department include:

1. Anti-thrombin
2. Proteins C and S
3. Lupus anticoagulant
4. Factor assays
5. Von Willibrand screen

All or any combination of the above tests requires a minimum of **3 green capped coagulation bottles, filled correctly to the 2.9ml mark** (green citrate). Specimens must be received in the laboratory within 4 hours of collection.

6. Paroxysmal nocturnal haemoglobulinaemia (PNH) screen
   - (i) 7.5ml EDTA blood specimen
   - (ii) Serum gel clotted specimen for serum biochemistry and **LDH**

All requests must provide relevant clinical details.

Antithrombin, Protein C and S requests are **not** accepted in the following situations as the test results are invalid:-

1. Oral anticoagulant therapy / heparin therapy
2. Pregnancy / postnatal
3. Oral contraceptive or hormone replacement therapies.
4. The post-operative period.
5. Suspected current DVT/ PE/ stroke (active event)
6. Liver disease
7. Renal failure
8. Patients with antiphospholipid antibodies.
9. Any other ‘acute phase’ event

NB: Care must be taken to ensure that the green capped citrate bottle for coagulation is filled to the line. Under filling or over filling will result in analyses not being performed.

Blood Transfusion Department

Addressograph labels are NOT acceptable on specimens in Blood Transfusion.

8548

BLOOD GROUPING AND CROSS-MATCHING

The safe determination of a patient's Blood group, the detection of atypical antibodies and the preparation of compatible blood, is a time-consuming process. Rapid processing of "routine" work increases the risk to the patient and compromises the ability of the department to react to the "real emergency".

The Department is UKAS accredited to ISO 15189: 2012 Medical Laboratory UKAS No. 8548, the schedule of accreditation & analytical methodology can be found using the link Blood Transfusion Schedule of Accreditation

In addition the Blood Transfusion department is regulated by the MHRA. Compliance is assessed annually by submission of the Blood Compliance Report. Blood Transfusion incidents, where required are reported to SHOT and MHRA via the SABRE Haemovigilance schemes.

If a patient is due to attend the hospital for a planned procedure, listed on the surgical blood ordering schedule, specimens should be taken from the patient on the first outpatient visit to determine blood group and antibody status. This reduces the risk of new, unidentified, patient antibodies delaying the provision of compatible blood products on the day of surgery.

In an effort to reduce Wrong Blood in Tube incidents (WBIT), **2x specimens taken at different times** should be available and tested prior to blood and FFP issue (except in cases of emergency), as recommended by BSH (British Society for Haematology) guidelines.
The following procedure should be followed:

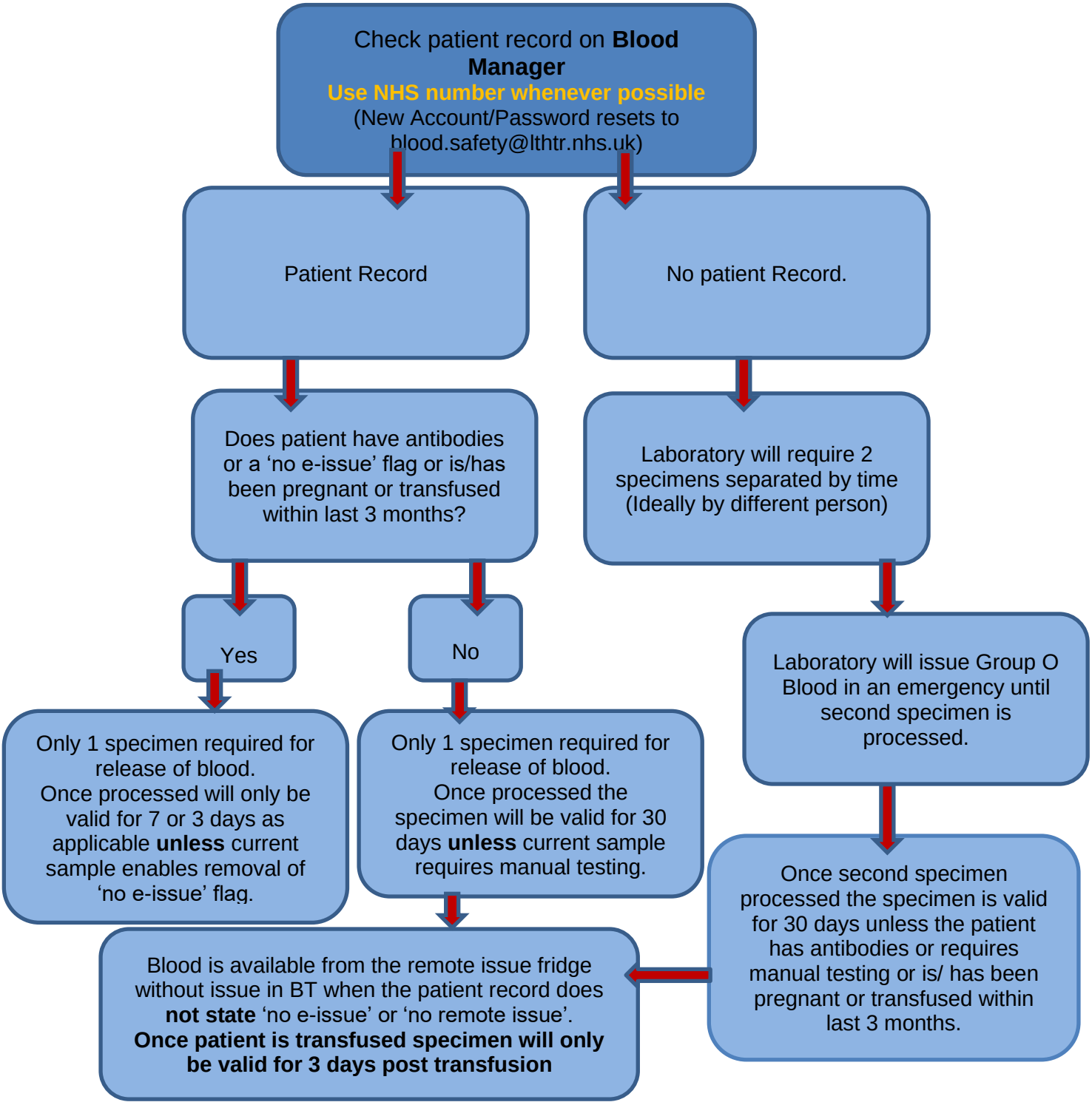
TWO SPECIMEN REQUIREMENT FOR BLOOD TRANSFUSION

If there is already a record with an identified blood group for a patient on the Blood Manager database, only one specimen needs to be taken. The first specimen does not have to be a recent specimen i.e. blood taken 10 years ago would count as a first specimen. Patients should be advised that the second specimen is required as a check group in order to maintain patient safety.
Blood Manager can be used to check on specimen status. On selecting the 'Patient Details' tab and following the input of the patients NHS number the statement "Electronic issue of blood products requires second specimen" will be visible in red writing in the blue box titled 'Blood specimens.
In urgent situations if only one group and save specimen has been taken then the recommendation is that group O (universal donor) blood should be issued until a second confirmatory group is received.

NB. If group O blood is given before a second specimen is taken then there may be a delay in processing the second specimen.

Two specimens can be taken on the same day but must be "distinct separate events" and ideally taken by different people; each of the specimens must be taken at different times using positive patient identification and sent with a separate request form.
The second specimen will be valid for 30 days provided the patient does not have antibodies or require manual testing for another reason and is not or has not been pregnant or received a blood transfusion within the last 3 months. Samples requiring manual testing are valid for 7 days. Patients who have been pregnant or transfused within the previous 3 months have a 72-hour sample validity. It is therefore essential to check patient history prior to ordering a blood transfusion. If a 'no remote issue' flag is present on the patient record, please call the laboratory regarding provision of blood products.

PROCEDURE FOR TAKING BLOOD TRANSFUSION SPECIMENS



The aim of the two specimen requirement is to prevent 'wrong blood in tube' and potential death due to an ABO incompatible transfusion.

*Always remember **positive patient identification** is paramount when taking specimens for blood transfusion.*

For **all** Blood grouping and cross-matching requests a **7.5ml** EDTA tube, correctly filled, together with a fully completed Blood Transfusion request form must be sent to the laboratory, allowing at least 24 hours' notice for inpatients and 72 hours' notice for outpatients for planned or routine procedures which may require blood or blood products. Specific bottles for neonatal and paediatric use are available for use within those clinical areas.

All specimens taken for blood transfusion must be taken by staff completing the relevant competency this includes phlebotomists, medical or nursing staff. Guidance around sample collection, labelling, sample validity and general principles of blood transfusion are outlined in the e-learning associated with blood transfusion and also the Blood Transfusion policy. Specimens have a limited validity depending on previous transfusion and clinical history, this is also covered in the blood transfusion policy (http://lthtr-documents/current/P1.pdf) along with the **Zero Tolerance policy**.

Guidance for users:

Guidance on Completion of Blood Transfusion form:

• All sections of the request form must be completed. Any omissions which are significant may lead to patient harm and/or sample rejection.
• Do not sign on another staff members behalf. Request forms that have been PP'ed (per procurationem) with another staff members name or signature will be rejected.
• Do not make amendments to details on request form. Any amendments, even if they have a 'strike through' and are initialled, will result in rejection.
• There must be a completed 'Requested by' section and 'Sample Taken by' section even if the same person has carried out both tasks. Both sections should be signed.
• Use the NHS number as the unique identification number wherever possible (if the patient does not have an NHS number, as described above, a hospital number is acceptable) The same unique identification number should be used on both sample and request form.
• You can use an addressograph label on the request form only.
• Date and time of phlebotomy should match on sample tube and request form.
• All writing should be legible.

Guidance on labelling of Blood Transfusion sample tube:

• Complete all boxes on the sample tube including signature of sample taker that matches the sample taker on the request form.
• All details on the sample tube should be handwritten.
• Do not use addressograph stickers or pre-labelled stickers on the sample tube.
• Do not make amendments to details on the sample tube. If an error is made, the sample tube should be discarded, and the patient should be bled again into a new sample tube.
• Use the NHS number as the unique identification number wherever possible (if the patient does not have an NHS number, as described above, a hospital number is acceptable). The same unique identification number should be used on both sample and request form.
• The sample tube must not expire within 30 days of phlebotomy. A new tube with a longer expiry should be selected prior to bleeding the patient.
• Date and time of phlebotomy should match on sample tube and request form.
• All writing should be legible.

Rejected samples-

Any deviation from the guidance above will result in enforcement of **zero tolerance policy** and the sample being rejected. A Datix report will be raised, and incident logged for the patient record.

The hospital has a remote issue facility enabling blood to be removed from the relevant fridge on demand for certain category patients providing the laboratory holds a valid and appropriate specimen. Information regarding the appropriate specimen is available via Blood Manager with access given via blood.safety@lthtr.nhs.uk inbox. However, if the patient has antibodies or for another reason is not suitable for e-issue and/ or remote issue it is vital to supply details of the number of units of blood to be prepared and the date and time they are required. Lack of information may delay the provision of blood and may result in the cancellation of operations.

Normally the minimum notice required for routine grouping and cross matching of blood is 24 hours, but if a less common group is discovered or antibodies are detected, more time may be required to obtain blood from the NHSBT.

Emergency Transfusion

The hospital has a specific '**Massive Haemorrhage Protocol'** to follow during times of emergency. This is available in all clinical areas and is activated via the 2222 system. Emergency O-negative blood is available at all fridges on demand. It is recommended that a blood specimen should be taken prior to the administration of any blood products, to prevent time delays during processing of the sample and subsequent blood provision.

The following approximate time scale applies for the release of blood during an emergency:

- O negative - immediate on demand at blood fridge or from BT if applicable (primarily ED and IRDU)
- Group specific – minimum 20 minutes following receipt of specimen.
- Full cross match – minimum 45 minutes from receipt of specimen.

Clear and timely communication is key during all emergency situations.

Withdrawal Times for labelled blood

Blood is withdrawn from reservation for a specific patient after a minimum of 48 hours from the date and time required unless clear clinical reason for a longer reservation time has been made to the laboratory. Please take this into account if surgery is cancelled and rescheduled. NOTE: This is not possible when the sample expiry is before this date and time, and this will dictate when blood is returned from issue.

Platelet Requests

Lancashire Teaching Hospitals does not hold a stock of platelets for immediate issue, unless in case of major haemorrhage or emergency craniotomy. Routine platelet requests must be received in the laboratory by 09:30 AM to allow delivery from the NHSBT by 12:30 PM 'lunchtime' of the same day. Orders received after 09:30 AM but before 4:00 PM will be delivered at 7.00 PM the same day. Any orders received after 4.00 PM will be delivered by 12:30 PM next day.

Urgent requests for platelets will be dealt with on an individual basis, but placing orders within the above time frame is encouraged to allow routine deliveries to be used without incurring extra transport costs. Any request of 2 or more units of platelets must be discussed with the Consultant Haematologist on call and be authorised by them prior to calling the laboratory.

Plasma Products

Plasma products are stored frozen and require to be thawed prior to use. Approximate turnaround time for these products is 45 minutes for urgent requests and 1 hour for routine requests. Two units of pre-thawed FFP is available for massive haemorrhage protocol only and should be requested via the 2222 Massive haemorrhage protocol activation.

APPROXIMATE TEST TURNAROUND TIMES

Test Group	Approximate Result Availability	Specimen Container
Group & Antibody Screen	Usually within 24 hours	Red (EDTA) 7.5 ml*
Blood product request	Variable time scale contact the laboratory for further guidance, exclusions apply	Red (EDTA) 7.5 ml*
Antenatal group and antibody screen	Usually within 24 hours	Red (EDTA) 7.5 ml
Perinatal Serology, including anti-D prophylaxis issue if appropriate	Usually same day	Red (EDTA) 7.5ml* (from mother and baby)
Kleihauer Foetal cell stain for FMH calculation	<3 days	Red (EDTA) 7.5 ml or 3.4ml (can be performed from maternal Perinatal serology specimen)
Specialist NHSBT analytical services, including HLA typing, Platelet antibodies, HIT testing and cold agglutinin testing	By arrangement. Contact Transfusion Dept. NB: these tests are referred to external NHSBT sites for analysis.	Dependant on requested test. Note for cold agglutinin testing: Red (EDTA) 7.5ml* maintained at 37ºC to be referred to Liverpool NHSBT.

* For Paediatric requests a 1.0ml EDTA Monovette tube may be used

Cellular Pathology

This department comprises of:
Histology, Non-Gynaecological Cytopathology, Neuropathology and the Mortuary.

8544

INTRODUCTION

The Cellular Pathology Laboratory provides comprehensive diagnostic Histopathology, Immunocytochemistry, Electron Microscopy, Neuropathology and Cytology services to its host trust, their associated general practitioners, private medicine services and HM Coroner. It also provides Cellular Pathology sub-specialisation for renal, plastics and neurosciences reflecting the role of the Trust at regional level, plus IHC / ISH testing for Her2 and Lynch syndrome for the L&SC Pathology Network. This is in accordance with the Pathology Directorate's Quality Policy and the service is appropriate to the needs of the users in Neuropathology, Renal Pathology and Dermatopathology.

The Department is UKAS accredited to ISO 15189: 2012 Medical Laboratory No. 8544 (with the exception of Mortuary services), the schedule of accreditation & analytical methodology can be found using the link Cellular Pathology Schedule of Accreditation. Test / antibodies that do not appear on our ISO 15189:2012 UKAS schedule may still be performed at this Trust and will fall into one of the categories below – users can contact the department directly if they wish to enquire about non-accredited tests in our repertoire.

Non-Accredited & research only tests will be reported with the following comments appended to the report:
Non-accredited antibodies/ tests
Please note the XXXX antibody / test is off scope (ISO 15189:2012). This antibody has been verified by LTH and is awaiting for UKAS accreditation

Research use only antibodies / tests
Please note the XXXX antibody off scope (ISO 15189:2012) as it is for research use only (RUO) antibodies that have clinical utility. These antibodies have been verified by LTH to reflect clinical use. However, the expected staining characteristics have not been formally validated by the manufacturer for clinical use.

The laboratories are staffed from 08.30 a.m. to 17.00 p.m. Monday to Friday. There is no formal out of hours' service in Cellular Pathology

SERVICES PROVIDED

Routine Histopathology

Unlike other pathology disciplines, routine histopathology relies on adequate fixation of tissues. Tissues are immersed in 10% formalin to preserve them as close to a life-like state as possible. This also protects the tissues from the physical and chemical rigours of tissue processing, the ultimate goal of which is to impregnate tissues with paraffin wax. This allows thin sections of tissue to be cut and placed on to slides for staining. These stained slides provide the consultant Histopathologist with a snapshot of the pathological processes occurring within these tissues. This is a relatively lengthy process and can take up to three days to complete. Clinicians are therefore encouraged to take this into account when booking appointments with patients to discuss results.

The volume of formalin should be at least 10 times that of the volume of the specimen. Delayed or inadequate fixation will have a detrimental effect on the initial diagnosis and may invalidate subsequent tests such as immunohistochemistry.

Formalin is a hazardous substance and care should be taken when handling. The lids of all specimen containers must be securely applied to prevent leakage. All specimen containers must be checked before use and is the responsibility of the user of these to ensure their integrity.

The department supplies a range of specimen containers to suit different sizes of specimens.
Small specimen pots should be placed into the sealed plastic specimen bags with the request card placed in the front envelope of the bag. This is to ensure that the cards are kept clean and avoid being ruined due to potential formalin leaks.
Once packaged the specimens should be sent in batches in sealed, transport bags (available from pathology reception) to be opened in the cellular pathology laboratory.

Larger pots must be kept upright and transported from theatre areas in specifically marked boxes. Pots too large to fit in the boxes must be sealed within the green bag supplied. It is the responsibility of theatre staff to ensure that specimen containers are appropriately packaged for porters to transport to Pathology.
Sharps bins must not be used for specimens.
All specimens must be clearly and accurately labelled. It is essential that all request forms or electronic orders are clearly and accurately completed. Incorrect or incomplete requests and specimen container labels will result in a delay, as a request must be made for correct completion before a specimen is processed or result released. Please ensure that the nature of the specimen is recorded on the specimen container. For more information, please refer to the **RMP-C-56 Pathology Specimen Rejection** procedure available on the intranet. Specimens are retained for a minimum of 28 days post sign out.

Specimens of testis, bladder, breast, kidney and uterus require slicing by the lab to aid fixation and preserve the tissue morphology and tumour integrity. These should be delivered directly to the pathology reception by 5pm on the same day where possible. **On a Friday (or last working day of the week) it is essential that these specimens reach the laboratory by 5.00 pm**. If they are not going to arrive in time the laboratory must be contacted to make arrangements to ensure the specimens can be sliced. It is the responsibility of the sender to ensure that the specimen is transported to Pathology Reception at Royal Preston Hospital.
To arrange out of hours transport from CDH to RPH:

- Ring Switchboard and ask for the manager of the day.
- Manager of the day will authorise use of a taxi.
- The taxi is arranged through switchboard.

REPERTOIRE OF TESTS

Tests provided:

- Formalin Fixed, paraffin embedded tissues.
- Intraoperative diagnosis
- Special stains.
- Immunohistochemistry and in situ hybridization: Over 100 primary antibodies for qualitative and semi-quantitative testing.

Rapid Intra-operative Diagnoses (Frozen Section Service)

This service operates between 9.00 a.m. and 4.30 p.m. on weekdays.
Surgical staff should book a frozen section request, **prior to the operation** with the Histopathology Department on extension 3109. If during the operation, it is found that the procedure is not required, the laboratory should be informed immediately, and the biopsy cancelled. This will allow the laboratory staff to prioritise other tasks. It is requested that patients requiring frozen section service are booked as early as possible on the theatre list.

Consultant availability can only be guaranteed through prior notification by telephone or letter of anticipated frozen section requests. **Specimens for frozen section should be sent unfixed directly to the department via pathology reception**.

A routine histology request must be completed, which must also bear a contact telephone number of the operating theatre or ward being used. It is necessary to allow 10-20 minutes for a frozen section report to be issued by telephone. Please ensure we have a contact number for all frozen section requests.

High Risk Specimens

Full clinical details should always be provided; This is of particular importance for specimens known or thought likely to be infected with high-risk organisms, notably Mycobacterium tuberculosis, hepatitis B & C and HIV. Failure to provide relevant details may put staff at risk.

Urgent Specimens

Please inform the laboratory of results, which are required urgently. Specimens usually require overnight processing for optimum technical results; however, in exceptional circumstances small biopsies can be processed during the day. Please note **this does not guarantee a report being issued on that day**. Urgent specimens should be marked appropriately and brought directly to the laboratory. **If the result is required for a specific appointment or a clinic, please state date by which result is required**.

Renal Biopsy
Renal biopsies ideally require the presence of a suitably qualified member of Cellular Pathology staff to be present during the biopsy procedure. This is to see if glomeruli are present in any of the specimens that are taken. Although every effort is made by the department to send a member of staff at short notice, the team responsible for taking the biopsy should contact Cellular Pathology at the earliest possible convenience so that suitable arrangements can be made.

TURNAROUND TIMES

The Cellular Pathology Department aims to primary report 80% of diagnostic cancer–cases (including Histopathology, Neuropathology and Non Gynae Cytology) within 7 days and 90% within 10 days of the receipt of the case. This is in line with RCPATH key performance indicators and monitored within the directorate and trust level cancer performance.

Routine cases may take up to 8 weeks to report. Exceptions include those cases requiring decalcification such as bone, tissue softening such as nail, muscle and nerve biopsies and large complex cases that require lengthy fixation or complex lengthy processing. Service users will be notified if significant changes to turnaround times occur that could impact on patients via methods such as MDT, intranet, or Trust comms.
Cases that require reporting by an external facility such as those on the Sarcoma Pathway have a minimum turnaround time of 14 days. Those needing special staining, immunohistochemistry, electron microscopy or an expert opinion as part of the diagnostic process will also have an extended reporting period to allow for the tests to be performed or supplementary reports will be added when additional testing is completed.

Cases referred to specialist molecular and genetic testing centres will generally have a primary report and a supplementary report containing the molecular diagnosis will be added when available (frequently used molecular tests are listed in the outsourcing table with approximate turnaround times).

The department urges its users to take this into account when booking follow up appointments. The department is happy to liaise with our service users should a case become clinically urgent and need expediting, please do not hesitate to contact the department for advice on specimens, reports, current turnaround times and other queries if required via the Cellular Pathology Office (Ext 2146)

Immunohistochemistry

The department provides a comprehensive range of immunohistochemical investigations including a wide range of tumour and pathogen markers. These tests can usually be performed on the material received for routine histopathology.

Our antibody repertoire Includes over 100 antibodies and in situ hybridization which identify a range of disorders including General surgical, Gynaecology oncology & routine gynaecology, Urological Oncology & routine urology, Haematological oncology, Breast pathology, Colorectal cancer, Upper GI cancer, ENT cancer, Lung & pleural tumours, Skin pathology, Renal, Perinatal pathology, Neuropathology, Non-Gynaecology Cytology and Respiratory cytology. The UKAS accredited repertoire can be found at https://www.ukas.com/wp-content/uploads/schedule_uploads/00007/8544-Medical-Single.pdf

Electron Microscopy

Electron microscopy is a powerful tool used by the department primarily for detecting renal disorders and neuropathological disorders. It is used to identify specific ultrastructural aberrations that are impossible to see with conventional microscopy.

Examples of renal disorders that can be detected by electron microscopy:

- Minimal Change
- IgA and IgG nephropathies
- Lupus nephropathy.
- Diabetic nephropathy.

Examples of neuropathological disorders that can be detected by electron microscopy:

- Mitochondrial Myopathy
- Inclusion body myositis

OUTSOURCED TESTING FOR CELLULAR PATHOLOGY WITH EXPECTED TURNAROUND TIME

Test	Location	Expected turnaround time
Sarcoma Service	Department of Cellular Pathology Specimen Reception 5th Floor Duncan Building Royal Liverpool Hospital Daulby Street Liverpool L69 3G	3-4 weeks
Respiratory Molecular Testing (Salvage Pathway)	Molecular Section Dept of Pathology Blackpool Victoria Hospital FY3 8NR	5 Days
Gastric Her2	UCL Advanced Diagnostics. Department of Pathology UCL Medical School 21 University Street London WC1E 6JJ.	1 week
Oral HPV	Department of Cellular Pathology Royal Victoria Infirmary Queen Victoria Road Newcastle upon Tyne NE1 4LP	2 weeks
CD4/ Poly	Dept Histopathology Clinical sciences Building Manchester Royal Infirmary Oxford Road Manchester M13 9WL	2-3 weeks
Neuropathology Molecular / Genetic Tests	Manchester Centre for Genomic Medicine	2-3 weeks
Oncotype DX	Genomic Health INC, 301 Penobscott Dr Redwood City, California	1 week
Variety of molecular tests with associated PDL1	Dr Philippe Taniere Dept of Cellular Pathology (level-1) Queen Elizabeth Hospital Birmingham (QEHB) Mindelsohn Way Edgbaston Birmingham B15 2WB.	2 -3 weeks
FISH and ad hoc IHC that are not available at LTH	HSL-AD Ground Floor 60 Whitfield Street London W1T 4EU	5 days
Variety of Cellular Pathology Molecular / Genetic tests	Manchester Centre for Genomic Medicine	2-3 weeks
HMDS	HMDS Level 3, Bexley Wing St James' University Hospital Leeds LS9 7TF	1-2 weeks

CYTOPATHOLOGY

Cervical LBC Cytology

All cervical smears and LBC specimens should be sent to the laboratory at RPH from where they are transported to Manchester Cytology Centre (MCC). Screening is performed at the Manchester Cytology Centre and reports are sent directly to the requesting individual. If sent direct to the MCC, it is the responsibility of the individual to ensure safe dispatch and arrival. LBC Clinic Kits will be supplied by MCC. Contact MCC by telephone: 0161 276511.

Non- Gynaecological Cytology Specimens

On Request Form - tick Cytology & **deliver to Cytology as soon as possible.**

Specimens

- Avoid contamination of any cytology specimen with glove powder or ultrasound gel.
- Unfixed specimens require, wherever necessary, the same "Danger of Infection" indicators as for other laboratory departments.

For URGENT specimens, write "**URGENT**" prominently on the form and include the time, date, and telephone number at which the report is required.

Fine Needle Aspirations (FNA)

CytoRich Red (CRR) Collection Fluid is a haemolytic, alcohol-based general-purpose fixative solution. Its active ingredients comprise of alcohols, formaldehyde, and non-toxic demulcents, emollients, and buffers. 10mls of CRR collection fluid in universal containers provided by Pathology reception at RPH and CDH.
Please give as much information as possible on the form with details of site, type, palpability, diameter of lesion (a simple diagram may be useful) and full clinical data including symptoms, known primary sites and previous treatment.

Serous Fluids

Serous fluid in universal pot without any fixative. Do not put serous fluids into CRR, as it coagulates the protein and renders cytological examination and other techniques extremely difficult, if not impossible.

NON GYNAE CYTOLOGY REPERTOIRE'

Test	Specimen Container	Notes
Urine	70ml Sarstedt universal container	Urine Freely voided, catheter, ileal conduit specimens or bladder/ureteric washings may be collected. It is essential that the specimen collection method is documented on the request form. The first urine passed in the morning should be avoided. A mid-stream specimen is sub-optimal. The whole 2nd voided specimen of the day is optimal
Sputum	70ml Sarstedt universal container	Guidance should be given to the patient on producing a deep cough specimen. A salivary specimen is inadequate for cytology. Nebulised saline may be used to induce sputum production in appropriate clinical circumstances The whole of the expectorated specimen should be submitted. The specimen should be taken before ingesting food.
Sputum Trap	Trap pot	Please secure line and tape to seal lid
Serous Fluids	70ml Sarstedt universal container	Clinical information is vital
Large volume peritoneal washings	In an appropriate container that provides easy access for the specimen retrieval For example -24hr urine container (no fixative)	Clinical information is vital
Cyst Fluids	Clear universal/ 50ml sputum pot	Clinical information is vital
Joint/Bursa /Synovial	70ml Sarstedt universal container	Aspirated fluid should be sent for cytology for morphological diagnosis only. Requests for 'crystals' should be sent to Immunology

Bronchoalveolar Lavage	Trap pot :*Delivery in a chilled state as soon as possible to preserve the cells for the Differential Count*	Write cell count & differential on form *Prior arrangements with laboratory for numbers of BAL specimens expected and expected time of delivery*
Bronchial washings Lavage Antral Tracheal washouts	Trap pot	Please secure line and tape to seal lid
Bronchial brush rinsing's	Pink FNA bottle	Agitate brush in fluid to release cytological material.
Endoscopic brushings	Pink FNA bottle	Agitate brush in fluid to release cytological material. Brush tip may be included
Cerebrospinal fluid (CSF)	Clear sterile 20ml universal	Lumbar puncture. Ideally, the submitting clinician should ensure a specimen is submitted to clinical chemistry and microbiology as well, if appropriate. A minimum of 1ml specimen is required for cytology.
CSF with suspected CJD	Clear sterile 20ml universal	2-3ml of clear, colourless fluid CSF is required. Each individual sample bottle needs to be double bagged and relevant request forms filled out. **Clearly mark on the request card that it is for CJD.** After obtaining the CSF, ring 3106 and ask them to wait at pathology reception for the samples. You need to hand them over personally to a staff member of neuropathology. Samples cannot be received after 4.30pm or at weekends. Neuropathology will arrange for receipt, storage and courier of the samples to Edinburgh, but they must first be contacted by you and a pre referral form emailed in advance in otherwise the sample will not be accepted. The referral form can be found here https://www.cjd.ed.ac.uk/csf-laboratory-1 A hard copy of the referral form must also be handed over to neuropathology with the specimen.
FNA (rapid clinics)	Pink FNA bottle Within 2 hours	Aspirate fluid up through needle and immediately expel. All passes with the aspirating needle should be sent in one pot labelled with the minimum data set and site. *Prior arrangements with laboratory for numbers of FNA specimens expected and expected time of delivery*
FNA	Pink FNA bottle	Aspirate fluid up through needle and immediately expel. All passes with the aspirating needle should be sent in one pot labelled with the minimum data set and site.
FNA (Anaplastic large cell lymphoma (ALCL) associated with breast implants	Pink FNA bottle 20 ml universal (no fixative) EDTA container	Priority dependant on amount of sample: First sample in CRR fixative Second sample a fresh one to prepare cell block here to do immunohistochemical stains. Third sample in EDTA – (please keep refrigerated in NG cytology fridge) this will be sent to HMDS along with the cell block if suspicious cells are present to do flowcytometry. If no atypical cells are present, this sample will be discarded.
Skin and mucosal scrapes Nipple discharge	Alcohol fixed smear fully labelled with an HB pencil	These should be spread directly onto a slide at the bedside. The spread should be fixed to prevent cell deterioration.

MORTUARY AUTOPSY SERVICE

Introduction

We are a team of five trained members of staff. We look after people who have died both in hospital and the surrounding community.
At our Royal Preston mortuary, we receive all deaths from the wards at RPH and all community deaths from Preston, Chorley, South Ribble, Ormskirk, and parts of Southport & Skelmersdale. Our Chorley & South Ribble mortuary only receives deaths from within the hospital.

Services Provided

We carry out the following post-mortems on behalf of the Coroner;

- Forensic/Home Office (where a criminal activity has led to the death i.e.. Assault, dangerous driving, or H&S violations)
- Neuropathological post-mortems
- Suspected CJD and other hazard group 3 infections
- Conventional post-mortems, with a pathologist
- Post-mortem computed tomography (PMCT), where a radiologist looks at CT images of the patient. We also perform these on behalf of Blackpool Teaching Hospitals, University Hospitals of Morecambe Bay, East Lancashire Hospitals

We can also carry out consented/hospital post-mortems.

- Brain, or brain & spinal cord donation for Alzheimer's or Parkinson's research
- CJD cases to help confirm a diagnosis of CJD.
- Requested by a medic treating the patient, to aid with medical research or to further understand the illness that caused the death of the patient)

The Coroner and coroner's officers will gather data on cases referred to them, and decided what kind of post-mortem is necessary. The Coroner will then authorise a post-mortem and request that the mortuary perform it on their behalf. The reason for a coronial post-mortem is generally to ascertain *why* someone died; occasionally it is also performed to aid in identification of the deceased person.
If a Coroner authorises a post-mortem, no consent from family members is needed, as the Coroner is a judicial official with a legal duty to investigate all deaths that happen within their area. The Coroners can be contacted on;
Preston Coroners Officers: 01772 524740
Chorley Coroners Officers: 01257 247756/7757
Coroners Court & Office: 01772 356356

Hospital post-mortems are typically carried out for research purposes. A doctor must have completed an MCCD (medical certificate of cause of death), and the death **MUST** have registered with the registrar. A hospital post-mortem is **NOT** to be used to find a cause of death. If the attending doctor cannot give a cause of death, the case must be reported to the Coroner. Hospital post-mortems require consent to have been given, this can either be by the patient before they die, or by their family after death. They cannot be done without prior consent.
Bereavement team are available to chaperone the consent process. They can be contacted on 01772 523730.

Mortuary Working Hours:

Royal Preston Hospital: Monday to Friday 8am-4pm
Chorley & South Ribble Hospital: Tuesday & Thursday 8am-10am (covered by RPH staff)
Out of hours on call service: Mortuary on-call staff can be contacted via switchboard on 01772 716565

NEUROPATHOLOGY

Brain Biopsies and Tumours

The department receives around 600 brain biopsies annually, most of which are from tumours. We provide an intra-operative (smear and frozen section diagnosis) provisional report within 20 mins.
We have developed vast experience in diagnosis of brain tumours using modern facilities and classification. We participate in organising multi-disciplinary meetings with adult neuro-oncology, neuro-radiology and neurosurgery and pituitary services.

Muscle and Nerve Biopsies

The department serves as the main referral centre for muscle and nerve diseases. We use comprehensive immuno-stains for inflammatory myopathy and sarcolemmal protein for muscular dystrophy. A panel of immunohistochemistry, semi-thin sections and electron microscopy can be used to investigate the nerve biopsies. There are regular meetings with neurologist and neurophysiologists to discuss cases.

Cases may also be referred to other specialist centres such as the Limb Girdle Muscular Dystrophies in Newcastle upon Tyne, The Newcastle Mitochondrial Diagnostic Laboratory Congenital Muscular Dystrophies, Dubowitz Neuromuscular Centre, London. It will be necessary to complete a referral form for these and are available upon request from the Neuropathology department. Upon completion and return of the form to the Neuropathology, department uplift of the specimens can be arranged to the appropriate referral centre.

Muscle Biopsy

Muscle biopsies may be taken at any hospital within the L&SC network.

It is important that the Neuropathology laboratory is made aware of an impending muscle biopsy so that necessary preparations and laboratory organisation can take place. **A minimum of 24 hours' notice is required.** The biopsies should all to be done in the morning, and preferably as early as possible. In order to allow a reasonable time for the dissection and selection of specimens for freezing and other procedures, **we do not accept muscle or nerve biopsies arriving later than 15.00 hours at our laboratory.**

Muscle biopsy specimens **must not be fixed** and should be placed directly into a dry sterile, airtight specimen container to minimise drying. Care in handling is necessary to prevent damage to the specimen. A full clinical history is also required to accompany the specimen.

Once these specimens are taken from a patient, it is extremely important that they are delivered to the laboratory, ideally within one hour and sent on wet ice /ice packs. This is because enzyme histochemistry will not work or will be compromised on specimens that have been allowed to degrade.

Neurohistological investigations include:

- Fibre typing
- Enzyme histochemistry
- Special stains
- Immunohistochemistry.

Nerve Biopsy

Nerve biopsies should be at least 15mm in length to ensure that there is adequate material for thorough investigation. **Biopsies should be unfixed** and placed within a sterile, airtight specimen container to minimise drying. The protocol for notifying and sending nerve specimens is the same as the muscle protocol detailed previously.

Neurohistological investigations include:

- Routine histology.
- Special stains.
- Immunohistochemistry
- Semi thin resin sectioning

Neuropathology Rapid Intra-operative Diagnoses (Frozen Section Service)

This service operates between 8.30 a.m. and 4.30 p.m. on weekdays.
Surgical staff should book a frozen section request, **prior to the operation** with the Neuropathology Department on extension **3106** If during the operation, it is found that the procedure is not required, the

laboratory should be informed immediately, and the biopsy cancelled. This will allow the laboratory staff to prioritise other tasks.

Specimens for intra-operative diagnosis must be **unfixed and sent immediately** to Neuropathology, informing the department of their impending arrival on extension **3106** or via switchboard**.**

A routine Neuropathology request must be completed, which must also bear a contact telephone number. It is necessary to allow 10-20 minutes for a frozen section report to be issued by telephone.

This service is unavailable for specimens deemed as High Risk

Autopsies/Forensic Neuropathology
The department develops excellent experience in autopsy examination (including examining fresh brains) and in forensic neuropathology, particularly head injury. Our services are offered to HM Coroner and forensic pathologists in the Northwest. We follow strict rules regarding consent for postmortem and follow national guidelines on organ and tissue retention.

Immunology Department

General enquiries	01772 528196

GENERAL INFORMATION

The Immunology Department provides a wide range of routine and specialised services. **The Department is UKAS accredited to ISO 15189: 2012 Medical Laboratory No. 8547.** The schedule of accreditation & analytical methodology can be found using the link **Immunology Schedule of Accreditation** Details of tests that are not present in the UKAS schedule but are performed by the Immunology department are available by contacting the department. Whilst not accredited at this time, such analyses are supported by local QA measures. The department is committed to extending UKAS accreditation where possible. **8547**
Services are provided to hospitals and practitioners within the Lancashire and Lakeland districts and to other hospitals within the North-West region. In addition, work undertaken by the Department supports several regional clinical specialist services including oncology, nephrology, paediatrics, rheumatology and neurology. Protein immunology (immunoglobulins, myeloma screening and typing, complement determination, Acute phase proteins and other specific protein assays), allergy and autoimmunity testing and immunophenotyping by flow cytometry are all performed in-house.
The department also provides a clinical service, specialising in the diagnosis and treatment of immunodeficiency and allergy. The nursing staff provides care and support to the patients who require immunoglobulin replacement therapy.

The department does not offer a routine out of hours service or shift system in the case an urgent test is required out of hours then please contact switchboard at RPH who will forward to the Consultant Immunologist for agreement and arrange for the test to performed if clinically indicated.
The Immunology Department is committed to providing a service of the highest quality and shall be aware and take into consideration the needs and requirements of its users.

All specific enquiries regarding clinical advice and interpretation, as well as the diagnosis and management of Immunological disorders should be made to Dr P Vijayadurai/ Dr Ariharan Anantharachagan/ Dr Samuel Chee/Dr Anthony Rowbottom.
The department is pleased to answer enquiries about the interpretation of test results – where appropriate, comments are made on the reports.

OVERVIEW OF LABORATORY INVESTIGATIONS

Medical Category	Clinical Conditions Covered
Allergy/Hypersensitivity	Anaphylaxis, Asthma, Atopic Eczema, Bronchopulmonary eosinophilia , Conjunctivitis, Food Allergy and Intolerance, Rhinitis, Urticaria
Other Hypersensitivity	Bronchopulmonary aspergillosis, Aspergilloma, Hypersensitivity pneumonitis, Bird fancier's disease, Farmer's lung, Coeliac disease
Organ Specific Autoimmunity	Adrenal failure, Chronic active hepatitis , Dermatitis herpetiformis, Dressler's Syndrome, Recurrent fetal loss, Gonadal failure, Liver autoimmunity, Pemphigus/Pemphigoid, Polyendocrine autoimmunity, Primary biliary cirrhosis, Primary sclerosing cholangitis, Thyroid disease
Infection and Immunity	HIV, Screening for primary immunodeficiency, Secondary cases of immunodeficiency, Acquired C1-inhibitor deficiency, Hereditary angioedema
Malignancy	Lymphoproliferative disorders: Acute and Chronic Leukaemia, Lymphoma
Neurology	Motor neuropathy, Myasthenia, Paraneoplastic syndromes, Multiple sclerosis
Renal Disease	Goodpasture's Syndrome, Necrotising crescentic glomerulonephritis, Nephrotic syndrome
Rheumatology	Polymyositis/Dermatomyositis, Primary anti-phospholipid antibody syndrome, Scleroderma/Systemic Sclerosis Screening, Sjögren's syndrome, Systemic lupus Erythematosus
Vasculitis	Eosinophillic Granulomatosis with Polyangiitis, Henoch-Schönlein Purpura, Kawasaki's syndrome, Microscopic polyarteritis, Primary systemic vasculitides, Small vessel (hypersensitivity) vasculitis, Granulomatosis with polyangiitis

SPECIMEN REQUIREMENTS

The majority of immunology tests can be carried out on serum (Clotted blood specimen) with the exception of the cellular investigations. **A separate specimen is required for the Immunology department if tests for another department within Pathology are also required.**

If a result is 'urgently' required on a particular patient, please contact the laboratory and when clinically indicated, every attempt will be made to provide the result as soon as possible. Some tests take 24 hours or longer before the result is known: this, for economy of materials, time and manpower, they are usually done in batches. Test frequencies are often changed, particularly the day of the week of weekly tests and batches are often re-arranged because of workload. A list of approximate test turnaround times can be found below.

Urgent Requests

Urgent ANCA requests received in the Immunology department before 2.00 p.m. will normally be tested the same day. CSF specimens for immunophenotypic analysis and Urgent DHR requests must have been pre-arranged with the Immunology Laboratory prior to the specimen being taken and brought to the Laboratory as soon as possible by a dedicated carrier. For urgent requests during laboratory hours, please contact the laboratory.
Urgent requests received after 2.00 p.m. will normally be tested on the next working day.

After analysis, serum specimens are stored at -20^{o}C for approximately 1 month during which time requests for further investigations can be placed. The department will endeavour to carry out your requests depending on the volume of stored specimens available.

Requesting Additional Tests on Specimens already despatched to the Immunology Laboratory:

It is the practice of the immunology lab to automatically reflex confirmatory tests where applicable. If, however you wish to request further additional tests, the immunology specimens are kept for a period of 3 weeks in appropriate storage conditions to allow additional requests within this time frame. There are a few immunology assays for which this request cannot be fulfilled due to the stability of the specimen. EDTA specimens for cellular immunology studies have a maximum shelf life of 72 hours therefore additional tests can only be performed within this timeframe. Add on requests can be made conveniently over the phone where advice can be sought, and actioning of the request will be performed by the immunology laboratory personnel. Please telephone Ext 8196 or 01772 528196 for external requestors.

Cellular Investigations

(a) T and B lymphocyte markers – 3.4ml EDTA blood. The blood must reach the laboratory within 72 hours of venepuncture and MUST be kept at room temperature.
(b) CSF leukaemia immunophenotyping for investigation of inflammation or infection NOT malignancy – 5-10ml of CSF specimen kept at room temperature to reach the laboratory within 24 hours. (prior arrangement with the laboratory needed)
(c) Neutrophil Function test (DHR assay) – 4.5ml of heparinised blood & 3.4ml EDTA (prior arrangement with the laboratory needed)

NOTE: These investigations require the specimen to be fresh and it is up to the requestor to ensure the specimen is delivered to the Immunology department within the required time period, to allow processing and analysis.

Cryoglobulins

It is essential that clotted specimens to be investigated for cryoglobulinaemia are maintained at a temperature of 37^{o}C immediately after venepuncture and during transit to the Immunology department.

Mast cell Tryptase

When a patient arrives at A&E with possible anaphylaxis, it is very important to determine the exact time when the symptoms started. Full details of the clinical situation must be conveyed with blood specimens. Blood should be collected by venepuncture into a 7.5ml Gel tube and allowed to clot. The timing of specimen collection is very important. A series of blood specimens must be taken to allow retrospective diagnosis of an anaphylactic event.

It is essential to record the time that the specimens were taken after the anaphylactic event on each tube to allow interpretation.
1st specimen within 1 hour (once the patient is stabilised)
2nd specimen between 3-6 hours
3rd specimen at least 24 hours post event (to exclude mastocytosis).

Postmortem specimens may be useful to support a diagnosis of anaphylaxis. After death there is no metabolic activity and tryptase levels are very stable, allowing specimens to be taken up to 24 hours after death. Routine post-mortem testing for tryptase is recommended by the Royal College of Pathologists as part of investigation following asthmatic death. When taking blood from a line where the patient has had multiple infusions, it is necessary to discard the first 5ml of blood to avoid haemodilution.

The blood can be maintained at 4°C for up to two to five days or separated and stored at -20°C prior to dispatch.

Antigen-specific IgE
When requesting specific IgE tests it is important that you specify the antigens/allergens to be tested. If you are not sure whether we are able to test for IgE levels to a specific antigen, please contact the laboratory and discuss your requirements.

Determination of Intrathecal IgG Synthesis and CSF Oligoclonal Bands
To carry out these investigations we need paired CSF (1ml minimum volume) and clotted blood specimens. The CSF should not be bloodstained as this would indicate contamination with serum IgG, rendering the specimen unstable.

Functional Complement Studies
Some Complement components are labile and so for functional Complement studies we require fresh blood sent on ice. This must be delivered to the laboratory immediately or separated and stored at -20°C prior to dispatch.

Synovial Fluid Analysis
The specimen should be collected in a Universal container and should be clearly labelled with the site from which the specimen was collected. Select Fluid Microscopy on Harris Flex Ideally shared specimens with Microbiology should be avoided, however if obtaining separate specimens is not possible, please clearly identify on the request form (if appropriate) that Synovial Fluid examination is required for the attention of the Immunology Department.

APPROXIMATE TEST TURNAROUND TIMES

Test	Usual test Frequency	Result Availability (excl. transport & postal time)	Specimen Container
Immunoglobulins	Daily	10 days	Gel tube
Complement C3, C4 (immunochemical)	Daily	5 days	Gel tube
Acute Phase Proteins	Daily	3 days	Gel tube
Serum electrophoresis	Daily	16 days	Gel tube
Urine electrophoresis	Daily	13 days	Random or 24 hours
Immunofixation	Daily	10 days	Gel tube
Serum Free Light Chains	Daily	7 days	Gel tube
Complement C1 Inhibitor	Daily	10 days	Gel tube
Beta-2-microglobulin	Daily	7 days	Gel tube
IgG subclasses	Daily	11 days	Gel tube
Functional Antibodies	Weekly	8 days	Gel tube
CSF investigations	4 x per week	12 days	Universal (CSF) + Gel Tube (Serum)
Cryoglobulins	Twice weekly	10 days	Gel tube
Total IgE	Daily	6 days	Gel tube

Specific IgE	Daily	7 days	Gel tube
Connective Tissue Disease Screen	Daily	7 Days	Gel tube
Tissue Autoantibody screen	Daily	9 days	Gel tube
Anti-Nuclear Antibodies	Daily	7 days	Gel tube
Rheumatoid Screen	Daily	5 days	Gel tube
CCP Antibodies	Daily	7 days	Gel Tube
Mast Cell Tryptase	4 x per week	7 days	Gel tube
DNA antibodies	Daily	10 days	Gel tube
ENA screen	Daily	10 days	Gel tube
Aspergillus precipitins	Twice weekly	10 days	Gel tube
Candida precipitins	Twice weekly	9 days	Gel tube
Farmers lung precipitins	Twice weekly	9 days	Gel tube
Avian precipitins	Twice weekly	9 days	Gel tube
ANCA screen	Daily	4 days	Gel tube
ANCA Quantitation	Daily	4 days	Gel tube
CSF immunophenotyping	As required	2 days	Gel tube
GBM quantitation	Daily	3 days	Gel tube
Phospholipid antibodies	Daily	11 days	Gel tube
Thyroid TPO antibodies	Twice weekly	9 days	Gel tube
Thyroid receptor antibodies	Weekly	15 days	Gel tube
Acetylcholine receptor antibodies	Weekly	15 days	Gel tube
Intrinsic Factor antibodies	Weekly	14 days	Gel tube
Functional C1Inhibitor	Weekly	10 days	Gel Tube*

*Serum must be separated & frozen asap

Test	Usual test frequency	Result Availability (excl. transport & postal time)	Specimen Container
Intrinsic Factor Antibodies	Weekly	14 days	Gel tube
Haemolytic Complement	Twice weekly	6 Weeks	Gel tube
Phospholipase A2 Antibodies	Weekly	10 days	Gel tube
Autoimmune liver profile	Weekly	10 days	Gel tube
Myositis profile	Weekly	10 days	Gel tube
Systemic Sclerosis Profile	weekly	10 days	Gel tube
Neuronal/Purkinje Cell antibodies	Weekly	8 days	Gel tube
Organ-specific antibodies (e.g. Adrenal, ovary, etc)	Weekly	8 days	Gel tube
Skin and Kidney Biopsies	As Required	11 days	**On ice** in a Universal tube with PBS or Michels medium
Coeliac screen	Daily	9 days	Gel tube
Lymphocyte subsets	Daily	5 days	3.4 ml EDTA X 1 **
Leukaemia immunophenotyping	Daily	10 days	3.4 ml EDTA X 2 **
CSF/Pleural fluid immunophenotyping	On request	3 days	Universal tube***
Dihydrorhodamine test DHR	On request	1 day	Lithium heparin tube***
Synovial Fluid Examination	Daily	4 days	70ml Sarstedt Universal

* Please refer to correct procedure for cryoglobulin specimen handling (Page 45)
** **Do not refrigerate**. Specimens must be kept at room temperature.
*** Please contact the Laboratory **prior** to sending specimen
**** Serum must be separated & frozen ASAP

The above turnaround times reflect the expected time to carry out and report an immunology test. These times refer to negative/normal results. Specimens with positive/abnormal results are often referred for further tests, which may significantly add to the turnaround time. Some tests have long processing times, which significantly affect the turnaround time. Urgently requested ANCA and anti-GBM antibody tests will be given priority.

REFERRED IMMUNOLOGY TESTS

Some tests that are referred to a reference laboratory and take longer to process due to the extra time taken for postal transit of the specimen and report. Specimens are posted weekly, usually on Tuesday. Normally, allow 2-4 weeks for the result to be available. Please contact the Immunology Department if a result is required urgently.

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

TEST REFERENCE RANGES - Full List including Paediatric

Ranges are the same for both sexes and all ages, unless stated otherwise.

Dark red = autoantibodies
Green = immunochemistry
Blue = flow cytometry
Orange = Referred Tests

Reference ranges are always available on the printed report. Interpretative comments are added to the results where necessary.
The source of reference ranges can be obtained by contacting the laboratory

Test	Sex	Age	Reference Range / Normal Result	Units
Autoantibodies				
Acetylcholine Receptor abs			< 0.25	nmol/l
Adrenal Cortex abs			Negative	
Calcium Channel abs			< 45	pM
Potassium Channel abs			< 70	pM
Cardiac Muscle abs			Negative	
Epidermal Basement Membrane abs			Negative	
Epidermal Intracellular Cement abs			Negative	
TSH Receptor abs			< 1.0	IU/l
Thyroid peroxidase abs			< 25	IU/ml
MAG abs			< 1000	Titre Units
ANCA			Negative	
Myeloperoxidase (p-ANCA) abs			< 3.5	IU/ml
Proteinase 3 (c-ANCA) abs			< 2.0	IU/ml
Glomerular Basement Membrane abs			< 7	EliA Units
IgG Phospholipid abs (Cardiolipin)			< 10	GPL Units/ml
Paraneoplastic Abs			Negative	
PLA 2 receptor antibodies			Negative	
IgM Phospholipid abs (Cardiolipin)			< 10	MPL Units/ml
Glycolipid abs GA1, IgG & IgM			0 - 5,000	Titre Units
GD1a, IgG & IgM			0 - 500	Titre Units
GD1b, IgG & IgM			0 - 500	Titre Units
GD3, IgG & IgM			0 - 500	Titre Units

Test	Sex	Age	Reference Range / Normal Result	Units
GM1, IgG & IgM			0 - 500	Titre Units
GM2, IgG & IgM			0 - 500	Titre Units
GM3, IgG & IgM			0 - 500	Titre Units
GQ1b, IgG & IgM			0 - 500	Titre Units
GT1b, IgG & IgM			0 - 500	Titre Units
IgG Antibody to Globoside			0 - 500	Titre Units
IgG Antibody to Sulphatides			0 - 10,000	Titre Units
Connective Tissue Disease Screen			< 0.7	Ratio
Tissue Autoantibody Screen			Negative	Titre Units
Extractable Nuclear Antigens			Negative	EliA Units
HEp-2 Antibodies			Negative	Titre Units
Tetanus Abs IgG			>0.01	IU/ml
Haemophilus Abs			>0.15	mg/L
Gastric Parietal Cell abs			Negative	
LKM (Liver/Kidney/Microsome) abs			Negative	Titre Units
Mitochondrial - M2 abs			Negative	Titre Units
Mitochondrial - Non M2 abs			Negative	Titre Units
Neuronal/Purkinje Cell Abs			Negative	
Reticulin R1 abs			Negative	
IgA Tissue Transglutaminase abs			< 7	EliA Units
Endomysial abs			Negative	
Autoimmune Liver Profile / Blot			Negative	
Phospholipase A2 Receptor Antibodies			Negative	
Myositosis Profile / Blot			Negative	
Systemic Sclerosis Profile / Blot			Negative	
Rheumatoid Factor			< 15	IU/ml
Ribosomal abs			Negative	Titre Units
Smooth Muscle abs			Negative	Titre Units
Striated Muscle abs			Negative	
Skin and Kidney Biopsies			Negative	
Beta 2 glycoprotein (IgG/IgM)			< 10	U/ml

Test	Sex	Age	Reference Range / Normal Result	Units
Immunochemistry				
Albumin (serum)	M		35 - 47	g/l
	F		33 - 47	g/l
Serum Amyloid A (SAA)			0 - 10	mg/l
α1-acid glycoprotein	F	>50	0.8 - 2.0	g/l
		5-50	0.4 - 1.0	g/l
	M	>50	0.8 - 2.0	g/l
		5-50	0.6 - 1.2	g/l
α2-macroglobulin	F	45	1.4 - 4.0	g/l
		30	1.8 - 4.5	g/l
		15	2.2 - 5.0	g/l
		0	2.8 - 6.7	g/l
	M	45	1.3 - 3.5	g/l
		30	1.6 - 4.0	g/l
		15	2.0 - 4.5	g/l
		0	2.8 - 6.7	g/l
α1-antitrypsin		Adult	1.1 - 2.1	g/l
		15	1.2 - 2.0	g/l
		10	1.4 - 2.3	g/l
		5	1.1 - 2.2	g/l
		1	1.1 - 2.0	g/l
		6m	0.8 - 1.8	g/l
		0	0.9 - 2.2	g/l
β2-microglobulin (serum)			1.2 - 2.4	mg/l
β2-microglobulin (urine)			0 - 0.03	mg/l
CSF Oligoclonal Band Interpretation			Normal	
Complement C1 Inhibitor			0.15 - 0.35	g/l
Complement C3			0.75 - 1.65	g/l
Complement C4			0.14 - 0.54	g/l
Functional C1 Inhibitor			68-100	%

Test	Sex	Age	Reference Range / Normal Result	Units
Haemolytic Complement Classical			69-129	%
Haemolytic Complement Alternative			30-113	%
Haptoglobin	M		0.5 - 2.0	g/l
	F		0.4-1.6	g/l
IgG1 Subclass		Cord	3.6-8.4	g/l
		6m	1.0-3.0	g/l
		2yr	2.3-5.8	g/l
		5yr	2.3-6.4	g/l
		10yr	3.6-7.3	g/l
		15	3.8-7.7	g/l
		Adult	3.2-10.2	g/l
IgG2 subclass		Cord	1.2 - 4.0	g/l
		6m	0.3 - 0.5	g/l
		2yr	0.3 - 3.9	g/l
		5yr	0.7 - 4.5	g/l
		10yr	1.4 - 4.5	g/l
		15	1.3 - 4.6	g/l
		Adult	1.2 - 6.6	g/l
IgG3 subclass		Cord	0.3 - 1.5	g/l
		6m	0.1 - 0.6	g/l
		2yr	0.1 – 0.8	g/l
		5yr	0.1 - 1.1	g/l
		10yr	0.3 - 1.1	g/l
		15	0.2 - 1.2	g/l
		Adult	0.2 - 1.9	g/l

Test	Sex	Age	Reference Range / Normal Result	Units
IgG4 subclass		Cord	< 0.5	g/l
		6m	< 0.5	g/l
		2yr	< 0.5	g/l
		5yr	< 0.8	g/l
		10yr	< 1.0	g/l
		15	< 1.1	g/l
		Adult	< 1.3	g/l
IgA		45	0.8 - 4.0	g/l
		15	0.8 - 2.8	g/l
		12	0.8 - 2.8	g/l
		9	0.7 - 2.5	g/l
		6	0.5 - 2.4	g/l
		3	0.4 - 2.0	g/l
		2	0.3 - 1.3	g/l
		1	0.3 - 1.2	g/l
		9-12m	3.0 - 10.9	g/l
		6-9m	3.0 - 9.0	g/l
		3-6m	2.4 - 8.8	g/l
		6-12wk	2.1 – 7.7	g/l
		2-6wks	3.9 – 13.0	g/l
		0-2wks	5.0 – 17.0	g/l
IgG		15	6.0 - 16.0	g/l
		6	5.4 - 16.1	g/l
		3	4.9 - 16.1	g/l
		2	3.7 - 15.8	g/l
		1	3.1 - 13.8	g/l
		9-12m	3.0 - 10.9	g/l
		6-9m	3.0 - 9.0	g/l
		3-6m	2.4 - 8.8	g/l

Test	Sex	Age	Reference Range / Normal Result	Units
IgG continued		6-12wks	2.1 - 7.7	g/l
		2-6wks	3.9 - 13.0	g/l
		0-2wks	5.0 - 17.0	g/l
IgM		45	0.5 - 2.0	g/l
		15	0.5 - 1.9	g/l
		12	0.5 - 1.9	g/l
		6	0.5 - 1.8	g/l
		3	0.5 - 2.0	g/l
		2	0.5 - 2.2	g/l
		1	0.5 - 2.2	g/l
		9-12m	0.6 - 2.1	g/l
		6-9m	0.4 - 1.6	g/l
		3-6m	0.2 - 1.0	g/l
		6-12wks	0.15 - 0.7	g/l
		2-6wks	0.08 - 0.4	g/l
		0-2wks	0.05 - 0.2	g/l
Mast Cell Tryptase			2 - 14	µg/l
Specific IgE			0 - 0.34	KU_a/L
Total IgE		<3m	≤ 5	KU/L
		3 - 12m	≤ 11	KU/L
		1 - 4y	≤ 29	KU/L
		5 – 9y	≤ 52	KU/L
		10 – 14y	≤ 63	KU/L
		15-16y	≤ 75	KU/L
		>16y	≤ 81	KU/L
Aspergillus Precipitins			Negative <60	mgA/l
C. Albicans Precipitins			Negative <40	mgA/l
Budgerigar Precipitins			Negative <40	mgA/l
Parrot Precipitins			Negative <40	mgA/l
Pigeon Precipitins			Negative <40	mgA/l

Test	Sex	Age	Reference Range / Normal Result	Units
Flow Cytometry				
CD3+ (T cells) Absolute count		16	0.7 - 2.1	$x10^9 L^{-1}$
		10	0.8 - 3.5	$x10^9 L^{-1}$
		5	0.7 - 4.2	$x10^9 L^{-1}$
		2	0.9 - 4.5	$x10^9 L^{-1}$
		15m	1.4 - 8.0	$x10^9 L^{-1}$
		9m	1.6 - 6.7	$x10^9 L^{-1}$
		5m	2.4 - 6.9	$x10^9 L^{-1}$
		2M	2.3 - 6.5	$x10^9 L^{-1}$
		7D	2.3 - 7.0	$x10^9 L^{-1}$
		0	0.6 - 5.0	$x10^9 L^{-1}$
CD3+ (T cells) percentage		16	55 - 83	%
		10	52 - 78	%
		5	55 - 78	%
		2	43 - 76	%
		15M	39 - 73	%
		9m	54 - 76	%
		5m	50 - 77	%
		2m	48 - 75	%
		7D	60 - 85	%
		0	28 - 76	%
CD4+ (helper T cells) Absolute count		16	0.3 - 1.4	$x10^9 L^{-1}$
		10	0.4 - 2.1	$x10^9 L^{-1}$
		5	0.3 - 2.0	$x10^9 L^{-1}$
		2	0.5 - 2.4	$x10^9 L^{-1}$
		15m	0.9 - 5.5	$x10^9 L^{-1}$
		9m	1.0 - 4.6	$x10^9 L^{-1}$
		5m	1.4 - 5.1	$x10^9 L^{-1}$
		2m	1.5 - 5.0	$x10^9 L^{-1}$
		7D	1.7 - 5.3	$x10^9 L^{-1}$
		0	0.4 - 3.5	$x10^9 L^{-1}$

Test	Sex	Age	Reference Range / Normal Result	Units
CD4+ (helper T cells) percentage		16	28 - 57	%
		10	25 - 48	%
		5	27 - 53	%
		2	23 - 48	%
		15m	25 - 50	%
		9m	31 - 54	%
		5m	33 - 58	%
		2m	33 - 58	%
		7D	41 - 68	%
		0	17 - 52	%
CD8+ (suppressor T cells) Absolute count		16	0.2 - 0.9	$x10^9\ L^{-1}$
		10	0.2 - 1.2	$x10^9\ L^{-1}$
		5	0.3 - 1.8	$x10^9\ L^{-1}$
		2	0.3 - 1.6	$x10^9\ L^{-1}$
		15m	0.4 - 2.3	$x10^9\ L^{-1}$
		9m	0.4 - 2.1	$x10^9\ L^{-1}$
		5m	0.6 - 2.2	$x10^9\ L^{-1}$
		2m	0.5 - 1.6	$x10^9\ L^{-1}$
		7D	0.4 - 1.7	$x10^9\ L^{-1}$
		0	0.2 - 1.9	$x10^9\ L^{-1}$
CD8+ (suppressor T cells) percentage		16	10 - 39	%
		10	9 - 35	%
		5	19 - 34	%
		2	14 - 33	%
		15m	11 - 32	%
		9m	12 - 28	%
		5m	13 - 26	%
		2m	11 - 25	%
		7D	9 - 23	%
		0	10 - 41	%

Test	Sex	Age	Reference Range / Normal Result	Units
Helper / Suppressor Ratio		16	1.0 - 3.6	Ratio
		10	0.9 - 3.4	Ratio
		5	0.9 - 2.6	Ratio
		2	0.9 - 2.9	Ratio
		15m	0.9 - 3.7	Ratio
		9m	1.3 - 3.9	Ratio
		5m	1.6 - 3.8	Ratio
		2m	1.7 - 3.9	Ratio
		7D	1.3 - 6.3	Ratio
		0	1.0 - 2.6	Ratio
CD19+ (B cells) Absolute counts		16	0.1 - 0.5	$x10^9\ L^{-1}$
		10	0.2 - 0.6	$x10^9\ L^{-1}$
		5	0.2 - 1.6	$x10^9\ L^{-1}$
		2	0.2 - 2.1	$x10^9\ L^{-1}$
		15m	0.6 - 3.1	$x10^9\ L^{-1}$
		9m	0.6 - 2.7	$x10^9\ L^{-1}$
		5m	0.7 - 2.5	$x10^9\ L^{-1}$
		2m	0.6 - 3.0	$x10^9\ L^{-1}$
		7D	0.6 - 1.0	$x10^9\ L^{-1}$
		0	0.04 - 1.1	$x10^9\ L^{-1}$
CD19+ (B cells) percentage		16	6 - 19	%
		10	8 - 24	%
		5	10 - 31	%
		2	14 - 44	%
		15m	17 - 41	%
		9m	15 - 39	%
		5m	13 - 35	%
		2m	14 - 39	%
		7D	4 - 26	%
		0	5 - 22	%

Test	Sex	Age	Reference Range / Normal Result	Units
CD16+ (NK cells)		16	0.09 - 0.6	$x10^9$ L^{-1}
		10	0.07 - 1.2	$x10^9$ L^{-1}
		5	0.09 - 0.9	$x10^9$ L^{-1}
		2	0.1 - 1.0	$x10^9$ L^{-1}
		15m	0.1 - 1.4	$x10^9$ L^{-1}
		9m	0.2 - 1.2	$x10^9$ L^{-1}
		5m	0.1 - 1.0	$x10^9$ L^{-1}
		2m	0.1 - 1.3	$x10^9$ l^{-1}
		7D	0.2 - 1.4	$x10^9$ L^{-1}
		0	0.1 - 1.9	$x10^9$ L^{-1}
		16	7 - 31	%
		10	6 - 27	%
		5	4 - 26	%
		2	4 - 23	%
		15m	3 - 16	%
		9m	3 - 17	%
		5m	2 - 13	%
		2m	2 - 14	%
		7D	3 - 23	%
		0	6 - 58	%

Test	Sex	Age	Reference Range / Normal Result	Units
Referred Tests				
C. Diphtheria Antibodies			Minimum protective level 0.01 Optimum protective level >0.1	IU/ml
Insulin Antibodies			0-5	mg/l
Insulin IA2 Antibodies			Negative <10	IU/ml
Glutamic Acid decarboxylase antibodies (GAD)			Negative≤5 Weak positive 6-25 Positive >25	U/ml
Histone Antibodies			Normal <40	U/ml
Collagen Type 2 Antibodies			Negative	
Factor I			21-40	mg/l
C1q Antibodies			<10	U/ml
Complement C1Q			50 – 250	mg/l
Potassium Channel Antibodies			Negative 0-69 Equivocal 70-130 Positive >130	pmol/L
HMGCR			Negative	
β Interferon Neutralising Antibodies			Negative	
Nephritic Factor C3			Negative	mg/l
C3d			<5	mg/l
C2			10-30	mg/l
C9			50-250	mg/l
Total IgD			2-100	KU/L
Mannose Binding Lectin		< 5yr	0.6-4.0	mg/l
Mannose Binding Lectin		> 5yr	1.0-4.0	mg/l
Eosinophil Cationic Protein			1.0-15.0	Ug/l

Microbiology Department

Enquiries	01772 522 105

8545

GENERAL INFORMATION

Bacteriology and Virology services are provided by the Preston Microbiology Services in the Pathology Laboratory at Royal Preston Hospital.
The Department is UKAS accredited to ISO 15189:2012 Medical Laboratory No. 8545, the schedule of accreditation & analytical methodology can be found using the link: Microbiology Schedule of Accreditation

For further information on Microbiology please see the Microbiology User Guide available on both the Trust website and the intranet.

https://intranet.lthtr.nhs.uk/extranet/widget/resources/download/2024-673633f76815c5.43279175

Phlebotomy Information

INPATIENT PHLEBOTOMY SERVICE

A hospital-based phlebotomy service is available at the **Royal Preston Hospital** every day of the year except for Christmas day. At **Chorley & South Ribble Hospital** the phlebotomy service is available every day except Public Holidays. Doctors wishing to use this service should schedule the requests **before** 8 AM. Forms for transfusion specimens should be filled in and left on the designated collection point in the ward by 8 AM. The phlebotomists will take specimens for all pathology tests (**except for blood cultures**) on Mondays – Saturdays, but on Sundays will only take specimens for a limited range of investigations.

Clinicians & Nursing Staff Taking Blood*:* Please ensure that all specimens are taken under the correct conditions, appropriate preservative used and any special requirements adhered to. The individual sections of this guide should give you most of the information you require but if in doubt please telephone the appropriate department. The laboratory uses the Sarstedt Monovette system for taking blood. If you wish to know more about training to use this system, please contact Sarah Whalley, Phlebotomy Manager.

OUTPATIENT PHLEBOTOMY SERVICE

The Blood Test Clinic is situated in the Outpatient Departments at the Royal Preston Hospital & Chorley & South Ribble Hospital. The clinic is open for patients with an outpatient or **an urgent GP blood request** form **as a drop-in service**. Patients are expected to arrive at least within 20 minutes before closing time of the blood test clinic.

Outpatient Department	Royal Preston Hospital	Chorley & South Ribble hospital
Opening times:	8.30 AM to 5.00 PM	8.30 AM to 4.30 AM

Glucose Tolerance Test Clinic – Outpatient Department
Glucose Tolerance Tests (GTT) are performed on Thursdays in the Blood Test Clinic located in the Main Outpatient department. A GTT will be performed if clinically indicated & with the agreement of the Biochemistry Clinicians. To request a GTT, please send a fully completed blood request form to Pathology Reception. An appointment will be made with the patient if indicated.

Hospital doctors who wish their patients to be bled in the Clinic should give their patients a fully and accurately completed request form(s). The patient can then attend the Blood Test Clinics to be bled. Please refer to the individual sections to ensure that the patient is fully aware of any special requirements (e.g. Fasting overnight) before they attend the Outpatient Department.

COMMUNITY PHLEBOTOMY SERVICE

There is a community-based Phlebotomy service available to all Preston and South Ribble patients. GPs should give their patients a fully and accurately completed request form. Please refer to the individual sections to ensure that the patient is fully aware of any special requirements (e.g. fasting overnight) before attending for testing.
Preston patients should attend any of the following clinics. Patients may attend the Blood Test clinic at Royal Preston Hospital **for URGENT tests only**.

Opening Times:

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
AM	MINERVA HEALTH CENTRE 8.00am – 3.30pm FULWOOD CLINIC 8.00am – 11.30 am GEOFFREY STREET HEALTH CENTRE 8.30am – 11.30am	MINERVA HEALTH CENTRE 8.00am – 3.30pm ASHTON HEALTH CENTER 8.00 am – 11.30am GEOFFREY STREET HEALTH CENTRE 8.30am – 11.30am	BROOKFIELD CLINIC 8.30am – 11.30am FULWOOD CLINIC 8.00am – 11.30 am GEOFFREY STREET CLINIC 8.30am – 11.30am LONGRIDGE HOSPITAL 8.45am – 11.30am ASHTON HEALTH CENTRE 8.00am – 11.30am	FULWOOD CLINIC 8.00am – 11.30am INGOL HEALTH CENTRE 8.30am – 11.30am GEOFFREY STREET HEALTH CENTRE 8.30am – 11.30am	MINERVA HEALTH CENTRE 8.00am – 11.30am FULWOOD CLINIC 8.00am – 11.30am GEOFFREY STREET HEALTH CENTRE 8.30am – 11.30am LONGRIDGE HOSPITAL 8.30am – 11.30am
PM	ASHTON HEALTH CENTER 1.00pm – 3.30pm INGOL HEALTH CENTRE 1.00pm – 3.30pm LONGRIDGE HOSPITAL 1.00pm – 3.30pm CHORLEY HEALTH CENTRE (by appointment only) 01772 644771 5.00pm – 7.30pm	PENWORTHAM St MARYS HEALTH CENTER 08.00 am – 11.30am	FULWOOD CLINIC 12.45pm – 3.30pm RIBBLETON CLINIC 1.00pm – 3.30pm MINERVA HEALTH CENTRE-Paediatrics only (by appointment only) 01772644676 1.00pm – 4pm	FULWOOD CLINIC 12.45 pm – 3.30pm ASHTON HEALTH CENTRE 1.00pm – 3.30pm	MINERVA HEALTH CENTRE

	Saturday	Sunday	Bank Holidays
AM	FULWOOD CLINIC (By appointment only) 01772777226 8.30am – 12.00pm	CHORLEY HEALTH CENTRE (by appointment only) 01772 644771 8.30am – 12.00pm	Closed.

Ashton Health Centre Tel: 777160	69 Peddars Lane (on Ashton Park), Ashton. PR2 1HR
Brookfield Clinic Tel: 777474	Croasdale Ave, (off Watling St Rd), Preston. PR2 6UB
Chorley Health Centre: 777430	Collinson avenue, Chorley PR7 2TH
Fulwood Clinic Tel: 777225	4 Lytham Rd, Fulwood, Preston PR2 8JB
Geoffrey Street HC Tel 777300	Geoffrey Street (off New Hall Lane), Preston PR1 5NE
Ingol Health Centre Tel: 777427	86 Village Green La (off Tag Lane), Ingol, Preston. PR2 7DS
Longridge Community Hospital Tel: 777400	St Wilfreds Terrace, Longridge. PR3 3WQ
Minerva Health Centre Tel: 777600	Lowthorpe Road – (PNE Site) Deepdale. PR1 6SB
Penwortham St Mary's Health Centre: 644151	Cop Lane, Penwortham, Preston PR1 0SR
Ribbleton Clinic Tel: 777473	Langden Drive (off Pope Lane), Ribbleton, Preston. PR2 6HT
Royal Preston Hospital Tel: 716565	Sharoe Green Lane North Fulwood, Preston. PR2 9HT

Most up to date information can also be found on the website: https://www.lscft.nhs.uk/services/service-finder-z/phlebotomy

Chorley Pathology Laboratory

General Enquiries- Reception / Office	01257 -245255

GENERAL INFORMATION

The laboratory at Chorley & South Ribble hospital encompasses Clinical Biochemistry, Haematology and Blood Transfusion. It is staffed on a 24-hour basis for the processing of urgent specimens only. For specialist advice, please contact the relevant people listed for each department on pages 7- 9

For Clinical Biochemistry, a summary of the more common tests routinely performed, including reference ranges and collection details is given in the Biochemistry section of the user guide. Details on more specialised tests undertaken are available via the Duty Clinical Biochemist. For Haematology and Blood Transfusion, a full list of tests available and collection details is given in the relevant sections of section of this user guide.

MULTILAB

The Multilab performs an agreed restricted range of tests, which are available urgently 24 hours a day. Whenever possible requests for Pathology tests should be made electronically. Where electronic requesting is not available, forms for Clinical Biochemistry & Haematology are combined and the other departments have separate request forms. Whichever form you use, there are Minimum Data sets required. Failure to fill in form correctly will result in delays and may result in the specimen not being processed.

- Patient's full name
- Date of birth
- NHS number (except A & E)
- Date & time of collection
- Patient's Consultant/G.P. code
- Test requirements
- Valid signature
- Location
- Identify **URGENT** requests clearly

Addressograph labels are NOT acceptable on specimens in Blood Transfusion.

URGENT REQUESTS

The requesting Doctor must BLEEP the Pathology Department at Chorley via switchboard and mark the request as URGENT.

Failure to do so may result in delay in analysis. Please ensure that any request form is completed properly. The requesting Doctor **must** also indicate which tests are required urgently. The specimen will be analysed urgently after receipt and the results will be made available to the requesting location unless otherwise specified. Life threatening results will be phoned back.

Requests for **Blood Gases** must always be treated as urgent due to the instability of the specimen and the Department **must** be contacted on each occasion.

All specimens from **A&E, Coronary Care Unit, Renal Unit, Short Stay Unit and CrCU** will be treated as Urgent. The specimens will be analysed as soon as possible after receipt and the results made available for computer access. Results exceeding critical limits will be telephoned. The range of analyses available as Urgent is: -

- U & E (sodium, potassium, urea, creatinine and eGFR)
- Glucose
- Blood gases
- Calcium, Albumin and Adjusted calcium
- Amylase
- Paracetamol
- Salicylate
- CK
- CRP
- Bilirubin
- LFT
- FBC

- ESR (Referred to Preston Haematology Lab for analysis)
- INR
- aPTT
- Coagulation Screen
- D-Dimer
- CSF protein (Referred to Preston Biochemistry Lab for analysis)
- CSF glucose (Referred to Preston Biochemistry Lab for analysis)
- Troponin T
- Lactate
- Ammonia
- Magnesium
- Gentamicin
- Vancomycin

Urgent Requests for Tests out of normal working hours
Please bleep the Duty Biomedical Scientist via switchboard. Other tests of an emergency nature may be available by arrangement. In the first instance please contact the Duty Biomedical Scientist as above who may then request that you contact the On-Call Clinical Biochemist or Consultant Haematologist, who can be contacted via the Royal Preston Hospital switchboard on 01772-716565 and are available for advice 24 hours a day.

ROUTINE REQUESTS

The complexity and time taken to perform an assay, along with availability of equipment and staff, are the main limitations on the frequency of analysis. Other factors are clinical demand, cost-effective batch size, time-effective batch size and in-use reagent stability. However, please refer to the Clinical Biochemistry and Haematology sections of the user guide, which provide guidance on the turnaround times of the common analytes. Certain tests are sent away for analysis and the turnaround time is out of our control. If further information is required for Clinical Biochemistry, please contact the Duty Clinical Biochemist at Preston via switchboard (01772 - 716565).

Results of Haemoglobin, PCV, red cell indices, white blood cell count, platelets and coagulation will be made available for electronic access. Results for specialised tests which are performed in batches will follow within 24 hours. Abnormal results of a life-threatening nature will be phoned to the requesting source.

Specimens for routine analysis which are not performed on site will be processed routinely and the final report made available as appropriate. Specimens received in time for the 1.30 p.m. transport will be analysed on the same day for tests analysed daily. Requests arriving in the Chorley laboratory after that time will be sent on a later transport but may not be analysed that day. If not, they will be transported on the first run of the next working day.

Advice on Interpretation and Investigations
For Clinical Biochemistry, during normal working hours, Clinical Biochemists are available to give advice on appropriate testing and the interpretation of results. For further advice on Haematology and Transfusion issues, please contact one of the Consultant Haematologists at Preston. Out of hours advice is available. Please contact the switchboard at the Royal Preston Hospital.

CHORLEY PATHOLOGY SPECIMEN COLLECTION

Specimens are collected by the Porter from various locations in the hospital and delivered to the Pathology Laboratory. When the Laboratory is closed, specimens are delivered to the specimen box situated to the right-hand side of the front door of the laboratory on Level 3. The bell must be operated to alert staff of the arrival of specimens. The porter also collects reports from the Pathology Reception and delivers to the Wards.

Specimen collection
Specimens are collected from all wards, theatres and outpatient departments. Each ward/department has a designated collection point usually within the entrance/ reception area.
See Page 11 for times
Urgent requests for transport to the laboratory outside normal collection rounds

Porters may be bleeped at any time and requested to take **URGENT** specimens from the location to the laboratory. These are limited to the following type of specimens:

- Blood Transfusion requests
- Blood gases and urgent requests for Clinical Biochemistry
- Urgent Haematology requests
- CSF and material from brain abscesses
- Frozen sections, jejunal nerve & muscle biopsies
- All requests from CrCU, CCU, A&E and Theatres

TRANSPORT OF SPECIMENS TO THE ROYAL PRESTON HOSPITAL

Regular transport runs go to Royal Preston Hospital (RPH) throughout the day taking routine work for analysis by the laboratory at RPH.

Schedule of transport to the Royal Preston Hospital:	
Monday to Friday	**Saturday/Sunday**
Runs performed by LTHTr Transport 9.00 a.m. 10.00a.m. 12.00 p.m. 1.30 p.m. 2.15 p.m. 3.15 p.m. 4.30 p.m. Runs performed by North West Blood Bikes 18.30 01.00 (Return to CDH if Required)	Northwest Blood Bikes operate regular runs from CDH to RPH 11.00 13.30 15.00 16.30 01.00 (Return to CDH if required)

Anticoagulation Department

The Anticoagulation department runs Outpatient Anticoagulation Clinics at RPH, CDH, Bamber Bridge Community clinic. All patients discharged from RPH or CDH on oral anticoagulants must have a discharge/referral form emailed to the Anticoagulant service to anticoagulantclinic@lthtr.nhs.uk or completed via FLEX (Select Anticoagulant referral during Discharge). All referrals must be completed in full, any referrals deemed to be incomplete will be returned to the referring area for completion which may delay patient treatment. The anti-coagulant nurses can be contacted on Ext 7104
Advice is available from both Consultant Haematologists and Specialist Anticoagulant Nurses.

Anticoagulant Clinic

Patients need to book an appointment to be able to attend any clinics below.

Royal Preston Hospital – Outpatient department
Opening times: Tuesday 1.15 PM to 4.00 PM
Thursday 1.15 PM to 4.00 PM

Chorley & South Ribble Hospital – Pathology reception
Opening times: Monday 1 PM to 4 PM
Wednesday 9-12PM & 1-4PM

Bamber bridge Clinic- School Lane, Preston PR5 6QE
Opening times: Friday 9-12 PM

Self-testing service

The anticoagulation team will review the requirements of the patient and assess the suitability case-by-case for any patients that want to opt-in to the self-testing service. This is undertaken independently of the primary care services and service offered is in line with NICE guidance (National Institute for Health & Care Excellence.)