Department of Clinical Chemistry

Birmingham Women’s Hospital

Handbook for Users

Check the Birmingham Women’s and Children’s Hospitals web site:

https://bwc.nhs.uk/laboratories
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1 Introduction to CLINICAL CHEMISTRY

Services Provided
In addition to providing a general analytical service for obstetrics, gynaecology and the Neonatal Unit, the laboratory is a large fetal anomaly screening centre for Down’s syndrome, trisomy 18 and trisomy 13 anomalies. The department provides a service to over 30 maternity units including the majority of the West Midlands SHA trusts, all of North-West London, Bedfordshire, Berkshire, East & North Hertfordshire, Belfast and Guernsey, plus a number of private maternity healthcare providers.

Service Scope
The routine chemistry service provides clinical chemistry testing and clinical advice for patients attending the trust, working with the clinical chemistry laboratory of Birmingham Children’s Hospital to provide round the clock emergency cover for urgent work, using Roche Cobas c6000 analysers.

The fetal anomaly screening programme consists of first trimester and second trimester screening using Roche Cobas & Beckman Access systems to measure total hCG, AFP, uE3, Inhibin-A, free beta-hCG and PAPP-A. IT facilities include the SSDw and HealthTag software for antenatal screening and Telepath for general biochemistry.

A summary of tests performed in and out of hours is given in section 8 and reference ranges and collection details are given in section 11 respectively. Details of more specialised tests undertaken in the laboratory are available from senior laboratory staff.

The department may refer some tests externally. Please see section 10 for further details

Service Standards/Quality Assurance
The Clinical Chemistry Department is in the process of applying for UKAS assessment in accordance with Medical Laboratories – requirements for quality and competence (ISO 15189:2012).

Our accreditation is limited to those activities described on our UKAS Schedule of Accreditation found here: https://search.ukas.com/#/tabbed/search?q=Birmingham%20Women%20s&ati=1

Tests not in scope and therefore unaccredited and unaccredited tests referred to other laboratories are indicated with the symbol † in the repertoire tables. Once available, the scope will be published on the UKAS website.

The quality of our service is maintained by recognised effective internal quality control measures and by participation in the following National External Quality Assurance (EQA) Schemes:
- NEQAS
- WEQAS
- DQASS
- RIQAS

The members of staff working within the department are fully qualified, specialised and experienced, providing a quality service. A high quality service is maintained by frequently looking at feedback from user meetings, audits and satisfaction surveys.
Service Commitment
The 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. Our aim is to provide a service of the highest quality and promote the trust mission and values and corporate, directorate and departmental objectives to ensure that the families we serve are at the heart of all we do.

The purpose of this handbook is to provide information on the Clinical Chemistry laboratory service including test repertoire, specimen requirements and details on accessing our service.
2 Useful Contacts

Head of Department & Director of Foetal Anomaly Screening Service
Dr Sarah Heap
0121 333 9922 (BCH)
0121 472 1377 ext 5537 (BWH)

Laboratory Lead
Mr Ian Mills
0121 472 1377 ext 5537

Laboratory Manager
Mr William Macdonald
0121 472 1377 ext 5536

Point of Care Testing Co-ordinator
Rovinder Madhar
0121 472 1377 ext 5537
3 Information Governance

Data Protection
Information is a vital asset both in terms of the clinical management of individual patients and the efficient management of services and resources. It plays a key part in clinical governance, service planning and performance management.

Your personal data is data which by itself or with other data available to us can be used to identify you. We are Birmingham Women’s and Children’s NHS Foundation Trust, the data controller. Our Trust is registered with the Information Commissioner’s Office (ICO) to process personal and special categories of information under the General Data Protection Regulation (GDPR) and Data Protection Act 2018 (subject to parliamentary approval) and our registration number is Z6078102.

The department complies with the Trust policies relating to the handling, use and protection of personal information (add document here)

- We only ask for information that we need to allow interpretation of results
- We protect the information and ensure only those staff who need to see the information can access it
- We share the information only when we need to for patient care, for example sending the information to another laboratory for testing
- The data will be stored in accordance with The retention and storage of pathological records and specimens (5th edition) Guidance from The Royal College of Pathologists and the Institute of Biomedical Science, April 2015. We do not store any information for any longer than is absolutely necessary.

For more information, please click on the following link to read the Trusts Privacy Policy. This data protection and privacy policy sets out how we will use your personal data when you access our website. You can contact our Data Protection Officer at Birmingham Children’s Hospital, Steelhouse Lane, Birmingham B4 6NH if you have any questions.
https://bwc.nhs.uk/privacy-policy

Complaints
Pathology Services operates a complaints system in line with the Trusts Complaints Policy ‘Making Experiences Count Policy’.

Complaints, comments or feedback regarding the services provided by pathology can be made verbally or in writing (letter or email). Please contact the Pathology Services Manager or the Quality Manager.

If you feel that your concerns have not been put right you can make a formal complaint:
https://bwc.nhs.uk/complaints
4 Patient Information

Phlebotomy / Blood tests
https://labtestsonline.org.uk/
5 Service Location & Availability

Location of the Department
Department of Clinical Chemistry
1st Floor, Birmingham Women’s Hospital

Laboratory postal address

Department of Clinical Chemistry
1st Floor
Birmingham Women’s Hospital
Mindelsohn Way
Edgbaston
Birmingham
B15 2TF

Service Hours
Normal Working Hours
Mon – Fri 09:00 – 17:15
Sat/Sun/BH 09:00 – 12:00

Out of Hours Service
Transport to Birmingham Children’s Hospital
Blood Sciences Clinical Chemistry Laboratory
Whittall Street
Birmingham

Sending a Specimen
Information on sending specimens collected within Birmingham Women’s Hospital can be obtained from the Hospital Laboratory Handbook located on the Intranet.

Specimens collected at sites outside Birmingham Women’s Hospital should, where possible, be sent via the blood sciences/clinical chemistry department in the originating hospital. In some cases specimens for certain tests may require immediate transport by courier or taxi. Specific needs are listed in the specimen requirement section of the table in this handbook. If using a courier or taxi please request that the specimens are delivered to the Paediatric Laboratory Medicine Block entrance at Whittall Street (not to the main hospital post room).
6 Specimen Collection, completion of the request form and management of urgent and additional requests

Consent

Unless written consent is required for a particular test or investigation (this will be documented in the test details), the laboratory assumes that informed consent for testing to be carried out has been given at the time the request form has been completed.

It is the responsibility of the requesting doctor to obtain consent for specimen collection and the tests requested. It is implicit in the receipt of the request form that consent has been obtained. We never request more sample than we need to; but where there is material left over after laboratory testing, it may be used for other purposes such as quality assurance or audit, under the provisions of the Human Tissue Act 2004. Specific research is regulated separately by the ethics committee. Consent for the use of tissue requires that patients must be given the option to refuse permission for spare material to be used. When this occurs, each request to the laboratory must be clearly marked so that specimens are not used for other purposes.

There may be specific requirements for written consent for DNA tests sent to other countries, please contact the molecular genetics laboratory for further information.

Specimen Collection (including the preparation of the patient)

See specific test
Instructions for the completion of the request form

The laboratories have well established acceptance criteria which need to be present for samples to be accepted and processed. All essential items need to be present on the form to ensure that patients are uniquely identified so that results are not allocated to the wrong patient, and that the correct test can be performed and reported to the correct clinician and sent to the correct location. It is the responsibility of the requesting clinician to complete the correct request form fully. Errors or incomplete information WILL result in the delay in specimen processing and reporting.

To comply with laboratory procedures, we will only accept samples where all mandatory information and minimum patient identifiers are provided. The following essential information is required:

### Essential Criteria

<table>
<thead>
<tr>
<th>Essential Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHS Number / Hospital Registration Number</td>
</tr>
<tr>
<td>Surname</td>
</tr>
<tr>
<td>Forename (if available)</td>
</tr>
<tr>
<td>Date of Birth</td>
</tr>
<tr>
<td>Identification and location of requestor</td>
</tr>
<tr>
<td>Investigation required</td>
</tr>
<tr>
<td>Date and time of collection</td>
</tr>
<tr>
<td>Specimen Type,</td>
</tr>
<tr>
<td>Relevant clinical information</td>
</tr>
<tr>
<td>Fasting or dietary status</td>
</tr>
<tr>
<td>The date of the onset of symptoms</td>
</tr>
<tr>
<td>Details of antibiotic therapy and drug therapy</td>
</tr>
<tr>
<td>Biohazard warning label</td>
</tr>
</tbody>
</table>

### Desirable Criteria

<table>
<thead>
<tr>
<th>Desirable Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient address</td>
</tr>
</tbody>
</table>

### Specimen labelling and minimum data set

The specimen must be labelled with the following information:

1. Surname
2. And two from
   - Forename
   - Date of Birth
   - Registration number
   - Referring laboratory specimen number

### Urgent Specimens

Prior telephonic communication to the laboratory, with urgency and contact details clearly written on the form.

### High Risk Specimens

High Risk sticker prominently displayed on the form and specimen.

### Add-on Tests / Verbal requests

Phoned or reported to the laboratory, with the additional requestor clearly identified at the time of requesting.
Criteria for acceptance and rejection of samples
Request forms and specimens are the key source of data for any department. The details on the request form form the information that is entered onto the Laboratory computer system, Telepath which enables results to be available on the Laboratory reporting system telepath browser. If any detail is missing on either the request form or sample, there is a risk that the specimen may be rejected. The criteria is clearly stated in ‘Instructions for completion of the request form’ and ‘Sample labelling and minimum data set’

Specimen rejection
If the specimen is received unlabelled but within an attached sealed transport bag and a requestor is clearly identified, the requestor will be invited to attend the laboratory to label the specimen and sign to accept responsibility for erroneous results.
7 Transportation of samples to the laboratory
All specimens must be handled with care and treated by all personnel as a potential infection risk. However, additional precautions are required for samples that are deemed to be high risk.

The majority of specimens collected and transported to the pathology departments do not present a significant risk of infection to staff handling them. These may be considered “low risk” diagnostic specimens. Such specimens will normally be packaged in a primary container (e.g. blood tube, swab tube, specimen pot), and an outer secondary container (a sealed pathology transport bag or sealed plastic bag). All specimens must be accompanied by an accurately, fully completed pathology request form which must preferably be integral and external to the bag. The tertiary container used to transport specimens around and between hospitals may vary in design, but must comply with the P60 specification outlined in this Policy.

Internal Transport
Add details

Air Tube
All sample containers must be properly closed and packaged in a dedicated sealed specimen bag with absorbent padding attached to the request form. Excessive numbers of samples should not be packed into a pod as this may cause the lid to open during transportation.

It is the responsibility of the sender to ensure that:

- The sample is labeled, packed appropriately and is accompanied by the relevant paperwork.
- The air tube sample carrier is secured properly before transport.
- The air tube sample carrier is sent to the correct ‘system’ address

The sample(s) should be secured in the air tube carrier pod and the lid is closed;

Instructions for sending samples from an external source
Specimens collected outside the hospital should be delivered using the correct packaging that complies with national guidelines and sent via hospital transport, courier or taxi. The department should be notified in advance of any urgent or special requests.
8 Examinations offered by the laboratory
This section of the handbook explains which examinations are offered by the laboratory, including (as appropriate) information concerning samples required, sample volumes, special precautions, biological reference intervals and clinical decision values.
The following tests are available urgently at all times.
Serum/Plasma

<table>
<thead>
<tr>
<th>ALT</th>
<th>CRP</th>
<th>Creatinine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albumin</td>
<td>GGT</td>
<td>Sodium</td>
</tr>
<tr>
<td>ALP</td>
<td>Glucose</td>
<td>Urate</td>
</tr>
<tr>
<td>AST</td>
<td>Magnesium</td>
<td>Total Protein</td>
</tr>
<tr>
<td>Total Bilirubin</td>
<td>Phosphate</td>
<td>Calcium</td>
</tr>
<tr>
<td>Direct Bilirubin</td>
<td>Potassium</td>
<td>Urea</td>
</tr>
<tr>
<td>LDH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Urine
- Sodium
- Potassium
- Urea
- Creatinine
- Protein

Specimens that are collected outside working hours and can wait for analysis until the following day may be stored in ward/clinic designated boxes, at room temperature, not in a ward refrigerator.

Factors affecting results
Certain key factors in sample collection and handling can affect the results obtained.

- Haemolysis – can occur if excessive pressure is applied during collection
  - Lipaemia
  - Delay between blood collection and centrifugation
  - Extended periods of cold storage prior to centrifugation

Stability prior to receipt in laboratory
Normal physiological changes that occur following blood collection mean that a delay in receipt of Clinical Chemistry specimens will lead to the results reported not accurately reflecting the true patient results.
The laboratory is open for a minimum of 3 hours in every 24 hour period. All samples should therefore be received in the laboratory within 24 hours of collection.

Exceptions to this rule are:
- Only acceptable up to 6 hours: AST, Bilirubin, LDH, Phosphate & Potassium
- Only acceptable up to 8 hours: Ferritin, Folate, Glucose & Vitamin B12
- Acceptable up to 7 days: TFTs

Please ensure that the time of collection is accurately recorded on the request form.

Specimens received in the laboratory after the appropriate time for the specific tests will be reported as ‘Not available’ and a fresh repeat sample requested.

Please note samples left at specimen reception Monday – Friday will be collected by Chemistry laboratory staff a minimum of 4
times in the working day. Urgent specimens should be brought directly to the laboratory.

**CONTAINERS FOR SPECIMEN COLLECTION**

This hospital uses the Sarstedt Monovette blood collection system. A full tube of blood is required for most tests, and if a large number of tests are requested, it is advisable to collect two tubes. Please note that in patients with very high haematocrit, sample volume will need to be increased.

<table>
<thead>
<tr>
<th>Blood Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube</td>
</tr>
<tr>
<td>Serum Gel 7.5 ml</td>
</tr>
<tr>
<td>Glucose FE 2.7 ml (yellow top)</td>
</tr>
<tr>
<td>EDTA KE 2.7 ml (red top)</td>
</tr>
<tr>
<td>Microvette 0.3ml CB300LH (brown)</td>
</tr>
<tr>
<td>Microvette 0.3ml CB300FH (yellow)</td>
</tr>
</tbody>
</table>
Urine Collection

<table>
<thead>
<tr>
<th>Container</th>
<th>Preservative</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>25ml universal</td>
<td>None</td>
<td>Neonatal urine electrolytes, creatinine, osmolality, Albumin: Creatinine ratio, Protein: creatinine ratio, amino acids, calcium, phosphate</td>
</tr>
</tbody>
</table>

Faecal Collection

A Plain 25 ml universal container, with no preservative, is needed for faecal sugar screen.

CSF Collection

<table>
<thead>
<tr>
<th>Container</th>
<th>Preservative</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>25ml universal</td>
<td>None</td>
<td>CSF protein, amino acids</td>
</tr>
<tr>
<td>Microvette 0.3 ml CB300FH (yellow)</td>
<td>Fluoride heparin</td>
<td>CSF glucose</td>
</tr>
</tbody>
</table>
9 Reports, turnaround times and availability of clinical advice

OBTAINING LABORATORY RESULTS

Reports

Laboratory Results Browser

Authorised results are available by using the Telepath Results Browser System on the ward PC.

Hot link is always visible on the top line of Trust PC’s, entitled “Telepath”.

1. Type in a relevant name in the next box.
2. Click on “Finish”
3. The browser allows you to look up and print results off from the following departments:
   - Clinical Chemistry
   - Haematology

Medical Staff, Nurses, Midwives, Medical Secretaries and Laboratory staff have been given authorised access.

4. Enter the patients registration number in the box provided. The database will be searched for all reports for the last six months as a default. You can change this search period in the boxes provided. However the database began on the 1st September 2006.

5. On the top of this page is also a filter menu item; which allows you to obtain reports from just one discipline.

6. Press return or click on “Get Results”.

7. A colour coded list appears towards the bottom of the screen of all the specimens the lab received. They are colour coded according to discipline with the discipline code, along with the date the sample was taken, a brief indication of the results on the report and the laboratory sample number.

8. Click on the appropriate report and they are displayed with the patient demographics that the laboratory received on the request form and the results. Results outside the reference ranges are highlighted where appropriate.

9. At the top of this page you have an option to print the report locally.

10. Click on “Close Window” at top of page to return to opening menu.

Access to patient reports is dependent on your login codes

Results by Telephone

Please do not telephone the laboratory for NON-URGENT and/or HISTORICAL results as continual interruption prevents the efficient
processing of current work. Authorised results are available by using the Results Browser system. All telephoned results should be recorded in a specified ‘LAB RESULTS BOOK’ by a suitably qualified nurse or clinician.

All telephoned results should be repeated back to the laboratory staff for verification. If in doubt about a recorded result, telephone the laboratory immediately for confirmation.

**Turnaround Times**

Turnaround times quoted are the anticipated times between specimen receipt in our laboratory and reporting under normal operating conditions. The turnaround times of all tests are monitored. Results will normally be returned via the local laboratory at the requesting hospital. The times taken for the specimen to reach the laboratory and for the report to reach the requesting clinician are not included. When appropriate, abnormal results will be telephoned to the requesting physician.

The general clinical chemistry work is carried out within the laboratory. U&Es, profiles, LFTs, TFTs & hCG are analysed daily, whilst tumour marker requests are analysed twice weekly. Endocrinology, immunology, TDM and some of the more esoteric tests are sent away to specialist laboratories and generally take between 7 and 10 days to return.

Urgent requests for analysis carried out at BWH will be reported within 1 hour either by telephone or released onto the results browser. Turnaround times are audited on a monthly basis as percentage complete within a given number of hours. These are assessed against standards.

<table>
<thead>
<tr>
<th>Test</th>
<th>Target Time (95%)</th>
<th>April 2019 % completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRP</td>
<td>3 hours</td>
<td>96</td>
</tr>
<tr>
<td>Pre-eclampsia Profile</td>
<td>3 hours</td>
<td>95</td>
</tr>
<tr>
<td>Neonatal Profile 1</td>
<td>3 hours</td>
<td>96</td>
</tr>
<tr>
<td>hCG</td>
<td>6 hours</td>
<td>100</td>
</tr>
<tr>
<td>TFT’s</td>
<td>24 hours</td>
<td>100</td>
</tr>
</tbody>
</table>

**EXTRA LABORATORY EQUIPMENT**

**Blood Gas Analysers**

**Neonatal Unit**

Two blood gas analysers are available on the Neonatal Unit for use by the trained clinical staff working on the unit. The Clinical Chemistry Department is responsible for the maintenance and service of the analysers.

**Main Delivery Suite**

A blood gas analyser is available on the Main Delivery Suite for use by trained clinical staff working on the Main Delivery Unit. The Clinical Chemistry Department is responsible for the maintenance and service of the analyser.
Only authorised staff may use these analysers. To receive training on the blood gas analysers please contact the POCT co-ordinator on bwh-tr.poct@nhs.net. There is a high risk of MEDICO-LEGAL problems with unauthorised use. The laboratory keeps a register of all authorised users.

Out of hours Gas Analyser problems

If there is a technical or computer problem with any of the gas analysers, outside of working hours, help is available by contacting Radiometer on the following Helpline telephone number: 01293 517599. An operator will arrange for an engineer to contact the caller and some problems may be solved by following instructions given over the telephone.

Glucose meters

The reagent strips for these meters are available from the Clinical Chemistry Department. Training is provided by ward-based core trainers and a certificate of competence will be given to each member of staff who receives the training. The member of staff must bring their certificate to the Clinical Chemistry Department to receive a bar-code which will enable use of the meters on the wards. Any problems with the glucose meters should be reported to the Department of Clinical Chemistry who will check and service the meter.

Urilyzers

There are urine strip meters for use by the medical/nursing staff in the following areas:

- All wards
- Main Delivery Suite
- Antenatal clinics

The reagent strips for these meters are available from the Clinical Chemistry Department. Training is provided by ward-based core trainers and a certificate of competence will be given to each member of staff who receives the training. The member of staff must bring their certificate to the Clinical Chemistry Department to receive a bar-code which will enable use of the meters on the wards. Any problems with the Urilyzer should be reported to the Department of Clinical Chemistry who will check and service the meter.

Fetal Fibronectin (FFN) meter

This meter is for use by the medical/nursing staff in the Main Delivery Suite

The reagent cartridges for these meters are available from the Pharmacy Department. Training is provided by ward-based core trainers and a certificate of competence will be given to each member of staff who receives the training. The member of staff must bring their certificate to the Clinical Chemistry Department to receive
a bar-code which will enable use of the meter on the wards. Any problems with the FFN meters should be reported to the Department of Clinical Chemistry who will check and service the meter.

**Ketone meters**

These are for the use of the medical/nursing staff in

- Ward 1
- High Dependency Unit

The reagent strips for these meters are available from the Clinical Chemistry Department. Training is provided by ward-based core trainers and a certificate of competence will be given to each member of staff who receives the training. The member of staff must bring their certificate to the Clinical Chemistry Department to receive a bar-code which will enable use of the meters on the wards. Any problems with the ketone meters should be reported to the Department of Clinical Chemistry who will check and service the meter.

**External Quality Assessment**

Staff utilizing extra-laboratory equipment are expected to participate in external quality assessment schemes as required.

**Extra-laboratory Equipment**

Users are directed to the Medical Devices Policy on the Trust Intranet for further information regarding Point of Care testing.
10 Work Referred Away
The department regularly refers specimens to other specialist centres in order to provide a comprehensive diagnostic service. Most UK laboratories to which samples are referred are UKAS accredited. The performance of referral laboratories is routinely monitored. Where work has been done in other centres, this is made clear on our laboratory report. A list of referral laboratories is available.

ANALYSES PERFORMED AT OTHER HOSPITALS

Birmingham Children’s Hospital
Address:
Department of Newborn Screening and Biochemical Genetics,
Birmingham Children’s Hospital,
Steelhouse Lane,
Birmingham
Head of NSBG Mrs. Mary Anne Preece 0121 333 9940
Metabolic Laboratory 0121 333 9942
Neonatal Screening Laboratory 0121 333 9933

Department of Blood Sciences – Clinical Chemistry
Birmingham Children’s Hospital,
Steelhouse Lane,
Birmingham
Head of Blood Sciences -
Clinical Chemistry Dr Sarah Heap 0121 333 9922
Clinical Chemistry Laboratory 0121 333 9915
Pathology Reception 0121 333 9912

Newborn Screening & Biochemical Genetics Department and Blood Sciences – Clinical Chemistry at the Children’s Hospital provides a wide range of metabolic and neonatal screening and clinical chemistry assays, respectively. For further information about assays available please contact the laboratory at the Children’s Hospital directly. Paper reports are sent via this department. Please contact the appropriate department within Paediatric Laboratory Medicine at Birmingham Children’s Hospital directly for results. The Birmingham Children’s Hospital Pathology user handbook can be found at [http://www.bch.nhs.uk/node/867](http://www.bch.nhs.uk/node/867)

City Hospital
Address:
Department of Chemistry,
City Hospital,
Dudley Road,
Birmingham
Telephone: 0121 507 4135 or 4136
Head of Department Dr Berg 0121 507 5353
During normal working hours:

A routine (same day) service for caffeine is offered by the City Hospital. All specimens should be delivered to the Clinical Chemistry laboratory at BWH before 12.30pm to ensure analysis that day. It is essential to provide full details of the patient’s current medication and time of last dose on the request form. Please contact the laboratory directly for a full repertoire of assays provided and individual specimen requirements.

Out of hours:

All requests for urgent toxicology analyses (except for paracetamol and salicylate) should be directed to the West Midlands Poisons Unit at the City Hospital. The National Poisons Information Service is available to clinical staff 24 hours a day which has access to a wide variety of reference data.

Clinical Biochemistry offers a range of assays. Contact the Clinical Biochemistry department directly for a full repertoire of assays provided and individual specimen requirements. The reports are sent to the requesting consultant’s secretary or ward via Clinical
Chemistry, BWH department. Please contact the Duty Endocrinologist directly for advice with interpretation.

Please contact the Clinical Biochemistry laboratory directly for results.

**Immunology**

Address:

Clinical Immunology Service,
Division of Immunity & Infection,
PO Box 1984,
Medical School,
University of Birmingham,
Birmingham

Consultant Immunologist  Prof Lane
Duty Consultant Immunologist  07831 681 955

Results enquiry  0121 414 3824

Requests should be made on specially designated forms (yellow/white). Contact the Immunology laboratory directly for a full repertoire of assays provided and individual specimen requirements. The reports are sent to the requesting consultant’s secretary or ward via this department. All results are also available on the web browser. Please contact the Immunology laboratory directly for results.
11  Reference Ranges, Variation, Sample Volumes & Turnaround Times

S = serum, P = plasma, LH = Lithium Heparin Plasma, U = urine, 24hU = 24 hr. urine, F = fluoride, E = EDTA, C = CSF, Inc. = increased, haem = haemolysis, T1/2/3 = 1st/2nd/3rd trimester, Un = universal, Roc = test run on the Roche analyser - 1ml required for 20 such tests, 0.5 ml required for 10 such tests. Maximum turnaround times apply within working hours. SD = standard deviation.

Appropriate age and gender specific reference intervals are quoted alongside electronically reported results. Analytical variation data (measurement uncertainty) are available within the laboratory – please contact the laboratory for more /specific information. Differences between two results are analytically significant if the difference exceeds $2.8 \times$ analytical SD
<table>
<thead>
<tr>
<th>Analyte</th>
<th>Units</th>
<th>Spec. type</th>
<th>Volume required</th>
<th>Maximum turnaround time</th>
<th>Analytical variation (SD at stated concentration)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT</td>
<td>U/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>1.2 at 43.7 (41.3 - 46.1)</td>
<td></td>
</tr>
<tr>
<td>Albumin</td>
<td>g/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>0.85 at 40 (38.3 - 41.7)</td>
<td></td>
</tr>
<tr>
<td>ALP</td>
<td>U/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>6.2 at 225 (212.6 - 237.4)</td>
<td></td>
</tr>
<tr>
<td>AFP</td>
<td>kU/L</td>
<td>S</td>
<td>250 ul</td>
<td>5 days</td>
<td>1.0 at 17.5 (15.5 - 19.5)</td>
<td>Tumour marker</td>
</tr>
<tr>
<td>Amylase</td>
<td>U/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>1.4 at 75.9 (73.1 - 78.7)</td>
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<tr>
<td>AST</td>
<td>U/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>0.8 at 43.7 (42.1 - 45.3)</td>
<td>Inc. by haem</td>
</tr>
<tr>
<td>Bile Acids</td>
<td>umol/L</td>
<td>S</td>
<td>ROC</td>
<td>4 hours</td>
<td>1.3 at 19.0 (16.4 - 21.6)</td>
<td></td>
</tr>
<tr>
<td>Bilirubin</td>
<td>umol/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>9.0 at 253 (235 - 271)</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>umol/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>1.16 at 21.0 (18.68 - 23.42)</td>
<td>Direct</td>
</tr>
<tr>
<td>Test</td>
<td>Normal Range</td>
<td>LOX (if applicable)</td>
<td></td>
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<tr>
<td>CA-125</td>
<td>kU/L S or LH 250 ul 5 days</td>
<td>1.1 at 22 (19.8 - 24.2)</td>
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<tr>
<td>Calcium</td>
<td>mmol/L S or LH ROC 4 hours</td>
<td>0.027 at 2.2 (2.146 - 2.254)</td>
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<tr>
<td>CEA</td>
<td>ug/L S or LH 250 ul 5 days</td>
<td>0.24 at 4.6 (4.12 - 5.08) Inc. in smokers</td>
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<tr>
<td>Creatinine</td>
<td>umol/L S or LH ROC 4 hours</td>
<td>1 at 87.5 (85.5 - 89.5)</td>
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<tr>
<td></td>
<td>mmol/L U 200 ul 4 hours</td>
<td>0.34 at 17.59 (16.91 - 18.27)</td>
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<tr>
<td>CRP</td>
<td>mg/L S or LH ROC 4 hours</td>
<td>0.71 at 30.1 (28.68 - 31.52)</td>
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<tr>
<td>Ferritin</td>
<td>ug/L S or LH 250 uL 72 hours</td>
<td>3.4 at 118 (111.2 - 124.8)</td>
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<tr>
<td>Folate</td>
<td>ug/L S 250 uL 72 hours</td>
<td>0.05 at 4.38 (4.28 - 4.48)</td>
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<tr>
<td>FSH</td>
<td>U/L S or LH 500 uL 8 hours</td>
<td>0.5 at 13.6 (12.6 - 14.6)</td>
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<td>Test</td>
<td>Unit</td>
<td>SI Units</td>
<td>Reference Range</td>
<td>Lower Limit</td>
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<tr>
<td>GGT</td>
<td>U/L</td>
<td>S or LH</td>
<td>ROC 4 hours</td>
<td>0.9 at 28</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(26.2 - 29.8)</td>
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<tr>
<td>Glucose</td>
<td>mmol/L</td>
<td>F</td>
<td>ROC 4 hours</td>
<td>0.16 at 7.3</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>(6.98 - 7.62)</td>
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</tr>
<tr>
<td></td>
<td>mmol/L</td>
<td>C in F</td>
<td>ROC 4 hours</td>
<td>0.5 at 3.0</td>
<td></td>
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</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(2.0 - 4.0)</td>
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<tr>
<td>HbA1c</td>
<td>mmol/mol</td>
<td>E</td>
<td>10 ul 24 hours</td>
<td>0.13 at 5.4</td>
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<td></td>
<td></td>
<td>(5.14 - 5.66)</td>
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<tr>
<td>hCG</td>
<td>U/L</td>
<td>S</td>
<td>250 ul 8 hours</td>
<td>0.5 at 3.7</td>
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<td></td>
<td></td>
<td>(2.7 - 4.7)</td>
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<tr>
<td>LDH</td>
<td>U/L</td>
<td>S</td>
<td>ROC 8 hours</td>
<td>6.1 at 252</td>
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<td>(239.8 - 264.2)</td>
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<tr>
<td>LH</td>
<td>U/L</td>
<td>S or LH</td>
<td>55 uL 8 hours</td>
<td>0.3 at 12.6</td>
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<td></td>
<td></td>
<td>(12.0 - 13.2)</td>
<td></td>
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<tr>
<td>Magnesium</td>
<td>mmol/L</td>
<td>S or LH</td>
<td>ROC 4 hours</td>
<td>0.018 at 1.3</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(1.264 - 1.336)</td>
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<tr>
<td>Parameter</td>
<td>Unit</td>
<td>Method</td>
<td>Sample Volume</td>
<td>Time</td>
<td>Lower Limit (Normal)</td>
<td>Upper Limit (Normal)</td>
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<tr>
<td>Oestradiol</td>
<td>pmol/L</td>
<td>S</td>
<td>500 ul</td>
<td>72 hours (Rapid &lt;3 hours)</td>
<td>16.9 at 744 (685-803)</td>
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<tr>
<td>Phosphate</td>
<td>mmol/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>0.035 at 1.2 (1.13 - 1.27)</td>
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<tr>
<td>Potassium</td>
<td>mmo/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>0.059 at 3.6 (3.482 - 3.718)</td>
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<tr>
<td></td>
<td>mmol/kg/24h</td>
<td>U</td>
<td>200 ul</td>
<td>4 hours</td>
<td>0.39 at 31 (30.22 - 31.78)</td>
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<tr>
<td>Progesterone</td>
<td>nmol/L</td>
<td>S</td>
<td>200 uL</td>
<td>8 hours</td>
<td>0.9 at 27.8 (26.0 - 29.6)</td>
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<tr>
<td>Prolactin</td>
<td>mlU/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>72 hours</td>
<td>19.8 at 1020 (980-1059)</td>
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<tr>
<td>Total Protein</td>
<td>g/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>0.9 at 61.9 (60.1 - 63.7)</td>
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<tr>
<td></td>
<td>g/24h</td>
<td>24hU</td>
<td>100 ul</td>
<td>4 hours</td>
<td>0.01 at 0.14 (0.12 - 0.16)</td>
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<tr>
<td>Protein/creatinine ratio</td>
<td>mg/mmol</td>
<td>U</td>
<td>10 ml</td>
<td>8 hours</td>
<td>0.016 at 0.18 (0.148 - 0.212)</td>
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</tr>
<tr>
<td>Parameter</td>
<td>Unit</td>
<td>Ref. Test</td>
<td>Vol.</td>
<td>Time</td>
<td>Value</td>
<td>Range</td>
</tr>
<tr>
<td>-----------</td>
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</tr>
<tr>
<td>Sodium</td>
<td>mmol/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>2.08 at 136.2</td>
<td>(132.04 - 140.36)</td>
</tr>
<tr>
<td></td>
<td>mmol/kg/24h</td>
<td>U</td>
<td>200 ul</td>
<td>4 hours</td>
<td>0.8 at 65</td>
<td>(63.4 - 66.6)</td>
</tr>
<tr>
<td>fT4</td>
<td>pmol/L</td>
<td>S or LH</td>
<td>250 ul</td>
<td>30 hours</td>
<td>1.2 at 25</td>
<td>(22.6 - 27.4)</td>
</tr>
<tr>
<td>TSH</td>
<td>mU/L</td>
<td>S or LH</td>
<td>500 ul</td>
<td>30 hours</td>
<td>0.4 at 6.2</td>
<td>(5.6 - 7.0)</td>
</tr>
<tr>
<td>Urate</td>
<td>mmol/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>7.9 at 483</td>
<td>(467.2 - 498.8)</td>
</tr>
<tr>
<td>Urea</td>
<td>mmol/L</td>
<td>S or LH</td>
<td>ROC</td>
<td>4 hours</td>
<td>0.089 at 6.6</td>
<td>(6.4 - 6.8)</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>ng/L</td>
<td>S or LH</td>
<td>250 uL</td>
<td>72 hours</td>
<td>7.2 at 597</td>
<td></td>
</tr>
</tbody>
</table>