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ACT Pathology Handbook
2016 edition

Introduction

This handbook aims to assist you in the better use of ACT Pathology in the care of your patients by outlining:

- how to access the service
- the range of services
- information about the tests available, including referred tests reference ranges.

Copies of this handbook can be obtained from the ACT Pathology Customer Service Manager ph 6244 2932 or visit the ACT Pathology website for an electronic version. [www.actpathology.act.gov.au](http://www.actpathology.act.gov.au)

This handbook is revised annually and any suggestions on how the Laboratory may improve its service, including the revision or layout of this handbook will be welcomed.

In addition to the handbook, ACT Pathology publishes the Pathology Newsletter. We also include any updates and modifications of our procedures on our website under Pathology news.

Main Laboratory

Building 10, The Canberra Hospital, Gilmore Crescent, Garran, ACT (Next to Maternity)
Branch Laboratory
Ground Floor, Xavier Building, Calvary Hospital, Bruce, ACT.

Accreditation
ACT Pathology is an Approved Pathology Provider (APP) accredited in the field of medical testing by the National Association of Testing Authorities (NATA), acting in collaboration with the Royal College of Pathologists of Australasia (RCPA), as complying with the requirements of AS ISO 15189-2009, Medical laboratories - Particular requirements for quality and competence. ACT Pathology has two Approved Pathology Laboratories (APL) that are accredited by Medicare Australia. One is located at the Canberra Hospital and the other at Calvary Hospital. In conjunction with ACT Health, accreditation is maintained with the Australian Council on Healthcare Standards (ACHS).
Section 1: General Information

Medicare billing

ACT Pathology bills through Medicare Australia and private health insurance funds. As such we are required to follow Medicare Australia requirements as outlined in the Medicare Benefits Schedule (MBS) which is updated regularly.

In order to provide this service to your patients ACT Pathology will need your help in providing the information needed by Medicare Australia and the private health funds.

Outpatient requests

To enable us to bill to Medicare Australia, there are certain requirements that must be met and all written request forms must contain the following particulars (as outlined in the current MBS Category 6 P2.2.)

Requesting Practitioner

- the surname and initials
- practice address
- provider number
- date of request

Patient details

- the patient’s full name
- address
- date of birth
- sex
- tests requested

To be able to assign benefits to all eligible outpatients directly to Medicare Australia ie bulk-bill, the assignment box on the request form must be filled in with the patient’s Medicare number and signature.
Patients who do not complete the assignment box will receive an account that must be presented to Medicare to receive a refund.

**Tests not eligible for Medicare rebate**

Tests that are eligible for Medicare rebate are listed in the Medical Benefits schedule (latest edition of MBS). Tests that are not listed in this schedule DO NOT attract the Medicare rebate. The full cost of this testing must therefore be covered by the patient.

Examples of such tests include ThinPrep® Pap Test™, FISH studies, and metabolic screen. For a comprehensive list of non-Medicare tests performed by this laboratory please see the ACT Pathology website ‘Patient billing information’ for further details.

If this testing is performed in the ACT Pathology laboratory the patient will be issued an invoice from ACT Pathology to recover the cost of this testing.

If ACT Pathology has to refer specimens to our referral laboratories for testing, the patient will be issued an invoice directly from the referral laboratory.

Patients presenting at our collection centres with tests that are non-Medicare refundable will be asked to sign a form acknowledging the approx amount and that they accept responsibility for payment.

Practitioners ordering such tests should make their patients aware that there will be out of pocket expenses.

**Tests not done by ACT Pathology**

There are some specialised tests that are not performed by ACT Pathology. These tests are referred to accredited laboratories in other states. Billing is at the discretion of the referral laboratory. If they bill at Medicare scheduled rebate, this means that patients do not have to pay a gap. If we have received the patient’s Medicare number and an assignment form we will pass this onto the reference laboratory for bulk-billing.

If the laboratory does not accept Medicare scheduled rebate, the patient is responsible for the account.
Where referred tests are not eligible for Medicare, the Reference laboratory will bill Private inpatients, privately referred outpatients for the services provided.

Advance notice of potential out of pocket costs are made available where possible.

**Rule 3 Exemption criteria**

The Medicare Schedule allows some limited pathology tests to be repeated either up to six times in a period of 6 months or unlimited number of times for a period of 6 months (as in the case of INR) using one request. This is known as ‘Rule 3 Exemption’. The criteria covered by Rule 3 Exemption are outlined in the Medicare Benefits Schedule (latest edition of MBS). Please note that there are only a limited number of tests and conditions that are permitted to be covered by Rule 3 Exemption. Where a pathology request fits into any of the criteria outlined in the guide, the request form must be endorsed ‘Rule 3 Exemption’ for the request to be valid.

It is preferable that a Rule 3 Exemption request be on a separate request form to other investigations. If tests not covered by Rule 3 Exemption criteria are requested on same request form these tests will only be performed on the initial episode. A separate request form will be needed if subsequent testing is required for these non-eligible Rule 3 Exemption tests.

**Groups of tests**

The Medicare Benefits Schedule outlines a table of specified group of tests and their abbreviation that can be used by requesting practitioners. These groups exclude abbreviations such as MBA, TORCH, Thrombophilia screen, Antenatal screen.

For such screens, individual tests must be ordered. Lists of eligible groups of tests that can be ordered are contained in the MBS Category 6 PQ.4.

**Private inpatients and day stay patients**
ACT Pathology has billing agreements with some of the Health Funds. We will send the account directly to the Health Fund if you provide the patient’s Medicare number, Health Fund name and membership number on the request form.

If Medicare and Health Fund details are not provided or if no arrangement exists with the Health Fund, we will invoice the patient who must then present the invoice to their Health Fund and Medicare Australia to receive a refund.

Research studies requiring Pathology testing

Pathology testing that is to be carried out as part of a research study cannot be billed to Medicare. A quote for such testing must be obtained. ACT Pathology will not undertake research studies without prior discussions regarding quotes and arrangements. Please contact:

Administration Services Manager 6244 2839

Account enquiries

Payments can be made by credit card, mail or by EFT.

If you or your patients have any queries about our accounts please contact:

Accounts Enquiries 6244 3939
Accounts Payments 6244 2805
pathology.accounts@act.gov.au

Customer services

ACT Pathology provides pathology services to The Canberra Hospital, Calvary Hospital and The National Capital Private Hospital. We also provide service to General Practitioners and specialists of the ACT and surrounding region. This extensive service means that ACT Pathology can offer pathology testing while patients are in hospital and when they return to their homes. Our couriers visit these surgeries, delivering reports and collecting
specimens for transport to the laboratories situated at The Canberra Hospital and the Calvary Hospital.

Our Customer Services department acts as a point of contact to discuss all service delivery issues.

Any enquires relating to the range of services provided by ACT Pathology or any concerns regarding service delivery can be directed to the Customer Services team:

Customer Service Manager 6244 2932
Customer Liaison Officers 6244 3367
E: actpathology@act.gov.au

IT Services

ACT Pathology supports internal access to pathology results using its Clinical Information System (CIS) on the ACT Government Intranet.

For surgeries that have practice management software (eg. Medical Director, Medtech 32, Medical Spectrum, Intrahealth, Genie), ACT Pathology is able to provide direct and secure down loading of your pathology results in PIT or HL7 formats via broadband..

To arrange downloading for surgeries please contact

Customer Services 6244 2932

For CIS support, email: PathologyApplicationSupport Team@act.gov.au

Inpatient Collection Services

To help us deliver an efficient service, please

• use sticky labels on request forms for patient identification and
• record patient room and bed number on the form

No ward collection service is available on weekends or public holidays.

The Canberra Hospital

A blood collection service is available to the wards between 7.30 am and 2;30pm Monday to Friday.
Request forms must be written and left in the appropriate ward before 7.00am.

Specimens that need to be collected after the pathology collector has left the ward are the responsibility of the medical or nursing staff, or can be left for the Pathology collector until the next day.

**Calvary Hospital**

ACT Pathology provides ward collection rounds from Monday to Friday.

**The National Capital Private Hospital**

A blood collection service available 7.30 am to 4.00 pm Monday to Friday.

If a Pathology collector is required, they can be paged on 013 or telephone 6244 2816.

A collection service is available on Saturdays from 7.30 am to 10.30 am.
Outpatient Specimen Collection Services

For the convenience of patients, ACT Pathology has seven licensed collection centres throughout Canberra. Our centres are staffed by experienced collection staff who have been extensively trained in blood collection techniques for adults and children. Venepuncture and specimen collection services are provided at the following times:

**Canberra Hospital,**
Building 10, Level 1
Access via Gilmore Crescent
Monday to Friday: 7.30 am-5.30 pm
Saturday: 8.30 am-12.15 pm
*Telephone* 6244 2816
*Facsimile* 6244 2815

**Calvary Hospital,**
1st floor Marian Building (Maternity entrance)
Monday to Friday: 7.30am-5.30pm
Saturday: 9.00am-12.00pm
*Telephone* 6201 6270
*Facsimile* 6201 6272

**Tuggeranong Community Health Centre,**
Level 1, Cnr Anketell and Pitman Streets
Monday to Friday: 8.00 am-5.00 pm
Saturday 8:30am-12:00pm (closed long weekends)
*Telephone* 6205 2794
*Facsimile* 6205 2778

**Lyneham Collection Centre**
Unit 2/62 Brigalow Street
Monday to Friday 7.30 am-4.30 pm
*Telephone* 6262 7522
*Facsimile* 6262 9328
Gungahlin Health Centre
Cnr Earnest Cavanagh St and Fussell Lane, Gungahlin
Monday to Friday 7.30 am-4.30 pm
Saturday 8:30am-12:30pm (closed long weekends)
*Telephone* 6174 5264
*Facsimile* 6207 7445

Belconnen Health Centre
Cnr Lathlain St & Cohen St, Belconnen
Monday to Friday 8.00 am-5.00 pm
*Telephone* 6174 5264
*Facsimile* 6207 7445

Charnwood Collection Centre
West Belconnen Health Co-operative
20 Cartwright St, Charnwood
Monday to Friday 7:30am-4:30m
*Telephone* 6258 0787
*Facsimile* 6259 5109

Domiciliary Collection
ACT Pathology provides a home collection service for those patients who are unable to attend one of our collection centres due to their frailty or illness. Our staff will call on patients in their homes or nursing homes to take blood for pathology testing.

**These bookings must be made at least 24 hours prior.**

Contact number for home collection service in all suburbs is 6244 2816.
Pathology Request Form

A Pathology Request form must accompany each patient's specimen(s) that is/are sent to ACT Pathology for testing or examination that were collected in the one collection episode. The following information is mandatory on Pathology Request forms:

- The patient’s surname and first name
- Patient's date of birth
- Medical Record Number (applies to hospital inpatients and outpatients receiving procedures)
- Patient’s gender
- Patient address is important for computer records
- The Hospital and ward (if an inpatient)
- Requesting doctor’s name, provider number, and signature
- Date request was written
- Address for report, and also where appropriate, the name and address of any doctor requiring a copy of the report
- Date and time of collection
- Tests or examinations required
- The requesting doctor must complete the sections regarding relevant clinical information (including pre and postoperative diagnosis where appropriate) and current drug therapy
- Specimen type and source (if appropriate)

Requests for crossmatched blood or blood products for transfusion must be made on ACT Pathology Blood Transfusion request forms.

Where available, pre-printed self adhesive patient identification labels may be placed on request forms to provide some of the above information.

The above information must be completed in legible handwriting with the name of the Medical Officer initiating the request clearly identified in block letters.

**Note:** Incorrectly completed forms will cause delays in specimen processing.
Specimen collection

ACT Pathology requires that persons collecting Pathology specimens comply with the following patient identification and specimen labelling standards. Failure to comply may compromise patient safety.

(Ref: ACT Government Health Directorate ‘Patient Identification - Pathology Specimen Labelling SOP,’ DGD12-024).

1. Establishing patient identification

(i) Before collecting a specimen from a patient, a correctly filled in and completed ACT Pathology Request form must be obtained (refer to Pathology Request form section above). This request form, and no other, must be kept with the collector during the entire collection and specimen labelling process.

Note: Do not continue if the patient identification details section on the Request form has not been completed!

(ii) If specimens are to be labelled with pre-printed self-adhesive labels, these must be printed before a specimen is collected from the patient, but must be left on their backing paper until after the specimen is collected. Do not label specimen containers with pre-printed self-adhesive labels or handwrite patient identification details on specimen containers prior to specimen collection.

(iii) Take the patient’s Pathology Request form and any pre-printed self-adhesive specimen labels (left on their backing paper) to the area immediately beside the patient from whom the specimen is to be collected.

Note: Only the Pathology Request form and pre-printed self-adhesive specimen labels belonging to the patient to be collected are to be where the patient’s specimen is to be collected and labelled. Specimen labels and
Pathology Request forms belonging to any other patient must never be in the patient’s specimen collection/labelling area or its vicinity.

Note: The person collecting a Pathology specimen is responsible for positively establishing the patient’s accurate identification PRIOR to specimen collection.

(iv) Patient identification is established by asking the patient to state their first and last names, and their date of birth. If there is likely to be any confusion or ambiguity regarding the patient’s name or its spelling, the patient must also be asked to spell their name.

Note: Stating the patient’s name and date of birth and asking the patient if this information is correct is a dangerous and incorrect procedure for establishing the patient’s identification and must NOT be used.

(v) The identification of patients must be confirmed by comparing the patient’s answers to the above questions to the patient identification details on

- the Pathology Request form
- any pre-printed self-adhesive labels, and
- the patient’s wristband, if the patient is a hospital inpatient or outpatient receiving a procedure.

The patient identification details from each source must match exactly (including spelling).

Note: If the patient is a hospital inpatient or outpatient having a procedure performed and is not wearing an identification wristband, do not continue with the specimen collection, until this deficiency is corrected. This requirement is waived for hospital areas where there is a documented policy that patients do not wear identification wristbands.
(vi) The identification of patients, who are not lucid or are unable to respond coherently (e.g., the patient is unconscious, confused or cannot communicate using the language of the collector) must be confirmed by a witness. The witness must be:

- a relative of the patient, or
- a friend of the patient, or
- a medical or nursing staff member responsible for the patient other than the collector.

The witness must complete all the responsibilities listed in section 3, ‘Responsibilities of Specimen Collection Witnesses.’

**Note:** If there is any uncertainty regarding the patient’s identification, photo identification of the patient (e.g., Driver’s Licence) should be used, if available.

(vii) If the patient is being collected for a pretransfusion test, section 6 below must be complied with.

(viii) Only after each of these steps has been completed may the patient’s specimen be collected.

**Note:** Specimen Collection must not proceed until any discrepancy in patient identification between the identification band (if a hospital patient), Pathology Request form, pre-printed specimen labels and what is verbally stated by the patient themselves or a witness is rectified.

2. Labelling of pathology specimens

(i) Specimen containers must not be labelled with pre-printed specimen labels prior to collection. Similarly, the patient’s identification details must not be handwritten on specimen containers prior
to collection. The person performing the collection must personally label the specimen containers immediately after specimen collection, in real time, before leaving the patient. This task must NOT be delegated to another person.

Note: If pre-printed self-adhesive labels are used, only the labels belonging to the patient being collected are to be accessible during the collection and specimen labelling process. Labels and Pathology Request forms from any other patient must not be in the specimen collection/labelling work area or its vicinity. (This is necessary to prevent labelling errors).

Note: After the specimen is collected, the collector must not leave the patient to obtain pre-printed specimen labels. The patient identification details must be HANDWRITTEN on the specimen before leaving the patient, if pre-printed specimen labels (left on their backing paper) were not obtained prior to specimen collection.

(ii) Labelling: Pathology specimens must be accurately labelled with, as an absolute minimum:

- The patient’s full name (first name and last name)
- Date of birth
- Medical Record Number (if the patient is a hospital inpatient or outpatient receiving a procedure)

Pathology specimens should also be labelled with:

- Date and time of collection (mandatory for some specimens)
- Collector’s initials (mandatory for Blood Bank specimens)

Specimens other than venous blood must be labelled with:
• The specimen type (e.g., bone marrow biopsy, CSF, FNA, capillary blood, or tissue, etc.)

**Anatomical specimens** must be labelled with:
• The anatomical site of the specimen’s origin (e.g., biopsy right breast lump above nipple; polyp ascending colon)

Specimens from different anatomical sites must be placed in separately labelled containers.

Specimens of any type must be labelled with their source/anatomical site whenever it is diagnostically important (e.g., swabs for culture and sensitivity).

(iii) As confirmation that all patient identification steps have been conducted, and that the specimens have been correctly labelled, the collector must:
• Initial the labels of at least specimens for Blood Bank testing
• Complete and sign the collector’s declaration on the Pathology Request form, and
• Print their name legibly in the required box beside their signature on the Pathology Request form.

(iv) The collector must compare the patient identification details on the specimens with the patient identification details on the Pathology Request form, and on the patient’s identification band (if the patient is a hospital inpatient or outpatient receiving a procedure), and ensure all are consistent.

Where possible, the patient should be shown the labels on the specimens collected from them, and asked to read aloud the full name and date of birth on them and to confirm that the specimens are correctly labelled with their identification details.
Note: Specimen labelling patient identification details must accurately match what is recorded on the Pathology Request form.

The flowchart after the non-conformances section outlines the general overall procedure that must be complied with when establishing patient identification prior to specimen collection, and accurately labelling Pathology specimens.

3. Responsibilities of specimen collection witnesses

When a patient cannot respond to the collector’s identification questions clearly and coherently, or when specimens for Blood Bank/Pre-transfusion testing need to be collected, a witness is required to establish and confirm the patient’s identification. The responsibilities of this witness are as follows, all of which must be completed:

- Ensure the collector observes the establishment of the patient’s identification details and all other actions taken by the witness.
- Independently positively identify the patient and state the patient’s surname, given name and date of birth without any prompting from the collector.
- Confirm that the patient’s identification details on their identification band (if a hospital inpatient or outpatient receiving a procedure), Pathology Request form, and any pre-printed specimen labels all match exactly (including spelling).
- Observe the collector independently establishing patient identification in the same way.
- Observe the collector collecting and labelling the specimens.
- Read aloud the patient’s name on the specimen labels to confirm correct labelling.
- Confirm that the collector has initialled blood bank specimens.
- Observe the collector completing and signing the collector’s declaration on the Pathology Request form.
- Write on the Pathology Request form ‘Witnessed by:’ sign beside these words and print their full name legibly under their signature.
The witnesses’ signature on the request form is evidence that they have witnessed the collection and labelling of the specimen, confirmed that the patient identification on the specimen container is accurate and correct and that the collector has initialled the specimen label and signed the request form collector’s declaration.

4. Unidentified patients in the hospital environment

Where a patient’s name and date of birth is unknown (eg. an unidentified unconscious patient) the request form and specimens must be labelled with the following:

- A newly issued Medical Record Number (MRN) reserved for unidentified patients
- The surname labelled as ‘UNKNOWN’
- The given name labelled in the format of ‘MALE 123’ or ‘FEMALE 123’, where 123 is a unique number, also reserved for unidentified patients, and which is never reused. This number is allocated by the Emergency Department
- The date of birth recorded as 01/01/1900
- The address recorded as ‘UNKNOWN’ (applies only to the request form).

Note: All specimens must be labelled with two unique identifiers. For specimens from unidentified patients, the ‘unidentified’ patient MRN and ‘MALE 123’ (where 123 is a unique number) as the given name, constitute these two unique identifiers.

When the patient is finally identified, a search must be performed to establish whether the patient has a previously assigned MRN. If a previous MRN is found, the Medical Records Department merges the
newly assigned ‘unidentified’ patient MRN into the patient’s pre-existing MRN.

Note: If possible, photo ID (eg. passport) should be used to help establish patient identification

5. Use of specimen pre-printed self-adhesive labels

It is preferable that patient identification information is handwritten on specimen containers. The use of pre-printed self-adhesive labels is associated with a significantly higher incidence of incorrectly identified/labelled specimens, which can cause serious if not fatal errors.

If pre-printed self-adhesive patient identification labels are used to label blood specimen tubes, they must be purpose designed, small, and no larger than 65mm x 25mm, and must be approved by the Pathology Department.

Note: Large labels (larger than the size quoted above) are unacceptable as specimens jam in analyser racks. This may cause analysis time to be considerably lengthened, which compromises test turnaround times and ultimately the quality of patient care.

Adhesive pre-printed specimen labels must be placed longitudinally on the specimen tube with a ‘window’ allowing the specimen to be viewed (ie place the pre-printed label over the specimen tube’s manufacturer’s label).

If consideration is being given to introducing pre-printed, self adhesive specimen labels, please contact the Pathology Department Customer
Services Manager on 6244 2932 to obtain label requirements

6. Requirements for requested blood banking

There are additional requirements for requesting cross matching of blood for transfusion, antibody screening of blood prior to transfusion. These requirements are as follows:

• A Blood Transfusion Request form must be used.

• The specimen and Transfusion Request Form must be labelled with the patient’s surname and given names, date of birth, patient (MRN) number and the date of collection.

• The request form must be labelled with the ward or clinic, and hospital, and signed by the requesting doctor, the collector and the witness.

• The National Pathology Accreditation Advisory Council (NPAAC) guidelines require that specimens for crossmatching, blood grouping or any Blood Bank test must be signed or initialled by the collecting officer, regardless of whether or not a pre-printed label is used.

• The collection of all specimens for pre-transfusion tests must be witnessed.

• The witness must complete all the responsibilities of a witness, as documented in section 3, ‘Responsibilities of Specimen Collection Witnesses.’

• The patient may act as the witness, but only after the significance of the procedure has been explained to them, and a determination made of whether they:
  • understand the significance of the witnessing procedure
  • are capable of performing the responsibilities of a witness, as itemised in section 3, ‘Responsibilities of Specimen Collection Witnesses’ and
  • are able to countersign the request form.
• If there is any doubt regarding the patient’s ability to act as a witness or they fail any of the assessments above eg. the patient is not lucid, cannot coherently respond and communicate in the language of the collector, does not understand the significance of the witnessing process, is unable to sign the request form (eg. due to vision impairment or an inability to write); then a third party witness that is able to perform all the responsibilities of a witness, as documented in section 3, ‘Responsibilities of Specimen Collection Witnesses’ is mandatory.

• A third party witness must be a relative or friend of the patient, or a medical or nursing staff member responsible for the patient, other than the collector.

• After the collection and labelling of the specimen, the patient (or third party witness) must sign the ‘Blood Transfusion Request’ form as the witness to the specimen identification and collection, and print their name under their signature.

The witnesses’ signature on the request form is evidence that they have established and confirmed the patient’s identification, witnessed the collection and labelling of the specimen, confirmed that the patient identification on the specimen container is accurate and correct, and that the collector has initialled the specimen label and signed the request form collector’s declaration and that all the other responsibilities of the witness, as itemised in section 3 have been completed.

Please refer to the Transfusion section in this Handbook for more information.

7. Patient Identification and Specimen Labelling Flowchart

Note: This flowchart is only a summary of the process for establishing patient identification and accurately labelling specimens. For full details, refer to the previous sections under the Specimen Collection heading.
This procedure is critical and must be complied with exactly to prevent potentially fatal errors.
Non-conformances

Where the above requirements are not met, laboratory staff may have to decline to perform the test, provided that the laboratory staff member concerned gives immediate notification of his/her decision to:

a) The doctor who signed the request form, or if that individual is unavailable or unidentifiable,

b) The person who would normally receive the test result, a medical staff member, nurse, or ward clerk of the team caring for the patient.

In addition, the laboratory staff member will enter a variation report into the Pathology Laboratory Information System, recording the details of the non-conformance and the name of the person notified above, and the date and time the notification was made.

A recollection is mandatory for all non-conformances (major and minor) involving specimens collected for pre-transfusion or Blood Bank testing.

1. Unlabelled/mislabelled specimens

A strict policy exists for unlabelled, mislabelled and inadequately labelled specimens that reach the laboratory. Whenever an unlabelled, mislabelled or inadequately labelled specimen is received by the laboratory, the area and personnel responsible for collecting the specimen and/or the requesting doctor will be notified. Specimens that are received unlabelled/mislabelled must be re-collected. Exceptions to this rule can only apply if the following conditions are applicable:

- The specimen cannot reasonably be recollected (eg. CSF, and tissue specimens)
• Where the requesting doctor states that analysis of the specimen is critical to the patient’s welfare or cannot be recollected.

In all cases where the specimen cannot be recollected and the laboratory has agreed to process the specimen, any identification error on the specimen label must not be corrected. In addition, the following will apply:

**Specimens collected within Canberra, Calvary or National Capital Private Hospitals**

The collecting officer will be requested to present at the Specimen Reception counter of the Pathology Department at either Canberra or Calvary hospital to sign an ‘Unlabelled/ Mislabelled Specimen Identification Declaration’ taking responsibility for specimen labelling, and any adverse consequence resulting from any specimen misidentification. Signing of this declaration is also an acknowledgement that ACT Pathology takes no responsibility for any misidentification adverse consequence.

**Specimens not collected within Canberra, Calvary or National Capital Private Hospitals**

An ‘Unlabelled or Mislabelled Specimens/Request’ Form declaration facsimile will be faxed to the collector to be signed to acknowledge they are taking responsibility for specimen labelling, and any adverse consequence resulting from any misidentification. This signed declaration must be returned to ACT Pathology to the ‘From’ fax number on the facsimile. On receipt of the returned signed declaration facsimile, the specimens will be processed.

Pathology reports issued on test results produced from inappropriately labelled specimens will include a disclaimer that ACT Pathology takes no responsibility for the accurate identification of the specimen and report, or for any adverse consequences resulting from any misidentification error.
2. Incorrectly identified request forms and specimens

When ACT Pathology receives a request form and specimen(s) that are identically labelled with the same patient’s identification details, but it is subsequently revealed that the collection was made on a different patient to that identified on the request form and specimen labels, the correct patient must be collected/recollected and the specimens sent to Pathology with a new request form. This applies even if the correct patient was originally collected, but the request form and specimens were labelled with the wrong patient identification details.

Exceptions to this rule can only apply if the following conditions are applicable:

- The specimen cannot reasonably be recollected (eg. CSF, tissue specimens)
- Where the requesting doctor states that analysis of the specimen is critical to the patient’s welfare.

In all cases where the specimen cannot be recollected, the Pathology report will not be reissued under the ‘correct’ patient’s name until the following is complied with:

**Specimens collected within Canberra, Calvary or National Capital Private Hospitals**

The requesting doctor must present at the Specimen Reception counter of the Pathology Department to complete and sign an ‘Incorrect Patient Declaration’ authorising the results to be reissued under the ‘correct’ patient’s name and taking responsibility for any adverse consequence due to any misidentification of the specimen(s) and report issued.

**Specimens not collected within Canberra, Calvary or National Capital Private Hospitals, and not collected by ACT Pathology staff**

An ‘Incorrect Patient ID Declaration’ facsimile will be faxed to the requesting doctor to be completed, and signed, authorising ACT Pathology to reissue the test results under a different patient, and guaranteeing that the new patient identification is correct. By signing this declaration, the doctor takes
responsibility for any adverse consequence resulting from any specimen misidentification. The signed ‘Incorrect Patient ID Declaration’ facsimile must be returned to ACT Pathology to the ‘From’ fax number on the facsimile.

**All cases (Hospital and non-hospital patients)**

The relevant Laboratory Chief Scientist(s) and/or ACT Pathology Department Director(s) must also approve the re-issuing of the results under a different patient’s name.

Pathology Reports issued on test results produced from specimens received by ACT Pathology incorrectly identified and transferred to a different patient will include a disclaimer that ACT Pathology takes no responsibility for the accurate identification of the specimen and report or for any adverse consequence should such identification be incorrect. In addition, a comment will be added that the requesting doctor has signed a declaration taking full responsibility for any adverse consequence resulting from the specimen/report misidentification and that they have authorised the report to be issued under a different patient’s name.

A retracted report will be issued on any previously issued report that allegedly had incorrect patient identification (as a result of an incorrectly identified request form and specimen) with all results deleted, and a comment requesting that any previous report issued with the same request number be discarded and destroyed.

**Blood collection tubes**

The following is a list of vacutainer collection tubes and the order in which they should be collected to avoid contamination:
<table>
<thead>
<tr>
<th>Order of Draw</th>
<th>Specimen Volume</th>
<th>Preservative/ Anticoagulant</th>
<th>Lid colour</th>
<th>Specimen Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>4ml</td>
<td>Buffered Citrate</td>
<td>Blue</td>
<td>Coagulation</td>
</tr>
<tr>
<td>2nd</td>
<td>9ml</td>
<td>Acid Citrate Dextrose (ACD)</td>
<td>Yellow</td>
<td>ACD</td>
</tr>
<tr>
<td>3rd</td>
<td>9ml</td>
<td>None (plain tube)</td>
<td>Red</td>
<td>Serum- no Gel</td>
</tr>
<tr>
<td>4th</td>
<td>8.5ml</td>
<td>None</td>
<td>Gold</td>
<td>Serum Gel</td>
</tr>
<tr>
<td>5th</td>
<td>9ml</td>
<td>Lithium Heparin</td>
<td>Green</td>
<td>Li Heparin- no Gel</td>
</tr>
<tr>
<td>6th</td>
<td>4.5ml</td>
<td>Lithium Heparin</td>
<td>Light Green</td>
<td>Li heparin Gel</td>
</tr>
<tr>
<td>7th</td>
<td>4ml</td>
<td>EDTA</td>
<td>Pink</td>
<td>EDTA</td>
</tr>
<tr>
<td></td>
<td>9ml</td>
<td>EDTA</td>
<td>Purple</td>
<td>EDTA</td>
</tr>
<tr>
<td></td>
<td>6ml</td>
<td>Trace Elements</td>
<td>Royal Blue</td>
<td>Trace Elements</td>
</tr>
<tr>
<td></td>
<td>2ml</td>
<td>Na Fluoride</td>
<td>Grey</td>
<td>Glucose only</td>
</tr>
</tbody>
</table>

Tubes with anticoagulant must be gently inverted several times after collection. For specific collection details refer to specific tests listed.

**Urgent specimens**

If the result on a specimen is required urgently, please make it clear what tests are urgent on the Pathology Request form, and contact the appropriate laboratory so that the relevant department can be notified of the urgency of the result.

*Main Laboratory (Canberra Hospital)*  
6244 2930

*Calvary Hospital Laboratory*  
6201 6708

**Rapid specimen transport system**

A Rapid Specimen Transport System is operational at Canberra Hospital and Calvary Hospital. Specimens must be packed separately in a clipped and sealed up biohazard bag with request form and paperwork in the side pouch. In turn the biohazard
Bag must be placed in a carrier according to instructions provided next to each station and dispatched without delay to the laboratory. If the system is unavailable at TCH, please phone the Central Equipment Service:

**Central Equipment & Courier Service:** (TCH)
(between the hours of 0800-2000hrs Mon-Frid)
0413 515 365

If the system is unavailable at Calvary Hospital, please phone:

*Calvary Hospital Laboratory* 6201 6708

**Ice should NOT be sent in the rapid transport system! All coagulation specimens may be sent in the rapid transport system except those for factor assays.**

At Canberra Hospital, Central Equipment & Courier service specifically delivers blood and blood products to the wards from 0800-2000hrs Monday to Friday. After this time the mail room courier and wardsmen carry out this duty.

**Result enquiries**

Doctor surgeries can obtain Pathology results by phoning the result enquiries lines which is staffed 24 hours a day.

**DOCTORS RESULTS LINE** (for both Canberra and Calvary Hospitals): 6244 2930.

**Hospital Wards** can obtain Pathology results by accessing CIS (Internal results system)

**Faxing reports**

Urgent reports can be faxed to your surgery if requested. Please indicate on the request form that you wish the report to be faxed and include the fax number. The reports will be automatically faxed on authorisation.

**Add on test**

ACT Pathology stores serum/plasma specimens for approximately 10 days. Doctor surgeries should
phone to inform if further testing needs to be performed on a previously collected sample. Please phone to inform the laboratory on the contact numbers below. A written request form must follow a verbal request within 24 hours.

Hospital Wards need only send the add on form via the Rapid Transport system. There is no requirement to call unless the add-on test is critically urgent.

Note: Not all requested tests can be added on to a stored specimen. Factors determining whether a test can be added will depend on the age of the stored specimen, the type of specimen, and the specific test requested. For example, Glucose tests cannot be added onto serum specimens that have been collected more than four hours previously.

Main Laboratory (Canberra Hospital)  
6244 2930

Calvary Hospital Laboratory 6201 6708

Specimen Referral

A specimen referral service operates from Specimen Reception, Canberra Hospital. Requests for laboratory tests, which are not performed by ACT Pathology, are referred to NATA accredited interstate laboratories. Specimens are sent daily Monday to Thursday. For these results or specific collection requirements for referral specimens contact:

Specimen Reception 6244 2930

Unexpected or markedly abnormal results

Any results, which are unexpected or are markedly abnormal, will be phoned/faxed to the doctor/ward/area where the request originated. Our aim is to provide these results as soon as they are verified.
Reference ranges and significant changes

Reference ranges are given as a guide to interpretation of the results. 5% of normal people will have a result outside this range, which is the population mean + 2 standard deviations.

For paediatric, geriatric and non-European patients, these ranges are not well established and are only an approximate guide.

Significant change figures (where given) indicate the magnitude of change required between two consecutive results for them to be significantly different. Any change greater than this figure is not due to laboratory method imprecision.

Interpretation of tests

Always exclude the possibility of an erroneous result first.

This is most commonly due to incorrect identification (labelling), collection, or preservation of the specimen.

Test results are then interpreted to either assist with making a diagnosis, or for monitoring a patient’s status:

• Diagnosis: the result is compared with the appropriate reference range (5% of normal people will have a result outside this range).

• Monitoring: if two results differ by more than 3 times the standard deviation a significant change has occurred (see next paragraph). Any such change is either physiological or pathological, and not due to laboratory method imprecision.

Significant change values, as quoted in this Handbook, are given as either three standard deviations or as a percentage:
Section 2: Department Details

MAIN LABORATORY
(The Canberra Hospital)

Building 10, The Canberra Hospital

Exc Director of Pathology  Prof Peter Collignon
Operations Manager  Charmaine Gray
Principal Scientist  Monica Brady
Quality Manager  Lloyd Allen

Departments
Pathology Reception  6244 2930
Customer Services  6244 2932
Anatomical Pathology  6244 2867
Cytology  6244 2875
Clinical Chemistry  6244 2809
Haematology  6244 2828
Immunoassay Services  6244 2847
Immunology  6244 2847
Transfusion Services  6244 2918
Cytogenetics  6244 3449
Microbiology  6244 2252
Molecular Pathology  6244 3485
Fax  6244 2962
Anatomical Pathology

For Cytology—see separate section below.

Location

Level 3, Building 10, The Canberra Hospital.

Telephone contact numbers

All general enquiries and Pathology results 6244 2930

Secretarial enquiries 6244 2867

Director, AProf Sanjiv Jain 6244 2869

Specialist Dr Genevieve Bennett 6244 2868

Specialist, Dr Michael Brown 6244 2866

Specialist, Dr Maya Cherian 6244 2865

Specialist, Prof Jane Dahlstrom 6244 2658

Specialist, Dr Millie Lui 6244 3767

Specialist, Dr Lavinia Hallam 6244 2877

Specialist, Dr Mitali Fadia 6244 2880

Specialist, Dr Huw Llewellyn 6244 2882

Chief Scientist, Narelle Brodie 6244 2879

Normal hours of business

Monday to Friday 0800-1700 (5pm)

The following section is a brief outline and is not comprehensive. If there are any doubts concerning specimen handling, please contact the laboratory and discuss these with the pathologist/registrar.

After Hours service

An Anatomical Pathology Specialist is available on call between 1700 and 0800 hours and on weekends and public holidays. Contact The Canberra Hospital switchboard.

Specimens
See the General Information Section of this handbook for specimen labelling requirements. Please include a detailed clinical history with the request to assist in analysis.

**Routine biopsy—small**

Immerse immediately in a ten-fold volume of 10% neutral buffered formalin in a container large enough to hold that volume.

**Routine biopsy—large**

These are poorly penetrated even by adequate volumes of 10% neutral buffered formalin. They should be handled as fresh specimens and delivered to the laboratory without delay, even if immersed in 10% neutral buffered formalin.

As a general rule verbal reports can be made available on urgent cases for small specimens the day after receipt and 24 hours later for larger ones. Contact the reporting Pathologist on 6244 2867.

**Non-routine specimens**

1) **Fresh**

With the increasing diversity of diagnostic techniques (Immunohistochemistry, Immunophenotyping, DNA Studies, Microbiological culture, Electron Microscopy) there is a need for specimens to be sent fresh to the laboratory.

It is preferable that the laboratory is notified when a procedure is planned, and when the specimen is consigned.

Fresh specimens requiring rapid transport to the lab include:

- Lymph node biopsies (and all other tissue biopsies) where the diagnosis of a lymphoproliferative disorder is suspected.
- Renal biopsies—these should not be undertaken without prior discussion with the laboratory.
- Frozen sections—for elective surgery these should be arranged in advance (a convenient
time is when the patient is booked in for an operation). These arrangements can be made with the laboratory on 6244 2867.

- Consideration should be given to placing frozen section operations early on operating lists.
- Failure to book frozen sections in advance may result in delays in performing frozen sections.
- **Fresh Tissue for immunofluorescence** examination is to be placed into HAMS solution. HAMS is available from the TCH laboratory, contact 6244 2874 and the Calvary laboratory, contact 6201 6706. Deliver sample to the Anatomical Pathology Laboratory immediately.
- Products of Conception and Chorionic Villus Biopsies: these specimens may also require cytogenetic testing. If there is only one specimen and both histology and cytogenetic testing are required, the specimen should be sent immediately to the laboratory as a fresh specimen. See also Cytogenetic Specimen Collection information (see Index). If histology only is required, the specimen should be placed in 10% neutral buffered formalin immediately.

2) **Urgent specimens**

Routine processing is an overnight procedure. Requests for urgent handling must be discussed with the laboratory.

3) **Muscle & Nerve biopsies**

These specimens are NOT processed/analysed in this laboratory.

Contact the Sendaways Dept :Ph 6244 2845.

There is a Fact Sheet available from Customer Services

**Post Mortems**

Request for a hospital (non coronial) post mortem examination is a consultation and must be made directly through one of the Anatomical Pathology Registrars or Specialists (contact details above).
Post Mortem examinations, except when ordered by the Coroner, shall not be performed on any deceased person without the written consent of the senior available next of kin of the deceased.

Post Mortem information pamphlets are available on the ward to be given to the next of kin.

An autopsy request form should be accurately and legibly completed, and include a detailed summary of the relevant clinical history. This form should be signed by the next of kin and requesting Medical Practitioner. The Designated Medical Officer signature required will be obtained by the Anatomical Pathology Department.

The following should be forwarded directly to the Medical Records Department.

• Clinical notes
• Signed Post Mortem request form
• Completed Death and Cremation Certification
Cytology

Level 3, Building 10, The Canberra Hospital

Telephone contact numbers

All general enquiries and Pathology results 6244 2930
Cytology enquiries 6244 2875
Cytopathologist, Dr Huy Llewellyn 6244 2882
Cytology manager 6244 2876

Normal hours of business
Monday to Friday 08.30-17.00 (5pm)

Urgent services outside these hours may be arranged in consultation with the Anatomical Pathologist on-call. Contact The Canberra Hospital switchboard 6244 2222.

Specimen collection

All material submitted, including slides, must be clearly labelled with at least 2 forms of identification eg Name and DOB..

Rapid transport of most fluid specimens to the Cytology Laboratory at The Canberra Hospital is essential to ensure optimal cell preservation.

Cervical & Vaginal/Vault Smears

For vaginal smears take care to sample the squamo-columnar junction (transformation zone). Label microscope slides with patient’s name, DOB, and date of collection. Use a cervix sampler (or spatula) and endocervical brush to collect samples from the ecto and endo cervical regions. Transfer cells to slide and fix immediately using a commercial spray fixative or place in 95% alcohol for 20 mins. Transport the cervical smears in slide containers.

In addition to the conventional Papanicolaou smear, ACT Pathology offers liquid-based cervical cytology (ThinPrep® Pap Test™). Liquid based cervical cytology has not replaced the conventional Pap
smear and because the ThinPrep® Pap Test™ is not yet a Medicare approved test for cervical cytology, a fee will be charged by ACT Pathology for all ThinPrep® Pap Tests™.

Contact the laboratory on 6244 2816 if you need supplies for the collection of Pap smears including ThinPrep® Pap Test™ specimens.

**Urine**

Mid morning, non catheter specimens of not less than 20 mL are preferred. Early morning samples are not used as cells degenerate quickly in urine. The specimen should be transported to the laboratory on the day of collection. Sensitivity is increased if the three specimens are collected on three different days.

It is not advisable to collect and store these specimens over a weekend.

**Sputum**

An early morning deep cough specimen in a clean container is preferred. Saliva is unsuitable for assessment. Physiotherapy may assist in production of the specimen. Sensitivity is increased if three specimens are taken on three different days.

It is not advisable to collect and store these specimens over a weekend.

**Bronchial washings, BALs and Brushings**

These specimens are collected by specialists in the Thoracic Unit.

**Bronchial Washings & BALs**—should be placed in a sterile container and forwarded to the laboratory ASAP as cells deteriorate rapidly in saline.

**Bronchial Brushings**—the brush should be rolled gently across the slide(s), which have been labelled with the patient’s name, date and site. Fix slides immediately using a commercial fixative or place the slides into a Coplin jar containing 95% ethyl alcohol. Allow the slide(s) to fix for a minimum of 20 minutes.
Send the slides to the laboratory in a slide container. Place the brush into a Thin Prep vial and send to the laboratory.

**Oesophago-gastric-duodenal Brushings**

These are usually collected by specialists in the Gastroenterology Unit.

The brush should be gently rolled across the slide(s). The slide(s) should then be rapidly air dried and labelled with the patient’s name, date and site. Please forward to the laboratory in slide containers on the same day of collection.

The residual brush should be placed in a yellow top jar (preferably containing saline) and sent to the laboratory.

**Cerebrospinal fluid**

Cells degenerate extremely rapidly in cerebrospinal fluid, and specimens must be processed within an hour of collection if assessment is to be of value. Therefore special arrangements must be made for immediate transport to the laboratory. In cases when cytological evaluation is considered critical, please advise the laboratory prior to collection (6244 2875).

**Serous or cyst fluids—including pleural, ascitic and Pericardial fluid**

A minimum volume of 50-75 mL of fluid, if possible, is preferred for cytological evaluation. If however a smaller volume is obtained, assessment may still provide diagnostic information. (If a large fluid specimen is being collected for cytology that also The fluid should be a direct aspiration and not a decantation from a larger volume, which may be deficient in cells. To prevent clotting, no more than 25 mL should be aspirated directly into a container containing 3 mL 3.8% sodium citrate, or 20 mL EDTA (pink top) or 200 units of heparin (special containers are available on request). Delivery to the laboratory on the same day as collection is recommended. However, if not possible, the specimen may be
refrigerated satisfactorily overnight until dispatch to the laboratory.

**Fine needle aspiration biopsies**

The yield of diagnostic information is directly proportional to adequate aspiration technique and preparation of material. Relevant clinical data must be provided if delays in reporting are to be avoided. Consultation with the laboratory is advised. Every effort is made by the laboratory to provide technical assistance, particularly for the more complex procedures performed by Radiology and Nuclear Medicine. For Fine Needle Aspirations to be performed by a Pathologist on the ward, or as an outpatient procedure, please make arrangements with the laboratory on 6244 2875. It is important that all relevant clinical data is provided to assist with the diagnosis.

**Smears from Ulcerated Lesions**

Use a spatula or scalpel blade to scrape material from the surface, and smear on 2-4 slides. Fix the first 1-2 slides by immediately using a commercial spray fixative or immersion in 95% alcohol, for 20 minutes and allow the remaining thinner smears to air dry. Slides should be marked ‘fixed’ and ‘air dried’.

**Semen analysis**

**Post-vasectomy specimens only.**

Specimen required: Post vasectomy semen only in yellow top sterile container.

Analysed: 8am-12noon Monday-Friday ONLY

Notes:

- Specimens will be accepted between 8am-2pm Monday to Friday at TCH Collection centre only.
- It is important that the specimen is dropped to this centre as soon as possible after collection as it must be analysed within 2 hours of collection. Specimens delivered outside these hours will NOT be processed unless prior arrangement with the laboratory. Contact Cytology on 6244 2875.
• The patient should refrain from sexual intercourse and masturbation for 3 days before producing a specimen.

• One sample collected 3 months post vasectomy after at least 20 ejaculations.

• A patient factsheet is available on the website or through Customer Services on 6244 2932.

All other specimens
Please contact the department prior to collection.

Cytology reports
If any clarification of terminology is needed, please phone the Cytopathologist or Chief Scientist.
Clinical Chemistry

Level 2, Building 10, The Canberra Hospital

Telephone contact numbers

All general enquiries and Pathology results
6244 2930

Director, A/Prof Peter Hickman 6244 2840

Chief Scientist 6244 2843

Fax 6285 4428

Normal hours of business

Monday to Friday 0800-1700 (5pm)

This department provides a full service during this period.

For urgent analysis please phone enquiries on 6244 2930 to identify the specimen and discuss the case.

After Hours service

1700 (5 pm) to 0800 each day

All day Saturday, Sunday and Public Holidays

Routine Biochemistry

This service is provided as an urgent service only and is limited to routine biochemistry testing that is excluding the tests below. This is available by contacting the Laboratory on 6244 2930.

Vasoactive Amines and other specialised tests

These may be collected but will not be analysed during these hours. If you wish to have these tests performed you must discuss the case with the Senior Staff on call by ringing the Laboratory on 6244 2809.

Drug testing

Paracetamol, Theophylline, Salicylate, Lithium, Phenytoin, Valproate, Phenobarbitone, Carbamazepine and Digoxin are available 24 hours/day.

All other drug testing can be collected but will not be analysed during these hours. These other drug tests are available only after consultation with the Senior
Staff on call. They can be contacted by ringing the laboratory on 6244 2809.

**Endocrinology, Proteins Electrophoresis, Tumour Markers**

*See Immunoassay Section for details.*
Haematology

For Transfusion Serology—see separate section below.

Location

Level 2, Building 10, The Canberra Hospital.

Telephone contact numbers

All general enquiries and Pathology results 6244 2930

Haematology Laboratory 6244 2828
Coagulation Laboratory 6244 2834
Immunophenotyping 6244 3584

Contact following specialists through TCH switchboard on 6244 2222

Director, Dr Michael Pidcock
Specialist, Dr Philip Crispin
Specialist, Dr James D’Rozario
Specialist, A/Prof Dipti Talaulikar
Specialist Dr Maya Latimer
Specialist Dr Nalini Pati
Specialist Dr Edwin Lee
Specialist Dr Emma Palfreyman

Haematology Registrars

Haematologist on Duty

Chief Scientist

Fax

Normal hours of business
Monday to Friday 0800-1700 (5pm)

This department provides a full Haematology and Coagulation service during this period. All urgent requests should be notified to the laboratory by telephone 6244 2930.

After Hours service
1700 (5 pm) to 0800 each day and all day Saturday, Sunday and Public Holidays.

The laboratory offers a limited range of essential tests after-hours. Requests should be limited to those that may affect patient management before the next normal working day. Priority will be given to these requests over other routine requests.

Other tests may be made available after consultation with the laboratory or the Specialist-in-Charge.
Immunoassay Services

Level 2, Building 10, The Canberra Hospital

This is a functional unit of ACT Pathology that combines the following areas of investigation using similar analytical technology:

**Immunology** including Autoimmunity and Immunofluorescence assays, Protein detection and quantitation (see next page).

**Endocrinology** including Hormone analysis, Tumour markers, Thyroid function tests and Haematinics.

**Infectious Serology** including HIV, Hepatitis and other infectious serology testing.

**Telephone contact numbers**

*All General enquiries and Pathology results*  6244 2930

*Director of Immunopathology*
*Dr Carolyn Hawkins*  6244 4194

*Immunologist, Dr Matthew Cook*  6244 4194

*Chemical Pathologist*  6244 2840

*Microbiologist*  6244 2105

*Haematologist*  6244 2222

*Chief Scientist*  6244 2846

*Fax*  6285 4428

**Normal hours of business**

Monday to Friday  0800-1700 (5pm)

See individual tests in Section 3 for availability.

For urgent analysis please phone enquiries on 6244 2930 to identify the specimen and discuss the case.
After Hours service

Specimens for Endocrinology, Protein detection and quantitation, Tumour markers, Haematinics, Viral testing, Autoimmunity and Immunofluorescence assays may be collected but out of hours analysis will only be considered after consultation with the senior scientist on call or specific arrangements have been made with the laboratory or specialist.
Immunology

Level 2, Building 10, The Canberra Hospital.

Telephone contact numbers

All General enquiries and Pathology results 6244 2930

Director of Immunopathology
Dr Carolyn Hawkins 6244 4194

Immunologist, Dr Matthew Cook 6244 4194

Immunology Registrar 6244 2841

Chief Scientist 6244 2846

Fax 6244 2892

Normal hours of business
Monday to Friday 0800-1700 (5pm)

After Hours Service

When urgent autoimmune serology is necessary for immediate patient management, requests (normal and after hours) should be directed to the Immunologist on-call (available through The Canberra Hospital switchboard).

Advice

Assistance with interpretation of results and advice about investigating patients with autoimmunity, suspected immunodeficiency and allergy can be obtained by contacting the Immunologist (number above or via The Canberra Hospital switchboard).

Our service includes lymphocyte and neutrophil function studies, and immunophenotyping, but these tests can only be performed after arrangement with Immunologists.
Transfusion

Level 2, Building 10, The Canberra Hospital.

Telephone contact numbers

General Enquiries, Requesting Blood

(TCH) 6244 2918
Calvary Hospital 6201 6274
Haematologists 6244 2222
Director, Dr Michael Pidcock
Specialist, Dr Philip Crispin
Specialist, Dr James D’Rozario
Specialist, Dr Maya Latimer
Specialist Dr Dipti Talaulikar
Specialist, Dr Nalini Pati
Specialist, Dr Edwin Lee
Specialist, Dr Emma Palfreyman
Haematology Registrars 6244 2823
Chief Scientist 6244 2993

Normal hours of business

Monday to Friday 0800-1700 (5 pm)

After-Hours service

Operates from both Canberra and Calvary Hospital laboratories 1700-0800 each day, and all day Saturday, Sunday and Public Holidays.

Pathology Clinical Integration System (CIS)

Blood transfusion request information can be obtained on the intranet via the Pathology Clinical Integration System. To determine whether a patient has a valid group and screen or units crossmatched, please check the CIS first and then if further information or discussion with laboratory staff is
required phone Pathology Results Line on 6244 2918.

Routine requests
The crossmatch procedure takes approximately 45 minutes from the time of receipt of specimen in the laboratory. Blood may be issued prior to completion of testing in a clinically urgent situation. Refer to Emergency Transfusion.

Urgent requests
Clinicians should speak to the laboratory staff at Canberra Hospital on 6244 2918 and Calvary Hospital on 6201 6274 about urgent requests, to enable all work to be handled with the appropriate priority. A polite explanation of the situation will alert them to the problem and help minimise communication and transport problems. It must be stressed that telephoning the laboratory continually can only prolong the procedure and jeopardise patient safety.

See also section on Emergency Transfusion.

Specimen requirements
Appropriate checking procedures must be followed to ensure that details on the patient wrist band, blood sample and Pathology Request form are identical.

All samples collected for crossmatching must be witnessed either by the patient, a relative present at the collection or a member of clinical staff (medical or nursing). The witness must sign the appropriate area of the crossmatch request form.

The following information is MANDATORY on the specimen:

- Patient surname and first name
- Date of birth
- Patient number (MRN)
- Date and time of collection
- Signature of collecting officer
Blood transfusion request form

Requests for Crossmatched blood, Group and Antibody Screen or blood products must be made on a Blood Transfusion Request Form.

The following information is MANDATORY:

- Patient surname and first name
- Date of birth
- Patient number (MRN)
- Requesting doctor’s name, signature and provider number
- The name and signature of the collecting officer
- The name and signature of the patient or witness to the collection whose signature verifies the identity of the patient’s specimen and who actually witnessed the collection.

Note: The collecting officer cannot also act as witness.

- A brief clinical history is essential including the reason for the request. eg type of surgical procedure or anaemia.
- Details about previous pregnancies and/or transfusions must be clearly indicated on the transfusion request form and the month and year must be given.
- Tests/products requested and date/time required.
- Ward or clinic address for report, including hospital.
- The name and address of any doctor requiring copies of the report.
- Date and time of collection.

Holding periods for group and screen requests

- In accordance with the Australian and New Zealand Society of Blood Transfusion Guidelines, the Transfusion Laboratory will apply the
following holding periods, depending on the information given.

- Where the form clearly indicates that the patient has not been transfused or pregnant in the last three months, Group and antibody screen will be valid for fourteen (14) days.
- Where the form clearly indicates that the patient has had a transfusion and/or has been pregnant in the last three (3) months, the Group and antibody screen will be valid for 72 Hours.
- Where no information is provided or it is unclear or insufficient, for safety reasons, the laboratory will assume that the patient may have been transfused or pregnant in the last three (3) months, and will consequently hold the serum for 72 Hours only.
- Where patients are receiving multiple unit transfusion due to trauma, post operative blood loss, or are transfusion dependant, serum will be held for 72 Hours only, as these patients are experiencing continuous immunological challenge and have a higher probability of antibody formation.

Request for crossmatch on a valid group and screen

For a patient where the transfusion of blood may be required, a Group and Antibody Screen is the appropriate request. If no clinically important antibodies are detected, no blood is crossmatched or reserved and the patient’s serum is held for a period of time, dependent on previous transfusion/pregnancy history. (See above). Blood is crossmatched by the laboratory on demand.

- If a transfusion becomes necessary, the following procedure should be followed:
  - Telephone the Transfusion laboratory on 6244 2918 (TCH) or 6201 6274 (Calvary Hospital).
  - Give patient’s full name, UR, number of units, ward and when required.
  - Wait while Laboratory staff confirm that a valid antibody screen exists.
• Compatible blood will be available in approximately 15 minutes.

NOTE: This is the only call the ward needs to make. Do not page the courier

Protocol for ordering blood for elective surgery

A Group and Screen should be collected prior to surgery for those procedures where blood transfusion may be required. The laboratory does not routinely crossmatch units prior to surgery, rather blood will be provided on demand.

Emergency Transfusion

Group specific blood

In cases of major haemorrhage where the time delay for a complete crossmatch is deemed unacceptable by the treating physician, group specific blood from the Transfusion Laboratory will be released on request by a medical officer. Laboratory staff will ABO and Rh(D) type the patient. ABO Rh(D) matched donor units will be issued on ‘Emergency Report and Labels’ and the laboratory officer will then continue with standard testing procedures. A Blood Transfusion Sheet and completed compatibility labels will be released on completion.

O Rh(D) Negative blood

4 units of un-crossmatched O Rh(D) Negative blood are available from the Transfusion Laboratory for use in extreme emergency. Remember - these units may still cause a reaction if the patient has red cell antibodies.

Neonatal transfusion (less than 4 months old)

Cord blood samples are not accepted for pre-transfusion testing. If a blood transfusion is anticipated, collect a heelprick specimen accompanied by a blood transfusion request form for a group and screen. This group and screen will remain valid until the baby reaches four months of
age, or is discharged from hospital. A concurrent maternal group and antibody screen is desirable. This maternal screen may be collected up to 72 hours prior to delivery, or 14 days post delivery.

For those babies likely to require recurrent transfusions within two weeks, a single donor adult unit may be split into four packs to reduce donor exposure. These packs are not routinely stocked in the ACT but may be ordered as required. Please contact the transfusion laboratory at TCH.

Exchange transfusions /Intrauterine transfusions

Proposed exchange transfusion must be notified in advance to the main laboratory so that appropriate blood is ordered and arrangements for testing and irradiation are put in place.

Main Laboratory (TCH) 6244 2918

Indications for Use of Irradiated Blood Products

Only cellular blood products need to be irradiated. Irradiation is used to prevent transfusion associated Graft versus Host Disease (GVHD). Plasma products (FFP and Cryoprecipitate) and other manufactured blood products (eg CSL products) do not require irradiation.

The medical officer initiating the procedure must be aware of the criteria for irradiation (see following guidelines ) and should indicate the appropriate diagnosis on the transfusion request form.

The request for irradiation of products must be made on the Transfusion Request Sheet and signed in the appropriate area of this form.

Note: All platelet packs are irradiated before issue.

Indications

Patients with the following diagnosis should have irradiated cellular blood products.
i) Patients undergoing, or who have recently undergone, allogeneic or autologous bone marrow or stem cell transplantation

ii) Patients undergoing active therapy for all forms of leukaemia and lymphoma

Patients who have received purine analogues (eg. Fludarabine) or Hodgkin disease have a definite indication for irradiated products. There is incomplete evidence for other haemopoietic malignancies, but irradiation is performed if required

iii) Patients with aplastic anaemia

- Primary T cell deficiency diseases, including severe combined immunodeficiency disease (SCID), as requested by a medical officer.

iv) Immunosuppressive therapy

This represents a theoretical risk only, and applies if therapy has recently concluded. An Immunologist must request irradiation of products for this group of patients.

v) All neonatal transfusions (neonate period is classified to four months)

Definitely indicated where prior intrauterine transfusion has occurred. May also be indicated in prematurity.

vi) All intra-uterine transfusions

vii) Directed donations from first or second degree blood relatives

This includes children, siblings, parents, grandparents, grandchildren, or a blood related aunt, uncle, niece or nephew of the donor.

viii) Patients receiving nucleoside or analogues of alemtuzumab for malignant or non malignant disorders.

Platelet transfusion guidelines

Note: All platelet units are routinely irradiated

- Platelets will be issued either as a pooled unit from four donors or as the equivalent amount collected by apheresis from one donor.
• Platelets are issued on ABO testing only. Platelets contain a very small volume of red cells, so if Rh (D) positive platelets are issued to Rh(D) negative women of child bearing age, a vial of anti-D may be issued. If apheresis platelets are to be issued they should also be plasma compatible.

• Occasionally ABO incompatible platelets will be issued. Occasionally reactions may occur, particularly in patients with small blood volumes, given plasma from ABO incompatible apheresis derived platelets. Please discuss with a haematologist if concerned.

• It is essential that platelets are infused immediately following receipt from the platelet shaker in the laboratory. They must remain at room temperature. DO NOT PLACE IN REFRIGERATOR

Guidelines for transfusional support with platelets are as follows

• Acutely ill patients with production-related thrombocytopenia (eg acute leukaemia, chemotherapy-related myelosuppression) should only be given prophylactic platelet transfusions if platelet counts are <10 x 10^9/L. If significant bleeding is present, give platelets if counts are <20 x 10^9/L.

• Patients with Immune thrombocytopenia (ITP) should not be given platelet transfusion, except as an emergency measure to control life-threatening bleeding. Transfusion support for such cases must be discussed with a Haematologist.

• Patients with documented qualitative platelet disorders may require platelet transfusion for bleeding or invasive procedures, Transfusion support for such cases must be discussed with a Haematologist.

• Cardiopulmonary bypass may cause a transient qualitative platelet defect. In the event of bleeding, 1 platelet unit may be issued. Additional
requests must be discussed with a Haematologist.

- Patients who are thrombocytopenic and who require invasive procedures. Such therapy should be individualised after discussion with a Haematologist. In general, a platelet count >30 x 10/L is safe for minor procedures, e.g., central line insertion. For procedures with a higher risk of bleeding (e.g., liver biopsy) a target value of >50 x 10^9/L should be attained.

- Patients undergoing neurosurgery with a platelet count of <100 x 10^9/L.

- Bleeding following DIC, trauma, or surgery should be discussed with a Haematologist.

**Fresh frozen plasma (FFP)**

A current group and screen is not routinely required, however one will be requested if the laboratory does not have a blood group on record.

If FFP is required contact the relevant laboratory giving patients details, indication for use and number of units required. A Blood Transfusion Request Form is required. The laboratory will arrange thawing of the product and notify the ward when it is ready.

*Main Laboratory (The Canberra Hospital)*
6244 2918

*Laboratory (Calvary Hospital)*
6201 6274

**Indications**

- Deficiencies where no specific concentrate is available.

- Warfarin reversal- Prothrombinex is usually preferred. See *Warfarin reversal guidelines in section on INR*.

- Other coagulopathies (e.g., Liver disease, DIC, massive transfusion). FFP will provide a transient reversal of coagulopathy for four to six hours, and may be appropriate in the presence of bleeding or invasive procedures. 2-4 units of FFP will increase the levels of coagulation proteins to
adequate levels in the majority of patients. Larger doses may be needed in DIC. Requests for larger volumes of FFP will be referred to the haematologist on call, and will require documentation of response to previous transfusion.

**Notes**

- Check coagulation studies post transfusion before considering further FFP.
- Use of additional units carries a significant risk of volume overload, particularly in elderly patients.

**Calculation of volume of FFP required**

The relationship between the prothrombin time (INR) and coagulation factors is not linear (see diagram). 2 units of FFP will increase the level of coagulation factors by 10-15%. This will have a much greater effect when the initial prothrombin time is markedly prolonged, but may have a minimal effect on mildly prolonged values. It is rarely necessary to fully correct the prothrombin time to normal to achieve adequate haemostasis.

![Prothrombin Time (seconds) vs. Percent of Normal Coag Factors Diagram]

<table>
<thead>
<tr>
<th>INR</th>
<th>Indication</th>
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<tbody>
<tr>
<td>&gt; 1.3 (1.4 or</td>
<td>Neurosurgery:</td>
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<tr>
<td>above</td>
<td>In theatre or active bleeding</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>≥1.5</td>
<td>General surgery/procedure: In theatre or active bleeding</td>
</tr>
</tbody>
</table>

**Cryoprecipitate**

A current group and screen is not routinely required, however one will be requested if the laboratory does not have a blood group on record.

If cryoprecipitate is required contact the relevant laboratory giving patients details, indication for use and number of units required. A Blood Transfusion Request Form is required. The laboratory will arrange thawing of the product and notify the ward when it is ready.

Main Laboratory (TCH)  6244 2918  
Laboratory (Calvary Hospital) 6201 6274

**Indications for use of Cryoprecipitate:**  
Low Fibrinogen

**Other blood products**

*The Canberra Hospital*

In addition to Red Cell and Platelet concentrates, FFP and Cryoprecipitate, the blood products listed below are provided by the Transfusion Laboratory. No specimen is required, however a transfusion request form or prescription is required that is signed by a Medical Officer and indicates the product, dose and indication.

*Calvary Hospital*

Staff of Calvary Hospital can procure supplies of the following products:

- through Calvary Hospital pharmacy
- through Calvary Hospital Pathology. The Calvary laboratory holds stock of some products, or will arrange delivery from TCH.
Albumex-4 (4% Albumin) (Intravenous)

At the Canberra Hospital, Imprest stock is available in OR and the cardiac bay in ICU. All other requests must be made on a Blood Transfusion Sheet.

Albumex-20 (20% Albumin) (Intravenous)

Authorisation by Haematology Specialist may be required.

All Intravenous Immunoglobulin

Strict adherence to guidelines applies—Authorisation by ARCBS Specialist Haematologist required. See Act Health Intravenous Immunoglobulin Policy.

Human Derived- Factor VIII and von Willebrand complex (Biostate)

Authorisation by Haematology Specialist may be required.

Recombinant Factor VIII or IX

Authorisation by Haematology Specialist may be required.

Prothrombinex (PTX) (Intravenous)

Authorisation by Haematology Specialist may be required.

Normal Immunoglobulin (Human) I.M.

The use of this product must be authorised by Health Protection-ACT.

Hepatitis B Immunoglobulin (Injection)

Indications: Accidental inoculation with HBsAg positive material or following contact with Hepatitis B.
Zoster Immunoglobulin (ZIG) (Injection)
Indications: Susceptible contacts eg immune deficiency, immunosuppressed patients.

Tetanus Immunoglobulin (TIG) (Injection)
Indications: Passive protection where no immunisation or doubtful immunisation history.

Rh(D) Immunoglobulin
Indications: Prevention of iso-immunisation in Rh(D) Negative females due to Rh(D) Positive cells in circulation from pregnancy.

Administration of Anti-D prophylaxis

<table>
<thead>
<tr>
<th>CSL anti-D immunoglobulin preparations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication</td>
</tr>
<tr>
<td>1(^{st}) trimester (12 weeks)</td>
</tr>
<tr>
<td>2(^{nd}) &amp; 3(^{rd}) trimester</td>
</tr>
<tr>
<td>Antenatal prophylaxis (28 &amp; 34 weeks)</td>
</tr>
<tr>
<td>Post natal</td>
</tr>
</tbody>
</table>

Rhophylac 1500 IU Anti-D immunoglobulin
•For Intravenous use when the recommended anti-D dosage is greater than 3 vials. Supplied by Red Cross Blood Service when required. Contact laboratory
Cytogenetics
The Cytogenetic Department provides a comprehensive clinical diagnostic service that includes conventional cytogenetic and molecular cytogenetic techniques.

Level 4, Building 10, The Canberra Hospital

Cytogenetics enquiries and results

Chief Scientist 6244 3449
Fax 6244 4646

Normal hours of business
Monday to Friday 0830-1700 (5 pm)
Saturday, Sunday, Public holidays on call 9am-1pm

Indications for Cytogenetic analysis
The laboratory performs cytogenetic investigations for the following:
1) Many congenital clinical indications eg, dysmorphic features, delayed puberty, multiple miscarriages.
   Specimen: Blood
2) Diagnosis and prognosis of leukaemias, eg AML, ALL, Myeloproliferative disorders and Myelodysplastic syndromes.
   Specimen: Bone Marrow
3) Certain malignant and pre-malignant diseases, eg Lymphoma.
   Specimen: Tumour tissue
4) Multiple spontaneous abortions of unknown cause; therapeutically induced abortion where there has been a pre-natal diagnosis of abnormality.
   Specimen: Products of conception
5) Chromosomal mosaicism.
   Specimen: Skin Biopsy
6) Prenatal diagnosis.
   Specimen: CVS—Chorionic villi sampling, AF—Amniotic fluid
Fluorescence in situ hybridisation (FISH)

Fluorescence in situ hybridisation is a molecular cytogenetic technique used to identify specific gene loci involved in chromosomal abnormalities.

Indications for Fluorescence in situ hybridisation

- Leukaemia/oncology eg fusion genes identified in chronic myeloid leukaemia, acute promyelocytic leukaemia, acute myeloid leukaemia and lymphoma..
- Prenatal aneuploidy screen for the rapid detection of aneuploidy in prenatal samples eg trisomy 13, 21,18, monosomy X.

Molecular karyotyping by microarray

This is a whole genome investigation for the detection of copy number change. It is the gold standard of investigation for:

- Autism spectrum disorders, mental retardation, developmental delay and congenital anomalies
- Investigation of microdeletion and microduplication syndromes
- Unbalanced rearrangements
- Exclusion of aneuploidy and unbalanced rearrangements in products of conception

These samples are referred by the Cytogenetics Laboratory to the Victorian Clinical Genetics Service (VCGS) for processing.

Collection protocol

Contact the laboratory for specific collection requirements on 6244 3449.
Costs: Some FISH testing is non-refundable by Medicare Australia.
Please contact the laboratory for confirmation of costs.

Cytogenetic specimen collection information

Amniotic Fluid (AF)
A reasonable sample size at 15 weeks of pregnancy is 20mL and should preferably be aliquoted into two sterile conical based tubes.

The sample should be transported at room temperature as soon as possible after collection.

**Peripheral Blood/ Cord Blood**

Minimum amounts to be sent in Lithium heparinized NON-GEL tubes (dark green top) are:

- Adult: 5 mL
- Paediatric: 2 mL

All samples collected into heparinized tubes should be agitated gently, not shaken, to mix the sample with the anticoagulant.

**Molecular karyotyping by microarray**

- EDTA
  - Adult: 5 mL
  - Paediatric: 2 mL

  - Transport the sample at room temperature to Specimen Reception, ACT Pathology as soon as possible after collection.
  - Do not freeze
  - Do not centrifuge or separate
  - Patients may be sent to any of our collection centres for blood collection Monday to Saturday.

**Bone Marrow**

**Only after consultation with a Specialist Haematologist**

- If the patient has **acute leukaemia** or there is a strong suspicion of this diagnosis, the Cytogenetics Technologist should be contacted before the start of the procedure to collect their sample at the bedside. Samples collected in this way, for direct preparation, synchronised marrow culture (or where no aspirate is obtained—trephine only processing), stand a better chance of yielding important cytogenetic information.

**For all other bone marrow procedures**
• All bone marrow specimens should be collected into sterile Lithium tubes containing 0.5 mL of transport medium (RPMI 1640 and 10% F.C.S.).
• Prepared tubes will be provided by this laboratory on request, 6244 2296
• At least 1 mL of bone marrow is required. **Note: Bone marrow specimens should be delivered to the Cytogenetics laboratory within one hour of aspiration.**
• For weekend collections, store in 4ºC refrigerator and contact ACT Pathology on 6244 2930.
• Referrals for Acute Lymphocytic leukaemia (ALL) require urgent attention. Transport to ACT Pathology ASAP and contact pathology reception on 6244 2930.
• Collect lymph node biopsy where the diagnosis of a lymphoproliferative disorder is suspected.

**Chorionic Villus Biopsies (CVS)**

• The specimen should be placed in a sterile container and brought directly to the laboratory to ensure optimal culture conditions.
• Transport medium should be used for CVS samples which may be delayed in transit. Transport medium may be obtained from the Cytogenetics laboratory on request.

**Products of Conception**

• The products of conception should be placed in a clean container of appropriate size and without additives. They should be kept moist by the naturally present blood or with a few mL of sterile normal saline. Sterile technique should be applied in preparing the specimen for transport and the container tightly sealed to prevent leakage.
• **Placenta**- The fetal surface should be biopsied so no decidua is included in the sample to prevent maternal contamination. Sample size required is 10mm x 10mm.
• **Fetus**- If fetus is available; a biopsy of skin or knee cartilage can be used. Sample size required is 2mm x 2mm.
• Please DO NOT place sample(s) in formalin.
• Specimens should be sent to the laboratory as soon as possible. If the specimen is obtained outside laboratory hours, it should be kept cool in a refrigerator. It must not be frozen.

Skin Biopsies
• Biopsies from live patients are normally aseptically performed with a skin punch and placed into sterile normal saline. The conditions of transport and storage are the same as for the Products of Conception.

Tumour Tissue
• Tumour or Lymph node specimens should be placed immediately into sterile yellow topped ‘Urine’ containers containing transport medium (RPMI 1640).
• Specimen should be sent to the laboratory as soon as possible at room temperature. The specimen must not be refrigerated. The specimen should be approximately 1cm x 1cm and non-fatty.

Approximate turnaround time for results
• Amniotic fluid 15 days
• Chorionic biopsy 15 days
• Blood 18 days
• Bone marrow 18 days
• Tissues 28 days
New acute leukaemias 5 days
Newborn bloods 5 days
Microbiology
Level 4, Building 10, The Canberra Hospital

Telephone contact numbers
All general enquiries and Pathology results 6244 2930
Microbiology Enquiries 6244 2514
6244 2252
6244 2254
Director, Dr Karina Kennedy 6244 2105
Specialist Microbiologist, Dr Chong Ong 6244 2922
Microbiology Registrar 6244 2514
or page 50070
Chief Scientist 6244 2510

Normal hours of business
Monday to Friday 0830-1700 (5pm)

It is requested that all routine work is restricted to these hours.

After Hours service
Reduced staff are on duty from 1700-2100 hours seven days for routine processing of the majority of microbiology specimens. Microbiology facilities are only operational between 2100 and 0800 hours for the processing of specimens that are considered urgent, ie.
• Cerebrospinal fluid examination
• Operating room specimens requiring urgent examination
A Microbiologist is on call for consultation by contacting Canberra Hospital switchboard 6244 2222 and a scientist is available for urgent specimens or specimens that have been approved by the Microbiologist on call.
Please consult with staff on any matters not listed in this handbook.

Microbiology specimens and their transport
The quality of results depends on the quality of the specimens.
Guidelines for collection
1) Avoid contamination with commensal flora.
2) If possible collect specimens prior to starting antimicrobial therapy.
3) Label all specimens carefully. See Unlabelled/Mislabelled specimens in the General Information Section of the Handbook.
4) Transport Conditions:
   - Swabs - Room temperature (RT),
   - Faeces-RT,
   - Urines-2-8 degrees
   - CSF-room temperature

Request forms
For general request form information and specimen collection refer to the General Information Section of this Handbook.
Processing and reporting depend entirely on information supplied.
The following information is critical for microbiology specimens and requests:
1) Exact identity of specimen and site of collection.
2) Any current, recent or proposed antimicrobial therapy, and/or relevant history.

Specimen transport
To ensure that special and urgent specimens reach the Microbiology laboratory quickly, either transport the specimen yourself, or use the rapid transport system directly to pathology.
In general non-urgent specimens, collected out of normal hours can be safely refrigerated until next day.
For notes on collection of specific specimens refer separate entries in the alphabetical listing

Viral Serology
See Immunoassay Services for Details
Molecular Pathology

Level 4, Building 10, The Canberra Hospital.

Telephone contact numbers
All general enquiries and Pathology results
6244 2930
Molecular Pathology enquiries 6244 3485
Specialist 6244 2105
Microbiology Registrar 6174 7292
Chief Scientist 6244 3705

Normal hours of business
Monday to Friday 0830-1700 (5 pm)

Some tests are conducted in batches and results may not be available the same day. For urgent analysis please phone enquiries on 6244 3485 to identify the specimen and discuss the case.

After Hours service
Specimens for Molecular Pathology collected out of hours will be processed on the following normal working day.
Specimens should be sent to Specimen Reception where they will be stored at 4°C and forwarded to the Molecular Lab the next working day.

Indications for Molecular analysis
The Laboratory performs molecular analyses for the following indications:

1) Factor Va (Leiden) and Prothrombin (G20210A) mutation detection. – (weekly)
   Specimen: 10mL EDTA (purple top tube). Only 1 tube is required for both mutations.
2) Hereditary Haemochromatosis - Detection of the C282Y and H63D mutations. – (weekly).
   Specimen: 10mL EDTA (purple top tube).
3) Herpesviridae (HSV1, HSV2, VZV and CMV) detection by PCR – (daily).
   Specimen: Viral or dry swabs, CSF. Urine, Plasma for CMV.
4) Cytomegalovirus (CMV) Viral Load (Quantitation) testing – (weekly)

Specimen: see above for Herpesviridae Testing.

5) Chlamydia and Gonorrhoea screening =- (daily)

Specimen: Urethral, cervical, vaginal, throat and rectal swabs. Use Roche Cobas PCR (yellow screw top for all swab collections), first void urine or ThinPrep vial.

6) Hepatitis C Confirmation by PCR – (weekly).

Specimen: 10mL EDTA (purple top tube) or serum (red top). Transport to laboratory as soon as possible.

7) Hepatitis C Virus Genotyping – (weekly)

Specimen: 10mL EDTA (purple top) or serum (red top). Transport to laboratory as soon as possible.

8) HIV Viral Load (Quantitation) Studies – (weekly):

Specimen: 10mL EDTA (purple top). Transport to laboratory as soon as possible.

9) HBV Viral Load (Quantitation) Studies – (weekly):

Specimen: 10mL EDTA (purple top) or serum (red top). Transport to laboratory as soon as possible.

10) Enterovirus detection by PCR – (daily as required)

Specimen: CSF.

11) Meningococcal detection by PCR – daily as required

Specimen: CSF, EDTA 4ml (pink top) 0.5-1.0ml from children. Requires approval from an Infectious Disease/Microbiology specialist.

12) Mycobacterium tuberculosis Complex (MTB Complex) testing – Daily as required). Requires approval from an Infectious Disease/Microbiology specialist.

Specimen: CSF, sputum.

13) HLA-B typing for B*27, *51, *57 – (weekly)

Specimen: 10mL EDTA (purple top)

14) Influenza, Respiratory Syncytial Virus (RSV) & other respiratory pathogens by Panel PCR – (daily).

Specimen: Nasopharyngeal ‘flocked’ or dry swab. (Also Sputum, BAL, NPA)

15) Adenovirus PCR – (daily)

Specimen: Eye swab (‘flocked’ or dry)

16) Bordetella pertussis by PCR – daily):
2016 ACT Pathology Handbook

Specimen: Nasopharyngeal swab (‘flocked’ or dry). (Also Sputum, BAL, NPA)

17) Targeted EGFR, KRAS and/or BRAF mutation testing by real-time PCR – (weekly)
Specimen: mounted FFPE tissue (Enquiries: Contact Anatomical Pathology - 6244 2930)

18) BCR-ABL p210 Monitoring by PCR – (daily as required)
Specimen: Fresh 10mL EDTA (purple top tube) or Bone Marrow (Specimen must be tested within 24 hours of collection).

19) General Molecular Pathology and Genetic Studies – eg. DNA Storage, Sanger Sequencing, Microsatellite Analysis.
Specimen: 10mL EDTA (purple top tube), tissue. (Contact Laboratory to discuss).

Specimen collection information

Blood
A dedicated EDTA specimen is required for molecular testing. Specimens cannot be shared with other pathology departments due the potential risk for cross-contamination.

Minimum amounts to be sent in EDTA tubes are:
Adult: 4 mL-10 mL
Paediatric: 0.5-1 mL

Bloods should be sent to the laboratory as soon as possible.

Out of hours store specimen at 4°C.

Note: HIV viral load, HBV viral load, Hep C PCR & Hep C genotyping should be transported to the laboratory ASAP for fractionation of plasma.

Bone marrow
All bone marrow specimens should be collected into sterile EDTA tubes (purple/pink label) or into sterile tubes containing 0.5 mL of transport medium (RPMI1640 and 10%FCS). If tube must stand overnight it can be placed at 4°C in a refrigerator.

Tumour tissue
Tumour or lymph node specimens should be placed into sterile yellow topped ‘Urine’ containers containing transport medium (RPMI1640) or sterile saline. Specimens may be refrigerated overnight. Do NOT place specimens in fixative.

**Turnaround time** for results: See individual tests.

NOTE: For information on Referral tests not listed, please contact the laboratory.
Calvary Laboratory (Calvary Hospital)

The Calvary laboratory is a branch laboratory of ACT Pathology which has its main laboratory located at the Canberra Hospital (TCH).

The Calvary laboratory undertakes urgent and routine general testing in areas of Clinical Chemistry, Coagulation, Haematology, and Transfusion.

ACT Pathology offers the processing of frozen sections at the Calvary Hospital. This service is co-ordinated by the Anatomical Pathology Laboratory based at TCH.

It is located on the Ground floor, Xavier Building, Calvary Hospital.

All results enquiries are handled by Main Laboratory at TCH location.

Telephone contact numbers
All general enquiries Pathology results 6244 2930
Calvary Laboratory enquiries 6201 6708
Laboratory Manager, Mary Brun 6201 6701
Anatomical Pathology-Frozen sections 6244 2867

Normal hours of business
Monday to Friday 0800-1700 (5pm)

After Hours service
1700 (5pm) to 0800 (8am) daily, 24 hours service provided for all weekends and public holidays. A range of essential tests are provided after hours. Requests after hours should be limited to those that may affect patient management before the next normal working day.

Staff are authorised to perform the following tests after hours:

Clinical Chemistry:
• Routine biochemistry, including LFT, UEC and Troponin
• Ethanol, Digoxin, Paracetamol, Gentamycin and Vancomycin - all other drugs sent to TCH
• Blood gas analysis
• Urine chemistry
• Pregnancy testing

Haematology:
• Full Blood Count including differential
• Film examination
• ESR
• Infectious Mononucleosis testing

Coagulation:
• PT/INR
• APTT
• XDP
• Fibrinogen

Transfusion:
• Cross-matching & Group and Screen requests
• Blood product issue
• Cord blood - Group & DCT
Section 3: Alphabetical list of tests

Acid Phosphatase
[Referred Test]

*Specimen required:* 5 mL blood, Serum (gold top) tube.
*Analysed:* weekly

Adenovirus Serology
[Referred Test]

*Specimen required:* 5 mL blood, Serum (gold top) tube.
*Analysed:* weekly

Adenovirus PCR
[Molecular Pathology]

*Specimen required:* Flocked" or dry swab (Eye or nasopharyngeal) Also sputum, BAL, NPA.
*Analysed:* Monday-Friday

Adrenocorticotrophic Hormone

[Immunoassay Services]

*Specimen required:* 4 mL blood, EDTA (pink top) tube (delivered to the laboratory on ice).
*Reference range:* <14 pmol/L
*Analysed:* Weekly

Note: **Transport to the laboratory on ice ASAP.** At the laboratory, the specimen must be separated within 20 mins of collection. Cannot be a shared specimen.

AH50 (Alternative Complement Pathway)
[Referral test]

Specimen required: 5ml SERUM (gold top) (delivered to the laboratory on ice).

Note:
Sample must be sent to laboratory within 20 mins

Alanine Aminotransferase (ALT)

[Clinical Chemistry] [Calvary]

Note: part of LFT
Specimen required Lithium heparin (light green top), Serum (gold top) tube

Reference range
Adults <55 U/L

Note:
1. This test is more selective for liver than is AST.
2. ALT may be falsely increased by haemolysis.

Albumin

[Clinical Chemistry] [Calvary]

Part of LFT & RUP
Specimen required Lithium heparin (light green top), Serum (gold top) tube

Reference range:
Adults 33-50 g/L

Paediatric (up to 1 y)
0-7 d 19-40 g/L
8-30 d 19-45 g/L
31-90 d 21-48 g/L
91-180 d 22-49 g/L
181-365 d 23-47 g/L

Note:
1. Prolonged stasis during venepuncture will give false high values.
2. Albumin may be falsely increased by haemolysis.

Albumin Excretion Rate

[Immunoassay Services]
Specimen required: Timed urine collection (preferably Overnight (min 8 hour collection required))

Reference range: <15 µg/min

Analysed: Daily

Note: Patient factsheets are available at all ACT Pathology Collection Centres and through Customer Services on 6244 2932.

Albumin/Creatinine ratio

[Clinical Chemistry] [Calvary]

Specimen required: Random urine

Analysed: Daily

Aldosterone-Blood

[Immunoassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.
1 mL paediatric tube.

Reference range: Upright: 100-950 pmol/L
Recumbent: 50-530 pmol/L

Aldosterone-Urine

[Referred Test]

Specimen required: Contact Pathology on 6244 2930.
Alkaline Phosphatase (ALP)

[Clinical Chemistry] [Calvary]

Part of LFT & RUP

Specimen required: Lithium heparin (light green top), Serum (gold top) tube

Reference ranges:

<table>
<thead>
<tr>
<th>Age</th>
<th>M</th>
<th>F</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td></td>
<td></td>
<td>20-110</td>
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<tr>
<td>0-7d</td>
<td>121-351</td>
<td>107-357</td>
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<tr>
<td>8-31d</td>
<td>138-486</td>
<td>107-474</td>
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<tr>
<td>31-90d</td>
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<tr>
<td>91-180d</td>
<td>94-425</td>
<td>125-449</td>
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<tr>
<td>181-365d</td>
<td>101-394</td>
<td>101-431</td>
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<td>1-3y</td>
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<td>185-383</td>
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<tr>
<td>4-6y</td>
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<td>191-450</td>
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<tr>
<td>7-9y</td>
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<td>218-499</td>
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<tr>
<td>10-11y</td>
<td>174-624</td>
<td>169-657</td>
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<tr>
<td>12-13y</td>
<td>245-584</td>
<td>149-499</td>
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<tr>
<td>14-15y</td>
<td>169-618</td>
<td>103-283</td>
<td></td>
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<tr>
<td>16-19</td>
<td>98-317</td>
<td>82-169</td>
<td></td>
</tr>
</tbody>
</table>

Note:
1. The high activity in infants decreases during the second year, but remains increased until puberty. A rapid decline to normal adult values then occurs in females, the decline in males is somewhat slower. Periods of accelerated bone growth, particularly in adolescent boys (13-15 yrs), can result in transient activity that is five to seven-fold the upper reference limit of adults. Alkaline phosphatase increases during the later stages of pregnancy. During the 3rd trimester, peak levels may reach 300 U/L. Following delivery a normal non pregnant level is reached after 3 to 4 weeks.
2. ALP may be falsely decreased by haemolysis.

Alkaline Phosphatase Isoenzymes

[Referred Test].
Specimen required: Lithium heparin (light green top), Serum (gold top) tube

Notes:
1. On adults Alkaline Phosphatase Isoenzymes are only available if the Alkaline Phosphatase is greater than 130U/L.
2. Gamma-Glutamyl Transferase levels will usually help identify the source of elevated alkaline phosphatase, making isoenzyme identification unnecessary.

Allergy Testing/ Allergen-Specific IgE (RAST)

[Immunooassay Services]

Specimen required: 5 ml blood, Serum (gold top) tube.

Analysed: Weekly

Note: Allergens not performed by ACT Pathology will be forwarded to a reference laboratory.

alpha-1-Antitrypsin

[Immunooassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

Analysed: Daily

Reference range: 0.8-2.0 g/L.

alpha-1-Antitrypsin phenotype

[Referred Test]

Specimen required: 5 mL blood, Serum (red top) tube.

Specimen Handling: Serum frozen within two hours of collection

alpha-Fetoprotein - Pregnancy

[Referred Test]

Maybe part of First Trimester Screen (Papp A). Contact laboratory.
alpha-Fetoprotein-Tumour Marker
[Immunoassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top) tube/ Serum (gold top) tube.
Reference range: Adult non pregnant <7 kU/L.
Analysed: Daily

alpha-Fetoprotein—Amniotic Fluid
[Referred test]

Specimen required: 5mL fluid. Contact Laboratory

Aluminium
[Referred Test]

Specimen required: 6 mL blood, Trace element (royal blue top) tube
Reference range:(Serum)
- Normals <1.0 mmol/L
- Renal patients <2.0 mmol/L
Analysed: Weekly.

Note: This specimen should be collected first if other tests are requested to avoid contamination.
A factsheet for medical practitioners is available on the website or through Customer Services on 6244 2932.

Amino Acid Metabolic Screen
[Referred Test]

Specimen required: Random urine.
Preferred volume 10 mL (minimum vol 1.5 mL).
Specimen must be kept cold, and frozen within two hours of collection.

Note: Non- Medicare test and cost to patient.

Amino Acids (Nutrition)
[Referred Test]

Specimen required: Can be either early morning urine or 5ml Blood, Lithium heparin (light green top)

Amiodarone

[Referred Test]

Specimen required: 5 mL blood, Non gel Serum (red top) tube.

Collection time: At least 8 hours post dose.

Ammonia

[Clinical Chemistry]

Specimen required: Lithium heparin (light green top) tube.

Concentration of ammonia rises artifactually after specimen collection, so sample MUST be transported to laboratory on ice within 15 minutes.

Reference range: Adult 10-50 µmol/L

Notes:
1. Haemolysed samples unsuitable, haemolysis falsely increases Ammonia.
2. Patient should be fasting. Levels rise rapidly on standing. False high values are obtained after muscular exercise.

Amniotic Fluid—Bilirubin

No longer available

Amylase

This test is no longer performed at this laboratory. Lipase is the preferred test for diagnosis of pancreatitis.

ANA and ANF (Anti Nuclear Antibodies/anti Nuclear factor)

[Immunoassay Services]
Specimen required: 5 mL blood, Serum (gold top) tube.

Analysed: Monday to Friday

**ANCA (Anti-Neutrophil Cytoplasmic Autoantibodies)**

[Imunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube.

Analysed: As required. Results available same day of analysis.

Note: For urgent requests contact the Immunologist on-call via The Canberra Hospital switchboard.

**Angiotensin Converting Enzyme (ACE)**

[Imunoassay Services]

Specimen required: 5 mL blood, Serum only (gold top)

Analysed: Monday, Wednesday and Friday

Reference range: 8-52 IU/L

Note: Incidence of elevated ACE correlates with extent and activity of sarcoidosis. There is approximately a 75% incidence in patients with active disease but only 17% with inactive disease.

**Anion Gap**

[Clinical Chemistry]

Reference range: 8-16 mmol/L

Calculation: \( \text{AG} = \text{Na}^{+} + \text{K}^{+} - (\text{Cl}^{-} + \text{HCO}_3^{-}) \)

**Antenatal-Blood Group & Antibody Screen**

[Transfusion] [Calvary]

Specimen required: 4 mL blood, EDTA (pink top) tube.

Note: Relevant history should include number of previous pregnancies and details of any known red cell antibodies.
Antenatal Screen
“Antenatal Screen” is not an available test under Health Insurance Act 1973. Tests for antenatal screen are listed individually in this book. The tests may include: FBC, Antenatal Blood Group and Screen, Hepatitis Bs Ag, Rubella, Syphillis.
Note: A factsheet for medical practitioners is available on the website or through Customer Services on 6244 2932.

Antibodies to Platelets
[Haematology]

It is essential that contact with the laboratory is made prior to requests for any of the following tests. Specimens must be received in am.

1) Heparin-Dependent Anti-Platelet Antibodies (HITS)
See following table. (Contact Haematology on 6244 2834)

Specimen required 10mL blood, non-gel serum(red top) tube.
### 4T test to be used to assess the probably of HITS

<table>
<thead>
<tr>
<th>Clinically</th>
<th>Points:2</th>
<th>Points:1</th>
<th>Points: 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thrombocytopenia</td>
<td>&gt;50% fall or platelet nadir 20-100 x10⁹/L</td>
<td>30-50% fall or platelet nadir 10-19 x 10⁹/L</td>
<td>Fall &lt;30% or platelet nadir &lt;10 x10⁹/L</td>
</tr>
<tr>
<td>Timing of platelet count fall</td>
<td>Clear onset between day 5-10, or less than 1 day if heparin exposure within past 100 days</td>
<td>Consistent with immunization but not clear or onset of thrombocytopenia after day 10</td>
<td>Platelet</td>
</tr>
<tr>
<td>Thrombosis or other sequelae</td>
<td>New thrombosis; skin necrosis; post heparin bolus acute systemic reaction</td>
<td>Progressive or recurrent thrombosis; erythematous skin lesions; suspected thrombosis not yet proven</td>
<td>None</td>
</tr>
<tr>
<td>Other cause of thrombocytopenia not evident</td>
<td>No other cause for platelet fall is evident</td>
<td></td>
<td>Definite other cause is present</td>
</tr>
</tbody>
</table>

Pretest probability score: 6-8=high, 4-5=intermediate, 0-3=low


### 2) Other Drug Dependant Anti-Platelet Antibodies.
Contact Haematology on 6244 2834

**Specimen required** 2.7 mL Coagulation (blue top) tube or 10 mL blood, Serum (gold top) tube.

Note: Probable diagnosis and details of previous transfusion and medication on request form.

**Antibodies to Platelets**

[Transfusion ]

1) NAIT (Neonatal Allo-Imune Thrombocytopenia)
   Contact Transfusion on 6244 2918.
   Liaison with Platelet Reference Lab in Sydney is essential.

2) Pla1 Typing Of Platelets
   Contact Transfusion on 6244 2918.
   Liaison with Platelet Reference Lab in Sydney is essential.

3) Refractoriness To Platelet Transfusion, Post-Transfusion Purpura, Idiopathic Thrombocytopenic Purpura (ITP), Drug Dependent Antibodies
   Contact Transfusion on 6244 2918.
   Note: All of the above testing is performed by the Australian Red Cross Reference Laboratory in Sydney and must be discussed with a haematology specialist.

**Antibodies and Titres to Red Cell Antigens**

[Transfusion]

**Specimen required** 4 mL blood, EDTA (pink top) tube.

Provide transfusion and pregnancy history.

**Anticonvulsant Drugs**

[Immunoassay Services]

**Specimen required** 5 mL blood, Lithium heparin (light green top)/Serum (gold top)/ tube.

**Analysed:** Daily

**Therapeutic range:**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Therapeutic</th>
<th>Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine</td>
<td>Range</td>
<td>Time</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>Carbamazepine (Tegretol)</td>
<td>17 - 51 µmol/L</td>
<td>Trough before dose</td>
</tr>
<tr>
<td>Phenobarbitone</td>
<td>65 - 170 µmol/L</td>
<td>not critical</td>
</tr>
<tr>
<td>Phenytoin (Dilantin)‡</td>
<td>40 - 79 µmol/L</td>
<td>Trough before dose IV: 2-4 hour post dose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oral: not critical</td>
</tr>
<tr>
<td>Primidone (Mysoline)</td>
<td>27 - 55 µmol/L</td>
<td>Trough before dose</td>
</tr>
<tr>
<td>Valproic Acid (Epilim)†</td>
<td>&lt;350 µmol/L</td>
<td>Trough before dose</td>
</tr>
<tr>
<td>Poor control</td>
<td>&gt;700 µmol/L</td>
<td></td>
</tr>
<tr>
<td>Potentially Hepatotoxic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† Valproic Acid Monitoring:

**Prerequisites:**
Dosage must be stable for at least 2 days. Doses cannot be changed or missed during this period. The elimination half-life is short (8-12 hours) and is decreased by alcohol.

**Timing of Collection:**
Special attention to collection time is required to monitor this antiepileptic.
Routine Monitoring: Just before the next dose (trough level preferred).
Suspected Toxicity: At least six hours after the previous dose.

**Indications:**
- Poorly controlled seizures.
- Suspected toxic symptoms.

**Therapeutic Range:**
Subtherapeutic <350 µmol/L
Potentially Hepatoxic >700 µmol/L

‡ Phenytoin Note:

• The drug is metabolised by hepatic microsomal enzymes. Its metabolism is influenced by a large number of drugs and this should be taken into consideration.
• This drug is highly protein bound and drug levels may be affected by the total protein and albumin concentrations.

General Notes

• Because many patients show transient elevations of amino transferases during the early months of therapy, LFT’s are not helpful in predicting liver damage.
• Although the occurrence of serious hepato-toxicity is rare, patients at highest risk are young children(under 2 years) receiving multiple anticonvulsant therapy. The onset is typically during the first six months of therapy.
• When making comparative measurements it is important that the sampling time be consistent.
Antidiuretic Hormone

[Referred Test]

Specimen required: 10 mL blood, EDTA (mauve top) tube.

Specimen handling: Transport on ice to laboratory as quickly as possible.

Anti-Dnase B—Streptococcal Serology

[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube.

Analysed: Weekly, results available pm.

Anti Factor Xa

[Haematology] [Calvary]

Specimen required: 2.7mL blood, Coagulation (blue top) tube. Must be filled precisely to the line indicated on label

NOTE: Anti Factor Xa is used for monitoring LMW heparin when required. Monitoring may be performed in patients who have renal failure, obesity, ongoing thrombosis while on anticoagulant therapy, pregnancy or have a Lupus anticoagulant.

A modified anti FXa assay is also available to measure rivaroxaban and apixaban. Contact the laboratory to arrange testing.

If anti FXa monitoring is required urgently, contact the laboratory or contact the duty haematologist.

Antiglobulin Test—Direct (DCT)

[Transfusion] [Calvary]

Specimen required 4 mL blood, EDTA (pink top) tube.

Note: Relevant clinical and drug history useful.

Antimicrobial Assays-Aminoglycosides

[Immunoassay Services]
Specimen required: 5 mL blood, Lithium heparin (light green top) /Serum (gold top) tube

Analysed: 7 days/week.

1) Contact Pharmacy for latest therapeutic guidelines.
2) It is essential to document the following:
   • Date and time of specimen collection.
   • Date and time of the last dose given.

Single Daily Dose
1) For calculation of the suggested next dose the optimal collection time is 6 to 8 hours post dose. It is necessary to provide the additional information below.
   • Dose Date
   • Dose Time
   • Dose (mg)
   • Patient weight (Kg).

2) Peak - 30 minutes post dose

Note: The 24 hour area under the curve method for patients with impaired renal function is available from Pharmacy.
<table>
<thead>
<tr>
<th>Drug</th>
<th>Therapeutic Range</th>
<th>Collection Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amikacin (Referred test)</td>
<td>Provided by Referral Laboratory</td>
<td>Trough: before dose Peak: 1 hour post dose</td>
</tr>
<tr>
<td><strong>Twice Daily Dose</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gentamicin</td>
<td>&lt; 2 mg/L</td>
<td>Trough: before dose</td>
</tr>
<tr>
<td></td>
<td>&gt; 2 mg/L</td>
<td>Toxic trough level</td>
</tr>
<tr>
<td></td>
<td>Peak level</td>
<td>Consult Infectious Diseases physician regarding therapeutic concentration.</td>
</tr>
<tr>
<td>Tobramycin</td>
<td>&lt; 2 mg/L</td>
<td>Trough: before dose</td>
</tr>
<tr>
<td></td>
<td>&gt; 2 mg/L</td>
<td>Toxic trough level</td>
</tr>
<tr>
<td></td>
<td>Peak level</td>
<td>Consult Infectious Diseases physician regarding therapeutic concentration.</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>15-20 mg/L</td>
<td>Trough: before dose</td>
</tr>
</tbody>
</table>

**Anti-Streptolysin-O (ASOT—Streptococcal serology)**

[Immunoassay Services]

*Specimen required:* 5 mL blood, Serum (gold top) tube.

*Analysed:* Twice weekly, results available pm.
Antithrombin (previously known as AT111)

[Haematology]

A clinical history in accordance with MBS guidelines must be provided. Specimens coming from other laboratories should be double spun and separated if not in laboratory within 4 hours. Specimens should be sent frozen packed in dry ice.

Specimen required 2.7 mL blood, Coagulation (blue top) tube—must be filled precisely to the fill line indicated on label.

Reference range: 70-145%.

Apixaban

[Haematology]

Specimen required 2.7 mL blood, Coagulation (blue top) tube—must be filled precisely to the fill line indicated on the specimen tube.

Contact the laboratory to arrange testing.

APC Resistance (APCR)

[Haematology]

A clinical history in accordance with the MBS guidelines must be provided. Specimens coming from other laboratories should be double spun and separated if not in laboratory within 4 hours. Specimens should be sent frozen packed in dry ice.

Specimen required 2.7 mL blood, Coagulation (blue top) tube—must be filled precisely to the fill line indicated on the specimen tube.

Reference range: APCR ratio 3.0-6.0

Apolipoprotein A1 (APOA1)

[Clinical Chemistry] [Calvary]
Specimen required  Lithium heparin (light green top), Serum (gold top) tube

Reference ranges

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Plasma/Serum Ref. Range (g/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 Male</td>
<td>0.61-1.64</td>
</tr>
<tr>
<td>0-1 Female</td>
<td>0.59-1.69</td>
</tr>
<tr>
<td>&gt;1-12 Male</td>
<td>0.93-1.72</td>
</tr>
<tr>
<td>&gt;1-12 Female</td>
<td>0.86-1.79</td>
</tr>
<tr>
<td>&gt;12-60 Male</td>
<td>0.95-1.86</td>
</tr>
<tr>
<td>&gt;12-60 Female</td>
<td>1.01-2.23</td>
</tr>
<tr>
<td>&gt;60 Male</td>
<td>0.73-1.86</td>
</tr>
<tr>
<td>&gt;60 Female</td>
<td>0.91-2.24</td>
</tr>
</tbody>
</table>

Apolipoprotein B (APO B)

[Clinical Chemistry] [Calvary]

Specimen required:  Lithium heparin (light green top), Serum (gold top) tube.

Reference ranges

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Plasma/Serum Ref. Range (g/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 Male</td>
<td>0.16-1.24</td>
</tr>
<tr>
<td>0-1 Female</td>
<td>0.17-1.20</td>
</tr>
<tr>
<td>&gt;1-12 Male</td>
<td>0.48-1.25</td>
</tr>
<tr>
<td>&gt;1-12 Female</td>
<td>0.51-1.26</td>
</tr>
<tr>
<td>&gt;12-60 Male</td>
<td>0.49-1.73</td>
</tr>
<tr>
<td>&gt;12-60 Female</td>
<td>0.53-1.82</td>
</tr>
<tr>
<td>&gt;60 Male</td>
<td>0.54-1.63</td>
</tr>
<tr>
<td>&gt;60 Female</td>
<td>0.64-1.82</td>
</tr>
</tbody>
</table>

Arsenic

[Referred Test]

Specimen required  2 x 5 ml EDTA
Urine -24 hour specimen in Heavy metal container or spot urine (min 15ml)
Note: Avoid consumption of seafood 5 days prior to collection, including fish oil tablets.

**Aspartate Aminotransferase (AST)**

[Clinical Chemistry] [Calvary]

*Specimen required*  Lithium heparin (light green top), Serum (gold top) tube  
*Reference range*: Adult 5-50 U/L  
*Significant Change*: 12% at 45 U/L

**Aspergillus Precipitins**

[Referred Test]

*Specimen required*  5 mL blood, Serum (gold top) tube.

**Aspirated Fluids— (Synovial, Pleural, Gastric, etc)**

[Microbiology]

*For microscopy and culture*: Collect into sterile bottles. Use yellow screw cap 50 mL sterile container + Bactec bottles (if possible)  
*For crystals*: See separate entry.  
*For cytology*: See entry under Cytology.  
If M/C/S and Cytology required- collect two (2) separate specimens in yellow sterile containers. Cytology require 50mls. Microbiology require 20mls.

**Auto-Absorption Tests**

[Transfusion]

Specialised Immunohaematology test, contact Transfusion on 6244 2823.

**Avian Precipitins**

[Referred Test]
Specimen required: 5 mL blood, Serum (gold top) tube.

Benzodiazepines
[Immun assay Services] [Calvary]

Specimen required: Random urine collection.
Analysed: Mon-Fri

Note:
1) The analysis is qualitative and not specific for a particular benzodiazepine.
2) A urine benzodiazepine screen is performed on all requests for a urine drug screen.
3) Sertraline (Zoloft) is known to give false positives for this assay.

Beta-2-Glycoprotein-1 (B2GP1) Antibodies
[Immun assay Services]

Specimen required: 5 mL blood, serum (gold top).
Analysed: Weekly

Bicarbonate (Total CO2)
[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top) tube

Reference range:
Adult Venous: 22-31 mmol/L
Paediatric ring laboratory (62442809) for age related ranges.

Bile Acids
[Clinical Chemistry]

Specimen required: 5 ml blood, Serum (Gold top)
Bilirubin--Blood

[Clinical Chemistry] [Calvary]

Specimen required  Lithium heparin (light green top), Serum (gold top) tube
Note: Protect from the light. Up to 50% decrease in one hour in direct sunlight.

Total Bilirubin Reference range:

<table>
<thead>
<tr>
<th>Time</th>
<th>Reference Range (µmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 24 hour</td>
<td>&lt;87</td>
</tr>
<tr>
<td>Up to 48 hour</td>
<td>&lt;123</td>
</tr>
<tr>
<td>3-5 days</td>
<td>&lt;180</td>
</tr>
<tr>
<td>&gt;1 month</td>
<td>2-20</td>
</tr>
</tbody>
</table>

Note: 1. Paediatric values are for full term infants. Values are usually greater for premature infants.
2. Bilirubin may be falsely increased by haemolysis.

Direct Bilirubin

Specimen required  Micro sample or Lithium heparin (light green top) tube.
A result of 30 µmol/L or greater could be significant

Bilirubin-Urine (dipstick)

[Clinical Chemistry][Calvary]

Specimen required  Random urine specimen.
Reference range:  None detected.
Note: Protect from light. Up to 50% decrease in one hour in direct sunlight.

Biopsy Specimens—for Culture

[Microbiology]

Send specimen in a sterile container (yellow top). Do not add formalin or other fixative. Send promptly to the laboratory.

Blood culture
[Microbiology]

Preparation and collection

To avoid false positive blood-cultures, the puncture site must be disinfected. Carefully and rigorously cleanse the skin of the selected venepuncture site with a swab soaked in 70% isopropyl or ethyl alcohol. Let the skin dry. Repeat the process with a new swab. Let the skin dry before venepuncture. Once disinfected, the venepuncture site should not be touched to avoid renewed contamination.

Adults

Refer to ‘Nurse Practice Standards 21.11.99, 4.1.2’

Each blood culture set contains two bottles—blue/grey cap bottle (aerobic) and purple/purple cap bottle (anaerobic).

Remove the flip off caps from the Bactec bottle and swab the visible part of the rubber stopper as described above for venepuncture.

Cover the stopper with a fresh swab soaked in alcohol until ready for use.

Puncture the vein in the usual manner. Twenty (20) mL of blood is optimal for each ‘set’. 8-10 mL of patient’s blood must be inoculated into each bottle.

Do not exceed 8-10 mL of blood for each bottle. If insufficient blood is obtained from venepuncture to inoculate both bottles, then inoculate the blue capped bottle only.

Pierce the disinfected rubber stopper of the blood culture bottle with the needle and let the blood flow into the bottle (8-10 mL per bottle).

Repeat the procedure for the second bottle. Carefully mix the contents of each bottle and transport directly to the Microbiology laboratory. Do not refrigerate bottles.

• Please do not separate the sets.
• Please do not cover the blood culture bar code label.
• Please do not cover the base of the blood culture bottle.

**Paediatrics**

**Collect one blood culture bottle with a silver/pink cap.**

Prepare the bottle as for adult bottles. Inoculate the bottle with 1-3 mL of blood. A maximum of 5 mL of patient’s blood.

**Labelling**

Label the blood culture bottles with the patient’s name, UR number, time and date of collection, ward and site.

If patient labels are used, do not place them over the barcode or base of the bottle.

**Storage**

Unused bottles should be stored in the dark at room temperature until use.

Inoculated bottles are to be transported directly to the Microbiology laboratory. **Do not refrigerate bottles after they have been inoculated. Please check expiry date.**

**Blood gases- Arterial/Venous**

**[Clinical Chemistry] [Calvary]**

*Specimen required:* 3 mL of arterial blood in heparinised syringe.

Expel air and seal syringe with a stopper, mix well after collection.

(pO2 requires an arterial stab. Minimum 0.5 mL collected in small heparinised syringe).

Specimens containing air bubbles are unsatisfactory for blood gas analysis.

Specimens that are received with a resheathed needle will not be analysed.
Transport in ice bath (or in the rapid tube system—not on ice) to the laboratory without delay.

The request form **must** state the date and time of collection, temperature of the patient and FIO2 (Fraction of Inspired Oxygen).

**Reference range:** Adult

- PH: 7.34-7.45
- pCO2: 35-45 mmHg
- pO2: 75-100 mmHg
- Actual bicarb: 22-26 mmol/L
- Base excess: -2.4 to +2.3
- Oxygen saturation: 95-98%
- Whole blood Sodium: 137-145 mmol/L
- Whole Blood Potassium: 3.5-5.0 mmol/L
- Ionised Calcium: 1.13-1.32 mmol/L
- Chloride: 98-106 mmol/L
- Glucose: 3.7-5.9 mmol/L
- Lactate: <2.0 mmol/L

**Specimens that are received with a resheathed needle will not be analysed**

Note: Haemolysis may cause the following
- falsely decrease CO2
- falsely increase potassium

**Blood Group Only**

[Transfusion][Calvary]

**Specimen required:** 4 mL blood EDTA (pink top) tube.

**Blood Group in conjunction with Xmatch, group and screen, routine antenatal**
Blood Oximetry

[Clinical Chemistry] [Calvary]

Specimen required: 3 mL of arterial blood in a heparinised syringe.
Reference range:

Carboxyhaemoglobin
Non-smokers 0.0-1.5% of total haemoglobin
Smokers 2-9% of total haemoglobin
Toxic (often fatal) >70% of total haemoglobin
Methaemoglobin 0-1.5% of total haemoglobin

Note: Samples should be drawn before commencing O2 therapy for accurate results. Specimens that are received with a resheathed needle will not be analysed.

Bone Marrow Biopsy

[Haematology]

Only after consultation with Specialist Haematologist— phone 6244 2829.

Bordetella (B.pertussis/whooping cough)

[Microbiology]

Test no longer performed. See Bordetella pertussis PCR under Molecular Pathology.
Bordetella pertussis toxin IgG—Serology
[Immunoassay Services]

Specimen required  5 mL blood, Serum (gold top) tube.
Analysed:  Weekly

Bordetella pertussis PCR(whooping cough)
[Molecular Pathology]

Specimen:  A flocked or dry nasopharyngeal swab.
Tested:  Monday-Friday.

Bronchial Washings and Bronchial Alveolar Lavage for Culture
[Microbiology]

To maximise the value of cultures the following comment should be noted:
1) Preparation washings are not appropriate for routine culture due to the inhibitory nature of the solution and contamination with upper respiratory tract flora. (Examination for M. tuberculosis may be requested on these specimens.)
2) Do not use any fluid for the lavage which contains a bacteriostatic agent. Saline, without an inhibitor, or Ringers solution are appropriate.
3) As the first washing return is the most likely to have upper respiratory flora contaminating it, this should not be used for routine culture. Examination for M. tuberculosis may be carried out on this specimen. Subsequent washings should be clearly labelled for microbiology, fungi, etc.
Brucella Antibody
[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube.

Analysis: Mon- Friday- as required.

C1q antibodies
[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube.

Analysed: Batched monthly

CA 125
[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube.

Reference range: <35 kU/L
Analysed: Daily

CA15-3
[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube.

Reference range: <30 kU/L
Analysed: Daily

CA19-9
[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube.

Reference range: <34 kU/L
**Analysed:** Monday to Friday

**Calcitonin**

*[Referred Test]*

*Specimen required:* 5 mL blood, Serum (gold top) tube (serum frozen).

**Calcium—blood**

*[Clinical Chemistry] [Calvary]*

*Specimen required:* Lithium heparin (light green top), Serum (gold top) tube

*Reference range:*
- Neonate (mean value) Day 2-7: 1.95-2.82 mmol/L
- Fasting Adult: 2.10-2.55 mmol/L

*Significant Change:* 6%

Note: Prolonged stasis during venepuncture and haemolysis will give false high values. Serum albumin is always measured in conjunction with calcium and a corrected Calcium provided.

Patient must be fasting for 12 hours and seated for 20 mins prior to venepuncture for accurate baseline level.

**Calcium Corrected-Blood**

*Calculation:* Calcium + (44 - Albumin) x 0.015] mmol/L

(Correcting the calcium. Editorial BMJ 1977; 1:598)

*Note:* Correction is useful for albumin levels in the range of 20-45 g/L. Outside this range, significant errors may occur.

**Calcium (ionised)—Whole blood**

*Specimen required:* 1 mL Heparinised whole blood (see blood gases).

*Reference range:* 1.13-1.32 mmol/L.
Calcium—Urine
[Clinical Chemistry]

Specimen required 24 hour urine.

Reference range: 2.50-7.50 mmol/24hrs (dietary average calcium).

Note: Varies greatly with intake.

Calculi—Renal
[Clinical Chemistry]

Clean dry stone required, send to laboratory for analysis. Calculi are analysed qualitatively for the presence of ammonium, calcium, cystine, carbonate, magnesium, oxalate, phosphate, and urate.

CAPD Fluid
[Microbiology]

Send an aliquot in 50ml Falcon tubes x 2. Inoculate one set of blood culture bottles with 8-10 mL of dialysis fluid.

Carbon Dioxide—See Bicarbonate

This test is part of the EUC test panel. Also included in Arterial Blood Gas.

Carcinoembryonic Antigen (CEA)
[Immuoassay Services]

Specimen required 5 mL blood, Lithium heparin (light green top)/ Serum (gold top) tube

Reference range: < 5.0 µg/L

Significant Change: 25%

Analysed: Daily

Cardiac Enzymes
Varies depending on the requesting area but usually is CK only—other tests must be specifically requested.

**Cardiolipin Antibodies**

**[Immonoassay Services]**

*Specimen required:* 5 mL blood, Serum (gold top) tube.

*Analysed:* Weekly

**Carotene**

**[Referred Test]**

*Specimen required:* 5 mL blood, Lithium heparin (light green top)/serum(gold top) tube.

*Note:* Specimens must be protected from light to prevent photodecomposition and separated and frozen as soon as possible.

**Catecholamines—Blood**

**[Clinical Chemistry]**

*Specimen required:* Special tube required – contact laboratory. (Sodium Metabisulphate added to a non-gel Lithium Hep tube. Separate into 2 aliquots and freeze within 2 hrs of collection).

*Note:* Includes Adrenaline and Noradrenaline.

**Catecholamines—Free (Urine)**

**[Clinical Chemistry]**

*Specimen required:* 24 hour urine collected into HCl (Acid absolutely essential). 3 x 24 hour urine collections if index of suspicion is high. Drug history must be supplied. Random
samples from children may be satisfactory if there is difficulty collecting a 24 hour specimen. In this case, concentrations will be related to creatinine output. Random urines should be forwarded immediately to the laboratory for acidification.

Reference range for adults:

Noradrenalin  Adrenalin  Dopamine
nmol/24 hr   nmol/24 hr µmol/24 hr
<470  <110  <2.6

Analysed: Weekly

Note: Phenothiazines, promethazine and theophylline may increase catecholamine production. Clonidine and guanethidine may decrease excretion.

Catheter/Cannula Culture

[Microbiology]

Intravascular, Suction and Drainage
Disinfect skin entry site, remove cannula, cut off end 2 cm into sterile, screw-capped container.

Urinary Catheter Tips
Not processed. Please send urine specimen.

CVID

[Haematology]

Specimen required: 9 mL yellow topped ACD tube.

Analysed: Monday-Thursday only

Note: If requested with T cells, one ACD tube is enough for both tests

Cerebrospinal Fluid (CSF)

[Microbiology]

Specimen required: Special sterile 10ml black screw cap tubes must be used.

Volumes required for routine examination:
Adults—Prefer 4 tubes, equal volumes
Infants—Approx. 3 x 1 mL of CSF
Neonates—Approx. 2 x 0.5 mL

Other examination:
Streptococcus pneumoniae antigen. PCR tests may be available for other organisms eg. Neisseria meningitidis, but only after consultation with the Microbiologist or registrar. An extra tube marked “PCR only” is recommended if PCR tests are requested.

Note:
1) If special tests are required eg Acid Fast Bacilli, Virology, Malignant cells, Cryptococcus, and Amoebae a larger volume should be sent. Preferably allow at least 5 mL per test request. Negative results for the above tests when performed on small volumes of CSF cannot be considered conclusive.
2) All CSF specimens are treated as urgent and must be delivered to the laboratory immediately.

See also Herpes Simplex Virus, CSF protein and glucose - listed under alphabetical list of tests.
Note: CSF Glucose requires a separate fluoride tubes due to transit times

Ceruloplasmin
[Referred test]
Specimen required: Trace Element tube (Royal blue top)

CH50
[Referred test]
Specimen required: 5 mL blood, serum (gold top) tube.
Note: Blood must be in lab within 20mins of collection.

Chicken pox—Serology (Varicella-zoster IgG)
[Immunooassay Services]
Specimen required: 5 mL blood, Serum (gold top) tube

Analysed: Monday to Friday

For urgent Varicella Zoster IgG levels (exposure in pregnancy) please contact laboratory on 6244 4263 with patient details.

Note: Varicella-zoster IgM is referred to an interstate laboratory. If vesicular rash present, preferred specimen is viral swab for Varicella-zoster PCR.

**Chicken pox PCR** – see Varicella Zoster-PCR

**Chlamydia and Gonorrhoea PCR**

[Molecular Pathology]

PCR assay for Chlamydia trachomatis and Neisseria gonorrhoeae detection.

Specimen required:

Endocervical vaginal, rectal, throat & urethral swabs - use Roche COBAS PCR swab (yellow screw top). First catch urine and ThinPrep specimens can also be used.

Analysed: Monday-Friday

Notes:
1. A factsheet for medical practitioners is available through Customer Services on 6244 2932.
2. PCR for N. gonorrhoeae is not routinely performed on throat swabs. Bacterial swab for MC&S recommended.

**Chlamydia serology**

[Immunoassay Services]

This test is a group antigen assay for Chlamydia species but cannot distinguish between Chlamydia pneumoniae, Chlamydia psittaci, or Chlamydia trachomatis. Diagnosis requires testing of paired specimen (acute and convalescent) collected 10-14 days apart.
Specimen required: 5 mL blood, Serum (gold top) tube.

Analysed: Weekly

**Chloramphenicol**

[Referred test].

Specimen required: 5 mL blood, Serum (gold top) tube.

**Chloride**

[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top) tube

Reference range:

- Adult: 98-111 mmol/L
- 0-6 months: 97-108 mmol/L

Significant Change: 6%

This test is part of the UEC test panel.

**Cholesterol**

[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top) tube

Reference range: Less than 5.50 mmol/L (12 hour fast) (NHF recommendation).

**Cholesterol—High Density Lipoprotein**

[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top)

Reference range: >1.0 mmol/L (NHF recommendation).

Significant Change: 0.1 mmol/L
Note: Used as a potential risk factor for myocardial infarction in coronary heart disease.

**Cholesterol—Low Density Lipoprotein**  
*[Clinical Chemistry] [Calvary]*

*Specimen required:* Lithium heparin (light green top), Serum (gold top)

The low density lipoprotein cholesterol is calculated using the Friedwald formula,

\[
[\text{LD Chol}] = [\text{T.Chol}] - [\text{HDL Chol}] - [\text{TG}] / 2
\]

for fasting patients with serum triglyceride less than 4.5 mmol/L.

* Values for selecting Adults at moderate and high risk requiring treatment are given below.

<table>
<thead>
<tr>
<th>Age</th>
<th>Moderate Risk*</th>
<th>High Risk*</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29</td>
<td>&gt;3.6 mmol/L</td>
<td>&gt;4.1 mmol/L</td>
</tr>
<tr>
<td>30-39</td>
<td>&gt;4.1 mmol/L</td>
<td>&gt;4.6 mmol/L</td>
</tr>
<tr>
<td>40 and over</td>
<td>&gt;4.6 mmol/L</td>
<td>&gt;5.1 mmol/L</td>
</tr>
</tbody>
</table>

* Risk based on the recommendations made by the National Cholesterol Education Program of CDC in the USA.

**Cholinesterase—Plasma and Red Cell**  
*[Clinical Chemistry]*

*Specimen required:* 7 mL blood, Lithium heparin (green top) tube.

Clinical Chemistry will perform Plasma cholinesterase estimations in patients presenting with suspected organophosphate poisoning or overdose or in investigating sensitivity to succinylcholine administration. In cases of suspected overdose red cell cholinesterase levels will be performed by the ACTGAL laboratory if follow up is required. This will be determined by Clinical Chemistry. Any investigation of occupational
exposure to pesticides will be referred to Workcover (this will incur a cost to the patient).

Reference range: plasma:
Males  4389-10928 U/L
Females  2879-12669 U/L

Chromium
[Referred test]

Specimen required: 5mL blood, trace element tube preferred (royal blue top) (EDTA samples accepted)
Separate plasma into two tubes.
Urine- random sample in yellow top urine container.

Chromogranin A
[Referred test]

Specimen required  Serum tube(gold top)
Special Handling: Separate and freeze within 1 hour

Clobazam
[Referred test]

Specimen required: 5 mL blood, NON-GEL Lithium Heparin (dark green top tube) (Can use Non-gel Serum- red top tube)

Clonazepam
[Referred Test]

Specimen required: 5 mL NON-GEL blood, Serum (red top tube) or LiHep (dark green top) tube

Therapeutic range: Adult 32-160 nmol/L
Toxic:>256 nmol/L.

Serum peak level: 2-4 hours after oral administration.
Serum half life: 20-60 hours.
Protein binding: Approximately 45%.

Analysed Thursday/Friday

Clostridium difficile Toxin
[Microbiology]

Specimen required Half fill a faeces container and send to the laboratory immediately. Only unformed or liquid stool specimens will be examined.

Note: Test will not be done on children under 2 years of age without Microbiologist approval because of normal carriage of organism.

Clozapine/Clozaril
[Referred Test]

Specimen required 5 mL NON-GEL blood. Serum (red top tube) or LiHep (dark green tube)

Serum peak level: 12 hours post dose.

CMV (Cytomegalovirus) IgG and IgM
[Immunoassay Services]

Specimen required 5 mL blood, Serum (gold top) tube.

Analysed: IgG: Monday - Friday
          IgM as required.

CMV (Cytomegalovirus) PCR
(Qualitative)
[Molecular Pathology]

Specimen required: Urine, fresh tissue, gastric biopsy.

Analysed: weekly

CMV (Cytomegalovirus) PCR
(Quantitative)
[Molecular Pathology]

Specimen required 9ml EDTA (purple top) tube. Separate Specimen required to FBC tube.

Analysed: weekly

Coagulation Factors
[Haematology] [Calvary]

Specimen required 2.7mL coagulation (blue top) tube. Must be filled precisely to fill line indicated on label.

Specimens coming from other laboratories should be double spun and separated if not in laboratory within 4 hours. Specimens should be sent frozen.

Note: Assays are available for all coagulation factors. For testing arrange with senior technologist. Contact Coagulation Section, Haematology Laboratory—phone 6244 2834.

Coagulation Screening or Full Coagulation Profile. (FCP)
[Haematology] [Calvary]

Specimen: 2.7mL blood, Coagulation (blue top) tube. Must be filled precisely to fill line indicated on label.

Paediatric tube: 1 mL available.

Includes: PT and APTT, (TCT, XDPs and Fibrinogen if indicated or requested).

Cold Agglutinins
[Transfusion]

Specimen required 10 ml NON-GEL blood, Serum (red top) tube. Gel tubes are unacceptable.

Note: Specimen must be kept at 37°C and transported to the laboratory as soon as possible.
Collagen Cross Links / β-CTx or CTx / Telopeptides

[Referred Test for Urinary Cross Links or DPD/Creatinine Ratio]

Note: the urinary crosslinks has largely been replaced by the plasma/serum CTx assay. Unless a DPD/Creatinine ratio is required please collect a blood sample (see C-Telopeptide (CTX below).

Specimen required Urine: Second urine specimen of the morning, preferably before 9am. Protect from light immediately (wrap in foil or paper bag).

Complement (C3 and C4)
[Immunoassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum (gold top)/tube.
Reference range Age dependent.
Analysed: Daily.

Complement C1 Esterase Inhibitor
[Referred Test]

Specimen require: 5 mL blood. Serum (gold top) tube
Reference range: Provided by referral laboratory.

Copper
[Referred test]

Specimen required: Trace Element tube(Royal Blue top) or 24hr Urine bottle collected into 3L bottle.

Cord Blood Group and DCT
[Transfusion][Calvary]
Specimen required: 4 mL cord blood, EDTA (pink top) tube.

Cortisol

[Immunoassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum (gold top)

Recommended collection time: 08:00-10:00

Reference range: 140-690 nmol/L. (8am - 10am)

Analysed: Daily.

The Dexamethasone Suppression Test is recommended as the primary investigation for suspected Cushing's Syndrome. For suspected Addison’s Disease a Short Synacthen Stimulation Test is recommended.

Cortisol (Urinary-free)

[Immunoassay Services] [HPLC]

Specimen required: 24 hour urine. No preservative.

Reference range: <150 nmol/24 hours.

Significant Change: 15%

Analysed: Weekly

Note: The start and finish times must be recorded in the area provided on the container label to ensure accurate collection. Incomplete 24 hour collections will give misleading results due to very large diurnal variations.

Cortisol Day Curve

By appointment, phone Endocrinology 6244 3794.

C-Peptide (CPEP)

[Immunoassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.
Analysed: weekly

C-Reactive Protein (CRP)
[Imunoassay Services] [Calvary]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.
Reference range: 0-10 mg/L

Analysed: Daily

Creatine Kinase (CK)
[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top)
Reference range: Adults 30-200 U/L
Significant Change: 30% at 30 U/L
20% at 300 U/L

Note:
1. Values are raised by exercise, intramuscular injection and bruising. Creatine kinase from cardiac muscle is unstable and should be kept refrigerated and analysed within 24 hours. Trends within the reference range may be clinically significant.
2. Creatine kinase may be falsely increased by haemolysis.
3. CK-MB is only offered in support of clinical trials for which it is part of the protocol, or for cases of suspected re-infarction. All other indications will require consultation with the Director.

Creatinine—Blood
[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top)
Reference range: Endogenous creatinine production is known to be related to muscle mass. Higher levels are found in males
1-7 d  60-110 µmol/L  
8-31 d  30-70 µmol/L  
1 m- 12 m  20-40 µmol/L  
1 y- 13 y  20-70 µmol/L  
13y-16y  30-80 µmol/L  
Adult Male  60-110 µmol/L  
Adult Female  40-90 µmol/L  

Significant Change:  15% at 50 µmol/L  
                      9% at 150 µmol/L  
                      6% at 300 µmol/L  

Note: If specimen is part of a creatinine clearance test, please indicate this on the request form.

Creatinine—Urine  
[Clinical Chemistry] [Calvary]  

Specimen required  Random or 24 hour urine. No preservative.  

Reference range: Adult 9.0-18.0 mmol/day  

Creatinine Clearance—Urine  
[Clinical Chemistry] [Calvary]  

Specimen required:  24 hour urine collection for creatinine, plus blood for Creatinine taken during the urine collection period.  

Reference range:  1.50-2.00 ml/sec  

Below 3 years, creatinine clearance changes markedly with age, at 1 month a mean value of 0.92 mL was found. Neonates show even lower values and these depend markedly on hydration.  

Calculation  urine creat (mmol/L) x vol (mL)  
            serum creat (mmol/L) x time(sec)  

Note: The urine collection must be accurately timed. Urine specimens must be clearly labelled for creatinine clearance.
Crossmatch
[Transfusion][Calvary]

See Transfusion Department listing in Section 2 for detailed protocol for ordering blood and blood products.

Specimen required: 4 mL blood EDTA (pink top) tube. A dedicated specimen is required for crossmatching. Specimens are not shared with other sections of the laboratory.

Note:
1. Give full identification: name, DOB, URN, number and date of previous transfusions and pregnancies; also antibodies identified.
2. Give medical indications or type of surgical procedure and when blood is required.
3. If patient has a continuing requirement for cellular products, a fresh sample must be sent every 72 hours.

Cryofibrinogen
[Immunoassay Services]

Specimen required: 3 x 2.7mL Citrate tubes (blue top) tubes.

Note: Keep specimen at 37°C and transport to laboratory as soon as possible.

Cryoglobulins
[Immunoassay Services]

Specimen required: 2 x 10mL Serum (gold top) tubes.

Analysed: Monday to Friday - up to 4 pm

Note: Keep specimen at 37°C and transport to laboratory as soon as possible. Characterisation will be performed on first time positive sample.

Cryptococcus Antigen
**Immunoassay Services**

*Specimen required:* CSF - All CSF samples MUST also be accompanied by a serum specimen. 2.5 mL blood, Serum (gold top) tube.

*Analysed:* Mon-Frid-

**Cryptococcus Culture**

*[Microbiology]*

*Specimen required:* Send CSF, sputum, tissue or urine (clearly labelled for Cryptococcal examination).

Note: Urgent testing outside normal working hours requires discussion with on-call Microbiologist.

**Crystals—Synovial fluid**

*[Microbiology]*

Specifically request crystals. Collect into a plain sterile container. Anticoagulated samples may contain crystals of the anticoagulant which will interfere with the examination and should not be used.

**C-Telopeptide (CTX)**

*[Immunoassay Services]*

*Specimen required:* 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

*Analysed:* weekly

Note: Patient MUST be fasting

**Cyclosporin (CSA)**

*[Immunoassay Services]*

*Specimen required:* EDTA (pink top) tube (minimum 1 mL).

Collect as a trough level or 2 hours post dose.

*Reference range:*
### Liver Transplant Patients

- **0-3 months post transplant**: 250-300µg/L
- **2-12 months post transplant**: 200-250µg/L
- **>12 months post transplant**: 100-150µg/L

### Renal Transplant Patients

- **100-200µg/L**

### Cardiac Transplant Patients

- **0-2 months post transplant**: 300-400µg/L
- **2-12 months post transplant**: 200-300µg/L
- **>3 months post transplant**: 100-200µg/L

### Other

- **variable**

### Toxic

- **>400 µg/L**

**Analysed:** Monday and Thursday.

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### Dabigatran

**[Haematology]**

*Specimen required:* 2.7 mL blood, Coagulation (blue top) tube—must be filled precisely to the fill line indicated on the specimen tube.

Contact the laboratory to arrange testing.

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### Dehydroepiandrosterone Sulphate (DHEAS)

**[Immunoassay Services]**

*Specimen required:* 5 mL blood, Serum (gold top) tube.

**Reference range**

- **Adult Male**: 1.4-13.4 µmol/L
- **Adult Female**: 0.5-11 µmol/L

**Analysed:** Twice weekly

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### Dexamethasone Suppression Test

**[Immunoassay Services]**
For investigation of possible Cushings Syndrome 1mg of Dexamethasone is taken orally at 2300 hrs (11pm). The next morning between 0800 and 0900 hrs, a blood sample is collected for cortisol. The times for taking the Dexamethasone and having the blood collected must be strictly adhered to. Patient can come to any of our Outpatient Collection centres for blood sample.

Dialysis Fluid (CAPD)

[Microbiology]
Send aliquot in 50ml Falcon tubes x 2. Inoculate one set of blood culture bottles with 8-10ml of dialysis fluid.

Diazepam

[Referred test].

Specimen required: 5 mL blood, NON-Gel Serum (red top) tube. Can use NON-Gel lithium heparin (dark green top) tube

Digoxin

[Clinical Chemistry] [Calvary]

Specimen required Lithium heparin (light green top), Serum (gold top)

Therapeutic range: 1.0-2.6 nmol/L. Specimen must be collected at least 6 hours after the last oral dose.

Serum Peak Level: 1-5 hours after oral administration.

Serum Half Life: 20-50 hours.

Protein Binding: Approximately 25%. Digoxin also shows a high degree of tissue binding.

Significant Change: 18%.

Note:
1) Specimens must be taken at least six hours after the last oral or IV dose.
2) Serum Digoxin concentration may increase when a therapeutic dose of quinidine is administered concurrently. This increase is seen 2 to 3 days after commencement of quinidine.
3) Digoxin is predominantly excreted unchanged in the urine. The rate of excretion is related to the glomerular filtration rate. Serum creatinine can be used as an indicator of renal function.
4) The effect of Digoxin on myocardial tissue may be altered by situations which modify the tissue’s sensitivity. Increased sensitivity of myocardium to Digoxin may result from: hypothyroidism, hypokalemia, hypomagnesaemia, acid-base disturbance and hypoxemia. Decreased sensitivity may result from: hyperthyroidism and hyperkalemia.
5) Patients treated with Digibind for Digoxin toxicity should not have Digoxin requested until a week post Digibind therapy, due to interference with the assay.

**Donath Landsteiner Test**

**[Transfusion]**

Contact Transfusion Laboratory 6244 2918 to discuss specimen collection and timing of test.

**dsDNA (Double Stranded) Antibodies**

**[Immunoassay Services]**

*Specimen required:* 5 mL blood, Serum (gold top) tube.

*Analysed:* Weekly

**Drugs of Abuse Screen—Urine**

**[Immunoassay Services]**

*Specimen required:* 20 mL urine.

*Analysed:* Daily

Note:
1) This is a screening test only—these test results have no legal standing.
2) Cross-reactivity may occur with drugs other than the class tested. A specific drug identification test may be required to assist in determining if drugs of abuse are present.
3) If specific drug identification or quantitative testing is required, specimens can be referred to the ACT Government Analytical Laboratory (ACTGAL).

Ecarin time
[Haematology]

Used for the monitoring of treatment with direct thrombin inhibitors such as Lepirudin

*Specimen required:* 2.7ml coagulation tube (blue top)

*Therapeutic range:* ECT; 45-75 seconds

Electrolytes
[Clinical Chemistry] [Calvary]

Sodium, potassium, chloride and bicarbonate. For individual test information refer to alphabetical listing.

ENA (Extractable Nuclear Antigen) Antibodies
[Immunoassay Services]

*Specimen required* 5mL blood, Serum (gold top) tube.

*Analysed:* Weekly

Endomysial Antibodies (EMA)
[Immunoassay Services]

*Specimen required* 5 mL blood, Serum (gold top) tube.
Analysed: Weekly

Entamoeba Histolytica Antibodies—(Amoeba) Serology
[Immunoassay Services]

Specimen required 5mL blood, Serum (gold top) tube.

Analysed: as required Mon- Fri, results available within 48 hours.

Enterovirus- PCR
[Molecular Pathology]

Specimen required: CSF

Analysed: Monday-Friday

Enteroviruses—Culture
[Microbiology]

Specimen required: Throat swab or faeces

Note: This will only be performed in the setting of viral meningitis and requires Microbiologist approval.

Enteroviruses—Serology
[Referred Specimen]

Specimen required: 5mL blood, Serum (gold top) tube. Acute and convalescent.

Note: Includes Coxsackie A and B

Epstein Barr Virus Serology
(EBV- VCA IgG,IgM and EBNA IgG)
[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube. Note: Heparin unsuitable.

Analysed: Twice weekly
Erythrocyte Sedimentation Rate (ESR)
[Haematology] [Calvary]

Specimen required 3-4 mL blood, EDTA (pink top) tube.

A FBC can be performed from the same tube if filled sufficiently.

Ethanol
[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top) tube.

Notes:
To convert to mg/decilitre multiply by 0.0046.

$\text{mmol/L} = \text{mg/dL} \times 0.0217$

An ethanol level of greater than 20.0 mmol/L indicates acute intoxication. It is not a medico-legal test and can only be used for clinical purposes.

Eosin-5-maleimide testing for Hereditary Spherocytosis
[Haematology]

This testing can only be ordered after consultation with a Specialist Haematologist-6244 3584.

Analysed: Typically, once per month

Specimens required: Adult 4 mL EDTA (pink top), tube Paediatric: 1ml EDTA
Can be performed on the same fresh tube as FBC.

Ethosuximide
[Referred test ].

Specimen required: 5 mL NON-GEL blood, Serum (gold top) tube.

Trough level: within 1 hour of next dose
Peak level: 2-4 hours post oral dose
EUC (UEC, U&Es)

[Clinical Chemistry] [Calvary]

Sodium, potassium, bicarbonate, chloride, urea, glucose and creatinine.

For individual test information refer to alphabetical listing.

Euglobulin Clot Lysis

[Haematology]

Contact the Coagulation Section, Haematology Laboratory 6244 2834.

Factor Assays

[Haematology] [Calvary]


Specimen required 2 x 2.7 mL coagulation (blue top) tubes.

Must be filled precisely to fill line indicated on label.

Specimens coming from other collection centres should be double spun and separated if not in laboratory within 4 hours. Specimens should be sent frozen.

If factor assays are required urgently, contact the laboratory or contact the duty haematologist.

Factor Va Leiden Mutation and Prothrombin G20210A Gene Mutation

[Molecular Pathology]

Specimen required: 10mL of blood in EDTA tube (only 1 Specimen required for both tests)
Analysed: Weekly

Factor Xa Assay
[Haematology] [Calvary]

See anti factor Xa for detail.

Specimen required 1 x 2.7 mL coagulation (blue top) tubes.
Must be filled precisely to fill line indicated on label.

Factor XIII
[Haematology] [Calvary]

[Referred test]

Specimen required 2 x 2.7 mL coagulation (blue top) tubes.
Must be filled precisely to fill line indicated on label.

Factor Inhibitor Assay
[Haematology] [Calvary]

Specimen required 2 x 2.7 mL coagulation (blue top) tubes.
Must be filled precisely to fill line indicated on label.
Specimens coming from other collection centres should be double spun and separated if not in laboratory within 4 hours. Specimens should be sent frozen.

Faecal Fat
[Referred test].

Specimen required: Complete 72 hour faecal collection into standard container (available from Specimen Reception).
Reference range: Adults <15 g/72 hours.
Note: Patient must be on a diet containing 70-100 g of fat per day for at least three days prior to, and during collection. No laxatives should be given. Faecal fat measurements are useless if the weight of faeces from adults is less than 150 g/72 hour. Specimens must not be contaminated by extraneous material.

**Faeces**

[Microbiology]

**Specimen Collection and Transport**

1) Half fill a faeces specimen jar and send it to the laboratory as soon as possible, preferably within 30 minutes. Trophozoites (e.g. E. histolytica) are labile and do not survive well after collection. Select blood stained or mucoid portion. Rectal swabs are not acceptable.

2) Clinical details must include date of admission, date of onset, all antibiotics administered currently, or in the preceding fortnight and any recent overseas travel as this can determine how the specimen is processed.

3) Two specimens are sufficient to establish a bacterial cause. Protozoan parasites may require more (3 specimens over 6 days—Amoebae 6 specimens). These need to be taken directly to the laboratory so that a ‘hot’ stool can be examined.

4) Once a causative agent has been established, no further specimens are necessary.

5) Clostridium difficile (toxin): Must be specifically requested.

**Microscopy**

Microscopy is routinely performed on stool samples to look for white cells, red cells and parasites.

**Parasites (ie protozoa and worms)**

A Concentration method to look for evidence of parasitic infection (ie ova and cysts) is only performed if specifically requested.

**Culture**
Routine cultures for Enteric pathogens (Salmonella, Shigella and Campylobacter) are performed on all faeces specimens requesting culture. Other potential faecal pathogens (Yersinia, Vibrio) may be isolated from these routine cultures however specific isolation procedures will only be performed if specifically requested or if sufficient clinical information is available on request forms. Mycobacteria and Viral cultures will only be performed if specifically requested and adequate history is provided.

Adequate clinical history is mandatory for optimum processing of faecal specimens.

Ferritin

[Immuoassay Services]

Specimen required: 5ml blood, Lithium heparin (light green top)/ Serum (gold top) tube

Reference range:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Adult Male</td>
<td>20-370 µg/L</td>
<td></td>
</tr>
<tr>
<td>Adult Female &lt;50y</td>
<td>10-120 µg/L</td>
<td></td>
</tr>
<tr>
<td>Adult Female &gt;50y</td>
<td>20-370 µg/L</td>
<td></td>
</tr>
</tbody>
</table>

Analysed: Daily.

Fibrinogen Assay

[Haematology]

Specimen required 2.7mL blood, Coagulation (blue top) tube.

Must be filled precisely to the line indicated on the label.

Reference range: 1.5-4.0 g/L

First Trimester Screen (Papp A & Free BHCG)

[Referred test]

Specimen required: 5mL blood, serum (gold top) tube
This test is referred to Royal North Shore Hospital.

Flucytosine
(Referred Test)

*Specimen required:* EDTA (pick top) tube.

*Therapeutic range:* Supplied with report.

Foeto-Maternal Haemorrhage (FMH)
[Haematology]

The FMH test is used to determine the size of a foetal bleed to estimate the required dose of Rh(D) immunoglobulin, therefore should only be performed on Rh(D) negative patients.

*Specimen required:* MATERNAL SPECIMEN 3-5 ml Blood, EDTA (pink top) tube.

*Transport:* Keep cool if transport is delayed

*Storage:* Refrigerate at 4 C.

*Testing:* Monday, Wednesday &-Friday

Folate Red Cell
[Immunoassay Services]

*Specimen required:* 4 mL blood, EDTA (pink top) tube.

*Reference range:* 285-1475 nmol/L.

*Analysed:* Tuesday and Friday.

Folate
[Immunoassay Services]

*Specimen required:* 5 ml blood, Lithium heparin (light green top)/Serum (gold top)/) tube.

*Analysed:* Daily

Follicle Stimulating Hormone (FSH)
[Immunoassay Services]

**Specimen required:** 5ml blood, Lithium heparin (light green top)/Serum (gold top) tube

**Analysed:** Daily

**Free Androgen Index (FAI)**

[Immunoassay Services]

**Specimen required:** 5 mL blood, Lithium heparin (light green top) /Serum (gold top) tube.

Note: Available for females ONLY. Calculated from measured testosterone and Sex Hormone Binding Globulin (SHBG). For measured free testosterone see free testosterone entry below.

**Analysed:** Twice Weekly

**Free PSA (FPSA)**

[Immunoassay Services]

**Specimen required:** 5 mL blood, Serum (gold top) tube ONLY.

**Analysed:** Daily

**Free Testosterone**

[Referred test]

**Specimen required:** 5 mL blood, Serum (gold top) tube ONLY.

Note: Must be specified on request form. A Free Androgen Index (FAI) can be performed as a calculated value.
For measured free testosterone order as the free Testosterone assay.
For calculated FAI heparin plasma can be used.

**Free Thyroxine (FT4)**

[Immunoassay Services]
Specimen required: 5mL blood, lithium heparin (light green top) /Serum (gold top)

Analysed: Daily

**Free Triiodothyronine (FT3)**

[Immunoassay Services]

Specimen required: 5mL blood, Lithium heparin (light green top) /Serum (gold top)

Analysed: Daily

**Fructosamine**

[Clinical Chemistry]

Specimen required: Lithium heparin (light green top), Serum (gold top) tube

Reference range:
- 200-290 nmol/L—(physiological level)
- 300-400 nmol/L—indicates elevated mean blood glucose level
- >400 nmol/L—consider change in management or diabetologist consultation

Significant Change: 9% at 300 nmol/L

Analysed: Daily.

Note: Fructosamine is an index of metabolic control in patients with diabetes mellitus. High albumin turnover states falsely lower fructosamine and do not reflect metabolic control.

**FTA (Syphilis serology confirmation test)**

[Referred Specimen]

Specimen required: 5 mL blood, Serum (gold top) tube.

Note: Test is a confirmatory test and only referred for first time positive Treponema pallidum results.

**Full Blood Count (FBC)**
[Haematology] [Calvary]

*Specimen required:* 4 mL blood, EDTA (pink top) tube. 1 mL Paediatric tube available. At least 400 µL is required.

*Includes:* White cell count, Haemoglobin, Haematocrit, MCV, Red cell count, Platelets and Differential. Film examination where indicated. Hb, WBC, Hct and Platelet counts can be requested as single tests.

*Note:* Haematocrit (Hct) is a modern electronic equivalent for the Packed Cell Volume (PCV).
Galactose 1 Phosphate Uridyl Transferase (Galiput test)

[Immunoassay Services] [Referred Test]

Specimen required: 2 mL NON GEL Lithium Heparin.
Place on ice and transport to the laboratory immediately.

Reference range: Provided by referral centre.

Note: A Specialist’s signature and provider number is required on the original request form before a referral specimen can be processed.

Gastric Parietal Cell Antibodies

[Immunoassay Services]

Specimen required 5 mL blood, Serum (gold top) tube.
Analysed: Weekly.

Gastrin

[Referred Specimen]

Specimen required: 10 mL blood, Serum (gold top) tube-Serum must be frozen within 2 hours.
Note: Patient must be fasting for 10 hours or longer.
Analysed: fortnightly

Genetic Analysis

[Molecular Pathology]

General Comment: For any genetic test a separate EDTA specimen is required. Due to potential problems with cross-contamination, specimens cannot be shared with other Pathology departments.

Specimen required: 10 mL blood, EDTA (purple top) tube.
Analysed weekly.

**Gliadin Antibodies**  
[Immunoassay Services]

*Specimen required:* 5 mL blood, Serum (gold top) tube.

*Analysed:* Weekly

**Glomerular Basement Membrane Antibodies (GMB)**  
[Immunoassay Services]

*Specimen required:* 5 mL blood, Serum (gold top) tube.

*Analysed:* As required.

Note: For urgent requests contact the Immunologist on call via The Canberra Hospital switchboard.

**Glucagon**  
[Referred Test]

*Specimen required* Contact the laboratory for collection tubes.

**Glucose-6-Phosphate Dehydrogenase (G6PD) (Screen test)**  
[Haematology]

*Specimen required* 4 mL blood, EDTA (pink top) tube.

*Paediatric Collection:* no less than 0.5 mL

Note: Can be performed on same specimen as the Full Blood Count.
## Glucose—Blood

**[Clinical Chemistry] [Calvary]**

**Specimen required:** Usually 2 mL blood. Sodium fluoride (Grey top) tube but can be heparin or serum if the specimen can be delivered to the laboratory within 4 hours (2 hours for paediatric containers). **Fasting** is the preferred sample for diagnosis.

**Reference ranges**

<table>
<thead>
<tr>
<th>Age</th>
<th>Fasting (Males/Nonpregnant)</th>
<th>Fasting (Pregnant)</th>
<th>Random (Males/Nonpregnant)</th>
<th>Random (Pregnant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 d</td>
<td>3.5-5.5 mmol/L</td>
<td>3.5-5.4 mmol/L</td>
<td>3.5-7.7 mmol/L</td>
<td>3.5-7.9 mmol/L</td>
</tr>
<tr>
<td>2-7 d</td>
<td>2.0-4.9 mmol/L</td>
<td></td>
<td>2.6-6.1 mmol/L</td>
<td></td>
</tr>
<tr>
<td>8-31 d</td>
<td>2.6-6.1 mmol/L</td>
<td></td>
<td>3.0-6.5 mmol/L</td>
<td></td>
</tr>
</tbody>
</table>

Note: Random specimens should be taken approximately 2 hours after a meal.

**Impaired Carbohydrate Handling males and Non-Pregnant Females**

<table>
<thead>
<tr>
<th></th>
<th>Fasting</th>
<th>Random</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td>6.1-6.9 mmol/L</td>
<td>7.0-11.0 mmol/L</td>
</tr>
</tbody>
</table>

**Possible Diabetes in Non Pregnant Females and Males**

<table>
<thead>
<tr>
<th></th>
<th>Fasting</th>
<th>Random</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td>≥7.0 mmol/L</td>
<td>≥11.1 mmol/L</td>
</tr>
<tr>
<td>Random</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Possible Gestational Diabetes Mellitus (Pregnant)**

<table>
<thead>
<tr>
<th></th>
<th>Fasting</th>
<th>Random</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td>≥5.5 mmol/L</td>
<td>≥8.0 mmol/L</td>
</tr>
</tbody>
</table>

*See Glucose Tolerance Test for more information.

Although a formal diagnosis of impaired fasting glycaemia is only applied when the fasting plasma glucose is ≥5.5 mmol/L, experience has indicated
that an OGTT is useful when the fasting plasma glucose is between 5.6 and 6.9mmol/L

*Significant Change: 6% at 6 mmol/L*

**Note:**
1. Steroid therapy may give elevated results.
2. Glucose may be falsely decreased by haemolysis.

**Glucose—CSF**

*Clinical Chemistry*

**Specimen required** 1.0 mL CSF. Sodium fluoride (Grey top) tube but plain tube acceptable if received in Clinical Chemistry within 2 hours of collection.

**Reference range:** 2/3 blood level.

**Glucose—Whole blood**

See blood gases for collection details and reference range.

**Glucose—Urine**

Urinary glucose is no longer quantitated at this laboratory.

**Note:** Patient factsheets are available at all ACT Pathology Collection Centres and through Customer Services on 6244 2932.
Glucose Tolerance Test (GTT) —Blood

[Clinical Chemistry] [Calvary]

Interpretation

Males and non pregnant females (MJA 2007;186:461-5):

Fasting Normal $\leq 6.0 \text{ mmol/L}$
Impaired Fasting Glucose* $\geq 6.1 \text{ mmol/L}$
Diabetes $\geq 7.0 \text{ mmol/L}$

120 Minutes Normal $\leq 7.7 \text{ mmol/L}$
Impaired Glucose Tolerance* 7.8-11.0 mmol/L
Diabetes $\geq 11.1 \text{ mmol/L}$

*Whilst not currently diabetic a percentage of these patients may progress to true diabetes and they should be monitored every 6-12 months.

Pregnant Females (Adips Criteria 2014):

Fasting Normal $< 5.1 \text{ mmol/L}$
Gestational Diabetes $\geq 5.1 \text{ mmol/L}$

60 Minutes Normal $< 10.0 \text{ mmol/L}$
Gestational Diabetes $\geq 10.0 \text{ mmol/L}$

120 Minutes Normal $< 8.5 \text{ mmol/L}$
Gestational Diabetes $\geq 8.5 \text{ mmol/L}$

Prior to commencement of the test, a random or fasting blood glucose should be sent to the laboratory for analysis.

The oral glucose tolerance test must not be performed if:

- The patient is in hospital or very ill (The test is invalid in the presence of intercurrent illness or stress such as that induced by trauma, surgery etc).
- The patient is a known diabetic.
- Patients with symptoms suggestive of diabetes mellitus, with either a fasting glucose $\geq 7.0 \text{ mmol/L}$
on one occasion or random glucose $\geq 11.1$ mmol/L on one occasion or on two occasions without symptoms as they fulfil the criteria for Diabetes without the need for a glucose tolerance test.

**Procedure**

1. Ring ACT Pathology for an appointment and patient factsheets.
2. Follow a special diet for 3 days prior to test (150g carbohydrate per day.) For **Pregnancy**, there is no dietary requirement. Also testing should not be performed within one week of maternal steroid administration.
3. The patient must not smoke or drink alcohol
4. The patient must fast (except water) for 8-12 hours before the test.

The test is only performed in the morning (Monday—Saturday) and takes 2.5-3 hours. The test used by ACT Pathology for ALL (including pregnant) patients is:

- **Adult**: 75g glucose in 300 mL water
- **Children**: 1.75g/kg of body weight (75g max dose)

**Note**: Results will be interpreted by the lab according to the above criteria. Borderline results will come with an extra note as the diagnosis of diabetes should be clearcut.

**gamma-Glutamyl Transferase (GGT)**

**[Clinical Chemistry] [Calvary]**

**Specimen required** Lithium heparin (light green top), Serum (gold top)

**Reference range**: Adult male 15-73 U/L  
Adult female 12-43 U/L

A marked elevation of serum GGT is found in approximately half of healthy neonates. In children over 2 months of age gamma-GT activity stabilises well within the adult normal range.

**Significant Change**: 6 % at 50 U/L
Note: The result will be disproportionately raised following chronic or acute alcohol ingestion.
Glycated Haemoglobin (HbA1c)

[Clinical Chemistry]

Specimen required: Blood, EDTA (pink top) tube.

Clinical Significance:

- < 5.7% (< 39 mmol/mol) normal
- 5.7-5.9% ( >39-41 mmol/mol) chance of developing DM within 5 years
- 6.0-6.4% (42-46 mmol/mol) high likelihood of developing DM within 5 years
- >6.4% ( > 46 mmol/mol) consistent with diabetes mellitus

Analysed: Monday- Friday.

Gonorrhoea PCR

[Molecular Pathology]

PCR assay for Neisseria gonorrhoeae.

Specimen required: Endocervical vaginal, rectal, throat & urethral swabs - use Roche COBAS PCR swab (yellow screw top). First catch urines and ThinPrep specimens can also be used.

Analysed: Monday-Friday

Group And Antibody Screen

[Transfusion] [Calvary]

See Transfusion Department listing in Section 2 for detailed protocols.

Specimen required: 4 mL blood EDTA (pink top) tube. A dedicated specimen is required for this test. These specimens are not shared with other sections of the laboratory.

Note:
1) Give full identification, number and date of previous transfusions, pregnancies and also any antibodies present.
2) Sample will be held for a maximum of 14 days, dependent on transfusion/pregnancy history (see "Holding periods for Group and Screen requests" on page 33.)

3) This is a screening test only. Blood units are not designated to the patient by this request.

4) Blood units will be issued within 15 minutes of phoned request for compatible blood.

**Growth Hormone (HGH)**

[Immunoassay Services]

*Specimen required:* 5 mL blood, Serum (gold top).

*Reference range:* Interpretation depends on sampling conditions and suspected diagnosis.

*Analysed:* Weekly

**Haptoglobin**

[Immunoassay Services]

*Specimen required:* 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

*Reference range:* 0.6-2.7 g/L

*Analysed:* Daily

**Haemoglobin (Hb)**

[Haematology]

*Specimen required:* 4 mL blood, EDTA (pink top) tube.

*Adult Reference range:*

- Males: 135-180 g/L
- Females: 115-160 g/L
- Pregnancy: 110-140 g/L
Haemoglobin Studies—Thalassaemia and Haemoglobinopathy Screen

[Haematology]

Specimens required:
- 4 mL blood, EDTA (pink top) tube or 1.0 paediatric EDTA tube.
- Lithium heparin (light green top) tube for Ferritin at same time.

Studies include: Full blood count, Film, Reticulocyte count, Haemoglobin electrophoresis, Haemoglobin A2 quantitation, Haemoglobin F, Haemoglobin H test

Analysed: Tests are batched and performed approximately weekly.

Note: Can be performed on the same specimen as the full blood count. Specimen must be less than 12 hours old for testing.

Haemochromatosis (C282Y & H63D Mutations)

[Molecular Pathology]

Specimen required: 10 mL blood, EDTA (purple top) tube. At least 0.5-1.0mL required from children.

Test performed: Weekly

Heavy Metals Screen

[Referred tests].

Specimen required:
Urine: 24 hour specimen in special container, or random specimen.

Blood: trace element (royal blue top) tube. or 2 x EDTA (pink top) tube

Note: Detects arsenic, mercury, lead, cadmium. If other metals required, request separately. For enquiries, phone 6244 3632.

Heinz Bodies
[Haematology]

*Specimen required:* 4 mL blood, EDTA (pink top) tube, can be done on FBC tube.

Note: Must be booked, contact laboratory on 6244 2828.

**Helicobacter pylori**

[Immunoassay Services]

*Specimen required:* 5 mL blood, Serum (gold top) tube

**Analysed:** Batched

**Note:** Helicobacter Breath Testing is not performed at ACT Pathology or Canberra Hospital.

**Heparin Therapy Control** (Continuous Infusion)

Request this test as APTT

[Haematology] [Calvary]

A pre-heparin baseline coagulation screen is advisable.

*Specimen required* 2.7 mL blood, Coagulation (blue top) tube.

Must be filled precisely to the line indicated on the label.

**Therapeutic range:** APTT Ratio 1.5- 2.5

Time: 45-75 seconds.

For the latest Guidelines for Intravenous Heparin Therapy, contact your hospital pharmacy
Heparin Dependent Anti-Platelet Antibodies (HITS)

Refer to Antibodies to Platelets (Haematology)

Hepatitis A, B & C

[Immunoassay Services]

*Specimen required:* 5 mL blood, Serum (gold top)/Lithium heparin (light green top) tube.

*Analysed:*

- Hepatitis Bs antigen (HBsAg)
- Anti-Hepatitis Bs (anti-HBs)
- Anti-Hepatitis C antibody (HCV)

*Analysed:* Daily

- Hepatitis A -IgG (NOTE: SERUM only)
- Anti-Hepatitis Core (anti-HBc)
- Hepatitis A- IgM

*Analysed:* Monday -Friday

Hepatitis C Virus PCR & Genotyping

[Molecular Pathology]

*Specimen required:* 10mL blood, EDTA (purple top tube)

*Analysed:* Hepatitis C Virus PCR - weekly.
- Hepatitis C Virus Genotyping -weekly.

*Note:*

1) Specimen must be transported to the laboratory ASAP within 6 hours of collection.
2) Please refer to the Medicare benefits Schedule for eligibility criteria.

*Note:* A factsheet for medical practitioners is available on the website or through Customer Services on 6244 2932.
Hepatitis B Viral load (HBV DNA)
[Molecular Pathology]

Specimen required: 10mL blood, EDTA (purple top tube) or serum (Red top).
Specimen must be transported to the laboratory within 6 hours of collection.
Analysed: Specimens batched weekly.

Hepatitis Delta Antibodies
[Referred Test]

Specimen required: 5mL blood, Serum (gold top) tube.
Contact the laboratory regarding special requirements.

Herpes simplex Virus 1 & 2 IgG—Serology
[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube
Analysed: Weekly

Herpes Simplex Virus—PCR
[Molecular Pathology]

Specimen required Viral swab or dry swab or CSF
Analysed daily.

Note: A factsheet for medical practitioners is available on the website or through Customer Services on 6244 2932.
HIV I & 2—Serology
[Immunoassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum (gold top)/ tube.
Analysed: Daily

HIV Viral Load [Quantitative] PCR
[Molecular Pathology]

This assay determines the circulating levels of HIV virus in HIV positive patients.

Specimen required: 10 mL blood, EDTA (purple top) tube
Analysed: Weekly

Notes:
1) Specimen must be transported to the laboratory within 6 hours of collection.
2) A factsheet for medical practitioners is available on the website or through Customer Services on 6244 2932.

HLA B27
[Molecular Pathology]

Specimen required: 10 mL blood, EDTA (purple top) tube.
Analysed: Batched fortnightly
Method: HLA-B genotyping has replaced flow cytometry analysis.

Homocysteine
[Immunoassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.
Analysed: Weekly
Notes:
1) Specimen must be spun within 2 hours of collection
2) A factsheet for medical practitioners is available on the website or through Customer Services on 6244 2932.

**HTLV 1**

[Referred test]

*Specimen required*: 5 mL blood, Serum (gold top) tube.

**bHCG-Beta Human Chorionic Gonadotrophin**

[Immuonoassay Services]

*Specimen required*: 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

*Analysed*: Available 24 hours/day

*Reference ranges:*

**Tumour Marker (U/L)**
- Males: <5
- Females: <5

**Pregnancy (U/L)**
- Negative: <5
- Equivocal: 5-25
- Positive: >25

*Weeks Post LMP*
- 3-4: 9-130
- 4-5: 75-2,600
- 5-6: 850-20,800
- 6-7: 4,000-100,200
- 7-12: 11,500-289,000
- 12-16: 18,300-137,000
- 16-29: 1,400-53,000
- 29-41: 940-60,000
Hydatid Serology (Echinococcus granulosus)

[Immunoassay Services]

Specimen required 5 mL blood, Serum (gold top) tube.

Analysed: Monday- Friday- as required

5-Hydroxyindole Acetic Acid (5HIAA)—Urine

[Clinical Chemistry]

Specimen required: 24 hour urine collected into HCl.

Reference range: <32 µmol /24 hour

Analysed: Weekly, specimens to be in laboratory by Monday pm

Note: The following drugs and foods interfere with the estimation and should be avoided for at least 12 hours prior to and during the collection.

Phenothiazines, Fruits and fruit juices, Caffeine, Methyldopa, Eggplant, Tomatoes, Naproxen, Alcohol, Cough Mixture, Nuts.

This list is not complete. A list of all drugs being taken must be included on the request form. The specimen should not be exposed to sunlight or high temperatures either during collection or transport to the laboratory.

Note: Patient factsheets are available at all ACT Pathology collection centres or through Customer Services on 6244 2932. A factsheet for medical practitioners is also available through Customer Services

Hydroxy-Methoxy-Mandelic Acid (HMMA or VMA)—Urine

[Clinical Chemistry]
See also Vasoactive amines (VMA)

**Specimen required**: 24 hour urine collected into HCl.

A random urine from a child is satisfactory if there is difficulty collecting a 24 hour sample. In this case, the concentration will be related to the creatinine output.

**Reference range**: <40 µmol/24 hour

Note: The following drugs may give spurious results: Clofibrate, MAO inhibitors, Guanethidine, Nalidixic acid, Imipramine, Phenothiazines, Levodopa, Reserpine, Clonidine.

### 17-Hydroxyprogesterone (17OHP)

[Imunoassay Services]

**Specimen required**: 5 mL blood, Serum (gold top) tube.

**Analysed**: Weekly

**Reference range:**

<table>
<thead>
<tr>
<th>Stage/Years</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepubertal</td>
<td>Tanner I</td>
<td>&lt;2.8</td>
</tr>
<tr>
<td></td>
<td>Tanner II</td>
<td>&lt;3.5</td>
</tr>
<tr>
<td></td>
<td>Tanner III</td>
<td>&lt;4.2</td>
</tr>
<tr>
<td></td>
<td>Tanner IV</td>
<td>0.9 − 5.4</td>
</tr>
<tr>
<td>Postpubertal</td>
<td>Tanner V</td>
<td>0.7 − 5.3</td>
</tr>
<tr>
<td>Adult</td>
<td></td>
<td>&lt;10.4</td>
</tr>
</tbody>
</table>

**Menstrual Cycle**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follicular</td>
<td>&lt;5.5</td>
</tr>
<tr>
<td>Midcycle</td>
<td></td>
</tr>
<tr>
<td>Luteal</td>
<td>&lt;14.2</td>
</tr>
<tr>
<td>Postmenopausal</td>
<td>&lt;5.2</td>
</tr>
</tbody>
</table>

**Hydroxyproline—Urine**

[Referred Test]
Specimen required: Contact laboratory for special requirements.

ICP—Intensive Care Profile
[Clinical Chemistry]

Available only to The Intensive care units at Canberra and Calvary Hospitals, usually only once per day.

At TCH the panel includes: Sodium, potassium, chloride, CO2, anion gap, glucose, bilirubin (total), ALT, alkaline phosphatase, GGT, albumin, calcium, phosphate, magnesium, calculated osmolality, urea and creatinine.

At Calvary the panel includes: Sodium, potassium, chloride, CO2, anion gap, glucose, albumin, calcium, phosphate, calculated osmolality, urea and creatinine.

IgE Total
[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube ONLY

Reference range: Adult <100 kU/L

Analysed: Weekly

Immunoglobulins (IgG, IgM, IgA)
[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top)/Lithium heparin (light green top) tube

Reference range: Children-age dependent

Adult:

| IgG   | 7.0-16.0 g/L |
| IgA   | 0.7-4.0 g/L  |
| IgM   | 0.4-2.3 g/L  |

Significant Change: IgG & IgA 15%, IgM 20%
Analysed: Daily

Immunoglobulin and T Cell receptor gene rearrangement studies.

[Referred Specimen]

*Specimen required* 10 mL blood, EDTA (purple top) tube, Bone marrow, fresh tissue (not fixed)

**Immunophenotyping**

[Haematology]

Leukaemia, Lymphoma Cell Markers:

*Specimen required* 9 mL blood, ACD (yellow top) tube.

Contact Haematology Department 6244 3584.

**Testing** Monday to Friday only

Specimens must reach the lab by 1pm on Fridays.

**Infectious Mononucleosis Screen (IM test)**

[Haematology]

*Specimen required:* 3-5 mL blood, Serum (gold top) tube, Heparin (green top) or EDTA (pink top) tube

**Analysed:** Daily.

Note: Can be performed on the same specimen as the Full Blood Count

**Influenza A and B Serology**

[Referred Test]

*Specimen required* 5mL blood, Serum (gold top) tube ONLY.

**Analysed:** Weekly

**Influenza A and B Virus**
**Microbiology**

*Specimen required:* Dry Nasopharyngeal “flocked” swab (orange top) or Nasopharyngeal aspirate.

*Note:* A nasal wash is also suitable for testing but is less sensitive than the preferred type.

*See also Influenza PCR under Molecular Pathology*

**Influenza PCR**

**[Molecular Pathology]**

*Specimen required:* Nasopharyngeal “flocked” or dry swab (Also sputum, BAL, NPA)

*Analysed:* Monday-Friday

**Insulin**

**[Immunoassay Services]**

*Specimen required:* 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

*Must be transported to the laboratory immediately for separation and freezing.*

*Reference range:* <27 mU/L (fasting)

*Analysed:* Weekly

*Note:* The assay cannot be performed on insulin-treated diabetics.

Simultaneous serum glucose levels are necessary for the interpretation of results.

**Insulin Like Growth Factor (IGF-1)**

**[Immunoassay Services]**

*Specimen required:* 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

*Reference range:*

*Prepubertal:* 4 -32 nmol/L
Peripubertal/Young Adult  11 - 69 nmol/L
Mature Adult (>21 y)  8 - 42 nmol/L

Analysed:  Weekly

**Insulin Resistance Test (HOMA)**

[Immunoassay Services]

*Specimen required:* 5 mL blood, Serum (gold top) tube.

HOMA is calculated from a simple measure of glucose and insulin on a fasting sample. Can also be performed as part of Glucose Tolerance Test (SGTT)

Analysed:  Weekly

**Insulin Tolerance Test**

By appointment, phone Endocrinology 6244 3794

**International Normalised Ratio (INR)—**
request this test as INR“

[Haematology] [Calvary]

*Specimen required*  2.7mL blood, Coagulation (blue top) tube.

Must be filled precisely to the line indicated on the label.

Note: The INR is used only for monitoring of oral anticoagulant therapy.

**Recommended INR Ranges for Clinical Conditions**

- **Treatment of DVT and pulmonary embolism**  
  INR  2.0-3.0
- **Prevention (after surgery)**  
  2.0-3.0
- **Treatment (secondary prevention)**  
  2.0-3.0
- **Prevention of systemic embolism**
- **Valvular heart disease, AF, MI**  
  2.0-3.0
- **Tissue heart valve (first 3 months)**  
  2.0-3.0
- **Bileaflet mechanical heart valve**  
  2.5-3.5
- **High risk mechanical heart valve**  
  3.0-4.5

Refs:

### Guidelines for Warfarin Reversal (Adapted from Tran et al, 2013)

<table>
<thead>
<tr>
<th>Clinical Scenario</th>
<th>INR</th>
<th>Vitamin K</th>
<th>FFP</th>
<th>Prothrombinex</th>
<th>Other action</th>
<th>Next INR</th>
</tr>
</thead>
<tbody>
<tr>
<td>No bleeding, recent or urgent surgery</td>
<td>&lt;4.5</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Consider withholding or reducing the dose of warfarin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.5 – 10</td>
<td>0.5-1.0mg iv or 1.0-2.0mg po</td>
<td>None</td>
<td>None</td>
<td>Withhold Warfarin</td>
<td>Within 24 hours</td>
</tr>
<tr>
<td></td>
<td>&gt;10</td>
<td>3-5mg po or iv</td>
<td>None</td>
<td>15-30iu/kg* if bleeding risk is high</td>
<td>Withhold warfarin</td>
<td>12-24 hours</td>
</tr>
<tr>
<td>Clinically significant bleeding where warfarin induced coagulopathy is considered a significant contributor</td>
<td>&gt;1.5 with critical organ bleeding</td>
<td>5.0-10mg iv</td>
<td>1-2 units</td>
<td>15-50iu/kg*</td>
<td>Withhold warfarin. Assess continuously until INR&lt;5 and bleeding stops</td>
<td>15 minutes after correction</td>
</tr>
<tr>
<td></td>
<td>&gt;2 with non life threatening bleeding</td>
<td>5.0-10mg iv</td>
<td>None</td>
<td>15-50iu/kg*</td>
<td>Withhold warfarin.</td>
<td>15 minutes after correction</td>
</tr>
</tbody>
</table>

*Notes:*

- 25 IU/kg Prothrombinex with FFP is adequate in most patients. Repeat INR post administration if bleeding persists, before considering larger dose.

Vitamin K in small doses (1-2mg intravenously) is recommended concurrently. Factor VII has a short half life, so will only be transiently replaced by FFP. Vitamin K overcomes the effect of warfarin, enabling the production of normally active factors to replace the deficiencies induced by warfarin.

Larger doses (10mg) should be used with caution in patients in whom there is an ongoing need for anticoagulation.
INR targets may vary in special circumstances, such as patients with recurrent thrombotic events, those at high risk of bleeding or with marked variation in INRs. Target ranges outside the above recommended values may be indicated in these circumstances. Specialist consultation may be required.

**Intrinsic Factor Antibody**

[Referred test]

*Specimen required:* 5mL blood, Serum (gold top) tube.

**Iron**

[Imunoassay Services]

*Specimen required:* 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

*Reference range:*

<table>
<thead>
<tr>
<th>Age</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 month</td>
<td>11-36 µmol/L</td>
</tr>
<tr>
<td>1 month</td>
<td>0-31µmol/L</td>
</tr>
<tr>
<td>2 month</td>
<td>3-29µmol/L</td>
</tr>
<tr>
<td>4 month</td>
<td>3-29µmol/L</td>
</tr>
<tr>
<td>6 month</td>
<td>5-24µmol/L</td>
</tr>
<tr>
<td>9 month</td>
<td>6-26µmol/L</td>
</tr>
<tr>
<td>12 month</td>
<td>6-28µmol/L</td>
</tr>
<tr>
<td>Adult Males</td>
<td>11-28µmol/L</td>
</tr>
<tr>
<td>Adult Females</td>
<td>7-26µmol/L</td>
</tr>
</tbody>
</table>

Iron levels often remain low up to the age of 2 years rising to adult levels by 3 to 10 years.

*Analysed:* Daily

*Note:*  
• Steroid therapy may increase serum iron concentration.  
• **The best test for the diagnosis of Iron deficiency is Ferritin.**  
• Iron levels are useful in overdose and Iron overload detection.
Iron Studies

[Immunoassay Services]

Specimen required  5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.
Includes: Ferritin, Transferrin, Iron
Analysed: Daily.

Ketones

[Clinical Chemistry]

Specimen required: Fresh random urine.
Reference range: None detected.
Note: Routine test measures acetoacetate only, not acetone or betahydroxybutyrate

Kleihauer Test—see Foeto-Maternal Haemorrhage (FMH)

Used for detection of Foeto-maternal haemorrhage when accurate determination of bleed volume is not required for Ant-D dosing, eg. Trauma in Rh(D) positive women

Lactate—Blood

[Clinical Chemistry] [Calvary]

Specimen required: 2 mL blood, Fluoride (grey top) tube.
Reference range: 0.7-2.0 mmol/L

Notes:
1) Phone 6244 2809 to make arrangements before collection.
2) Minimum venous constriction.
3) STAT delivery to lab on ice within 20 min (or rapid transport system if available—not on ice).
4) Lactate also available on ICU, Calvary and CNC blood gas machines (specimen collected as for blood gases).
Lactate—CSF

[Clinical Chemistry] [Calvary]

*Specimen required*  CSF in Fluoride (grey top) tube.

*Reference range:*  1.2-2.1 mmol/L

Note: Phone The Canberra Hospital 6244 2809 to make arrangements before collection.

**STAT delivery to lab on ice within 20 min** (or rapid transport system if available—not on ice).
Lactic Dehydrogenase (LDH)

[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top)

Reference range: Adults 125-240 U/L

Note: Lactate dehydrogenase may be falsely increased by haemolysis.

Lamotrigine/Lamictal

[Referred test]

Specimen required: Non-gel Serum (red top)

Lead

[Referred test]

Specimen required: Blood-either 2 x EDTA (pink top) or 1x Trace Element (royal blue top)

Special Handling: DO NOT SPIN, DO NOT SEPARATE

Legionella

[Microbiology]

Culture: Culture is the “gold standard” test but may take several days. Urine antigen testing is considered a useful adjunct.

Specimen required Sputum/Bronchial lavage or urine sample for Legionella antigen testing.

Please request Legionella culture specifically.

Legionella—Serology

[Referred test]

Specimen required: 5 mL blood, Serum (gold top) tube.

Analysed: Weekly
Note: For definitive diagnosis acute and convalescent samples should be collected.

**Leprosy Smear**

Contact Microbiology for details, 6244 2514.

**Leptospira Culture- blood or urine**

Culture is rarely performed. Serology is the most sensitive test for leptospirosis. Contact Microbiology, 6244 2514.

**Leptospirosis—Serology**

[Referred test]

*Specimen required:* 5 mL blood, Serum (gold top) tube.

Note: Acute and convalescent are required for definitive diagnosis.

**Lice (Both head and body) Microscopy**

[Microbiology]

*Specimen required:* Send material (Hair with or without louse) for microscopy in yellow top container
Contact Microbiology Department, 6244 2514.

**Lipase**

[Clinical Chemistry] [Calvary]

*Specimen required:* Lithium heparin (light green top), Serum (gold top)

*Reference range:* Adults <80 U/L

**Lithium (Priadel)**

[Clinical Chemistry]
Specimen required  Serum ONLY (gold top) tube-cannot be done from Lithium Heparin (light green top) tube.

Therapeutic range: 0.4-0.8 mmol/L  
Toxicity possible: 1.0-1.5 mmol/L 
Toxicity common: >1.5 mmol/L  
Significant Change: 15% at 0.8 mmol/L

Note: The specimen should be taken exactly 12 hours after the evening dose. When levels over 1.5 mmol/L occur, discontinue lithium and assess the patient for toxic symptoms.

Liver Function Test

[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top)

Includes: Bilirubin, Alkaline Phosphatase (ALP), gamma-Glutamyl Transferase (GGT), Alanine Aminotransferase (ALT), Albumin (ALB) Total Protein (TP)

LKM Antibody

[Immuoassay Services]

Specimen required  5 mL blood, Serum (gold top) tube.

Analysed: Weekly.

Lupus Anticoagulant

[Haematology]

A clinical history must be provided. Specimens coming from other collection centres should be double spun and separated if not in laboratory within 4 hours. Specimens should be sent frozen.

Specimen required: 2 x 2.7 mL blood, coagulation (blue top) tubes.
Must be filled precisely to the line indicated on the label. It is essential that the blood is collected carefully as activated samples invalidate results.
Luteinising Hormone (LH)
[Immunoassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.  
Reference range:

<table>
<thead>
<tr>
<th>Stage/Years</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepubertal</td>
<td>Tanner I</td>
<td>&lt;3</td>
</tr>
<tr>
<td>Peripubertal</td>
<td>Tanner II</td>
<td>&lt;5</td>
</tr>
<tr>
<td></td>
<td>Tanner III</td>
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<td></td>
<td>Tanner IV</td>
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<td>&lt;12</td>
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<tr>
<td>Adult</td>
<td></td>
<td></td>
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<tr>
<td>Menstrual Cycle</td>
<td></td>
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</tr>
<tr>
<td>Follicular</td>
<td></td>
<td>2 – 12</td>
</tr>
<tr>
<td>Midcycle</td>
<td></td>
<td>8 – 90</td>
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<tr>
<td>Luteal</td>
<td></td>
<td>&lt;14</td>
</tr>
<tr>
<td>Postmenopausal</td>
<td></td>
<td>5 - 62</td>
</tr>
</tbody>
</table>

Analysed: Daily

Lyme Disease (Borrelia serology)
[Referred test]

Specimen required: 5 mL blood, Serum (gold top) tube.

Magnesium—Blood
[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top) tube

Reference range:
0-7 days  0.50-1.10 mmol/L
Adult  0.70-0.90 mmol/L

Note: Magnesium may be falsely increased by haemolysis.
Magnesium—Urine

[Clinical Chemistry]

Specimen required: 24 hour Urine plain

Reference range: The amount of magnesium excreted in the urine (1.7-8.4 mmol/24 hour) is closely related to the dietary intake.

Malarial Parasites

[Haematology]

Specimen required: 3-5 mL blood, EDTA (pink top) tube.

Can be performed on the same specimen as the FBC.

Measles Serology (IgG)

[Immunoassay Services]

Specimen required: 5mL blood, Serum (gold top) tube.

Analysed: Monday - Friday.

Measles Serology (IgM)

[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube.

Analysed: As required

To ensure that special and urgent specimens reach the Immunoassay laboratory quickly, either transport the specimen yourself, or use the rapid transport system directly to pathology. Please contact the Immunoassay lab on 6244 4263.

For notes on collection of specific specimens see separate entries in the alphabetical listing.
Mercury
[Referred Test]

*Specimen required:* Blood, 2 x 5ml EDTA (or 24 hour urine in special container, or a spot urine.

*Special Handling:* DO NOT SPIN BLOOD

Metanephrines
[Referred Test]

*Specimen required*

**Urine:** 24 hour urine in acidified bottle

**Blood:** Lithium heparin (light green top), MUST be separated and frozen within 2 hours of collection.

Methotrexate
[Immunoassay Services]

*Specimen required* 5 mL blood, Serum (gold top)/Lithium heparin (light green top) tube (NON Gel preferred)

Note: PROTECT FROM LIGHT. If required as part of recovery therapy post treatment, do not collect within the first 48 hours.

Microfilariae
[Haematology]

*Specimen required* 3-5 mL blood, EDTA (pink top) tube.

Beta-2-Microglobulin
[Immunoassay Services]

*Specimen required:* 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

*Reference range:* Adult 0.8-2.2 mg/L

Analysed: Daily
Mitochondrial Antibodies

[Immunoassay Services]

Specimen required: 5mL blood, Serum (gold top) tube

Analysed: Weekly

M.R.S.A. surveillance

Methicillin Resistant Staphylococcus aureus

Specimen required: Nose and groin swabs. Wound & catheter exit sites if applicable


Mumps Serology

[Immunoassay]

Specimen required: 5mL blood, Serum (gold top) tube.

Analysed: Monday – Friday

Note: Mumps IgM is referred

Mycobacterium Tuberculosis Complex (MTB Complex)

[Molecular Pathology]

Specimen required: CSF, sputum

Analysed: Weekly

Mycology

[Microbiology]

Specimens are not routinely cultured for fungi. If a mycotic infection is suspected, this should be clearly noted on the request form and some material sent, not in formalin.
Skin, nail or hair infection (scrapings): Specimens to be collected into yellow-top containers and on microscopy glass slides

**Mycoplasma Pneumoniae Antibody**  
**[Immonoassay Services]**

*Specimen required*  5mL blood, Serum (gold top) tube ONLY.  
Note: Heparin unsuitable.  
*Analysed:* Twice weekly.  
Note: Acute and convalescent should be collected for definitive diagnosis.

**Nasopharyngeal Microbiology**  
**[Microbiology]**

Flexible wire swab or suction in sterile jar. Please specify the organism suspected. These specimens are unable to be processed without this information.  
Aspirates are most useful in the diagnosis of pertussis or viral pneumonia.  
See Respiratory Syncytial Virus.

**Neisseria meningitidis (Meningococcal) PCR**  
**[Molecular Pathology]**

*Specimen required:* CSF, 4ml EDTA or 0.5-1ml for children  
*Analysed:* This test requires approval from an Infectious Disease/Microbiology specialist. Once test is approved, the specimen will be analysed ASAP within normal working hours.  
Note: This test is not performed out of normal working hours, on weekends or public holidays. Specimens received out of hours will be processed the following working day.
Neuroblastoma Screen  
[Clinical Chemistry]  

**Specimen required**  10mL random urine specimen.  
**Reference range:**  Age dependent  
**Analysed:**  Within a week of receipt of specimen.  
It is important to send the specimen to the laboratory promptly so it can be acidified as soon as possible after collection.

Neuron Specific Enolase (NSE)  
[Referred Test]  

**Specimen required**  5mL blood, Serum (gold top) tube ONLY  
**Reference range:**  Provided by referral centre.

NICP—Neonatal Intensive Care Profile  
[Clinical Chemistry] [Calvary]  

Available only to Centre for Newborn Care. Sodium, potassium, chloride, CO2, urea, creatinine, calcium, albumin, PO4, calculated osmolality.  
For individual test information refer to alphabetical listing.

Nitrazepam  
[Referred test]  

**Specimen required**  5mL blood, Serum (gold top) tube.

Norovirus  
[Microbiology]  

**Specimen required:**  Faeces
Note: Requests for Norovirus are done only on patients from current recognised outbreaks.

**Nose Swabs**

[Microbiology]

Only useful to detect Staphylococcus aureus carriage. Use swab moistened in sterile saline and send in transport medium (Stuart”s). Swab both nostrils with a single swab.

**Occult Blood**

[Clinical Chemistry]

*Specimen required*  2g Faeces.

Note: Although it is not compulsory, the patient should be on a high-fibre meat-free diet for 2 days prior to and during the collection period. Foods containing peroxidase, eg horse radish, should be avoided. Ascorbic acid may cause false negative results. Care must be taken, when brushing teeth, not to cause bleeding gums.

Aspirin tablets may cause gastric bleeding and therefore give a positive result.

As G.I. bleeding may be intermittent, stool should be tested from 3 consecutive days.

Iron therapy does not interfere with the assay.

Patient factsheets are available at all ACT Pathology collection centres, on the website or through Customer Services on 6244 2932.

**Oestradiol (Estradiol) (E2)**

[Immunoassay Services]

*Specimen required*  5 mL blood, Serum (gold top)/Lithium heparin (light green top) tube

*Analysed:*  Daily

**Oligoclonal Studies—CSF and Serum**
[Immunoassay Services]

Specimen required: Min 1 mL CSF and 1 mL serum (gold top) tube.

Reference range: Interpretation required
Note: Oligoclonal studies cannot be completed without an accompanying serum specimen, which must be collected within 24 hours of the CSF specimen.

Analysed: As required

Osmolality- Blood

[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top)

Reference range:
0-1 month 270-290 mmol/kg of water
Adult 280-300 mmol/kg of water

Significant Change: 4%

Note: Blood should be collected with minimum stasis. Haemolysis will cause unreliable results.

Osmolality Calculated—Blood

Calculation: The following formula is used to calculate osmolalities:

Reference range: 280-300 mmol/L

\[(1.89 \times \text{Na}) + (1.38 \times \text{K}) + (1.03 \times \text{Urea}) + (1.08 \times \text{Glucose}) + 8\]


Osmolality—Urine

[Clinical Chemistry] [Calvary]

Specimen required: Random urine.

Result should be interpreted in conjunction with renal function, serum osmolality and clinical condition.
Osteocalcin
[Referred test]

Specimen required 5ml SERUM (gold top) tube
Analysed: Weekly

Note: Transport to laboratory as soon as possible- must be separated and frozen within 2 hours of collection.

Oxalates
[Referred Specimen]

Specimen required 24 hour urine in acidified bottle.
Reference range: Provided by referral centre.

Oxazepam
[Referred test]

Specimen required 5 mL blood, NON-GEL Serum (red top tube) or non-gel lithium heparin (dark green top tube)

P1NP (Total procollagen Type 1)
[Immunoassay services]

Specimen required 5ml Blood, seum (gold top) or LiHep(light green).
Analysed: Twice Weekly

Paracetamol
[Clinical Chemistry] [Calvary]

Specimen required Lithium heparin (green top), Serum (gold top) tube.
The minimum time for assessment of levels after ingestion of tablets is 4 hours, linctus 1-2 hours. Specimens collected earlier than these times may not indicate the peak serum concentration. There is
no benefit in serial measuring of paracetamol levels after parvolex treatment has commenced. The time since ingestion must be provided in order to assess whether toxic or non-toxic using the modified Prescott graph provided below.
Cautions for use of this chart:

**Use of this graph is ONLY valid when a SINGLE ingestion of paracetamol has occurred.**

- Blood levels drawn before 4 hours may not represent peak levels.
- The dotted line 25% below the standard nomogram is included to allow for possible errors in acetaminophen plasma assays and estimated time from ingestion of an overdose.
Parathyroid Hormone (PTH)
[Immunoassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

Note: Calcium levels should be assessed before PTH assays are requested.

Reference range: 1.6-7.2 pmol/L

Analysed: Daily

Note: Do NOT ADD ON test if collection more than 48 hours old.

Phosphate—Blood
[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top) tube

Reference range:
- Cord blood: 1.1-2.4 mmol/L
- 0-1 month: 1.0-2.5 mmol/L
- 1-3 month: 1.0-2.3 mmol/L
- 3-12 month: 1.0-2.2 mmol/L
- Adult: 0.75-1.4 mmol/L

The serum phosphorus level in children is markedly higher than in adults but falls to adult levels (15 yrs for females, 17 yrs for males) when ossification of the skeleton is complete.

Significant Change: 20% at 0.7 mmol/L
6% at 1.5 mmol/L

Note: Phosphate may be falsely increased by haemolysis.
Phosphate—Urine
[Clinical Chemistry]

Specimen required  24 hour urine.
Reference range  30-50 mmol/day

Plasma Viscosity
[Haematology]

Specimen required  2 x 4 mL blood, EDTA (pink top) tubes.
Reference range  1.4-1.8

Platelet count
[Haematology]

Specimen required  4 mL blood, EDTA (pink top) tube.

Adult Reference range:  150-400 x 10^9/L

Note: Full age reference ranges available on all reports.

Platelet Aggregation Studies
[Haematology]

Must be booked; contact Coagulation Section in Haematology - 6244 2834.

PFA (Platelet Function Analysis)
[Haematology] [Calvary]

Specimen required  2 x 2.7 mL coagulation (blue top) tubes.

Must be filled precisely to fill line indicated on label. Specimen must not be sent via the Tube System or centrifuged
For testing arrange with senior technologist. Contact Coagulation Section in Haematology Laboratory - 6244 2834.

Pinworm/Threadworm  
[Microbiology]

Cellotape slide, apply to perianal area, on arising in morning, prior to bathing or defecation.

Post-Natal Anti-D  
[Transfusion] [Calvary]

Specimen required  4mL blood EDTA (pink top) tube.

Blood to be collected 36-48 hours following post-natal Anti-D IM injection, in conjunction with repeat FMH testing for women who require more than one (1) dose of Ant-D

PNH (Paroxysmal Nocturnal Haemoglobinuria) Screening  
[Haematology]

This testing should only be ordered after consultation with a Haematologist. (6244 3584)

Specimen required  1 x ACD (yellow top) or 1x EDTA (pink top) tube,

Testing  Monday- Friday (Must be in lab by 12pm Friday)

Porphyrias  
[Clinical Chemistry] [Referred tests]

A guide for collection of specimens, with two Classifications— A and B

A
1) Congenital Erythropoietic Porphyria
2) Erythropoietic Protoporphyria
Specimens for analysis: Blood, Faeces, Urine.

B
1) Acute Intermittent Porphyria
2) Porphyria Variegata
3) Porphyria Cutanea Tarda (Congenital and Symptomatic)

Specimens for analysis: Faeces, Urine.

Specimen collection: Protect all specimens for Porphyria from light.

Blood Collect in 1 x EDTA (pink top) or NON-GEL Li Heparin (dark green) tube.

Faeces Approx 10g—The patient must not be constipated as this will give falsely elevated results. Specimens must reach the laboratory within 5 hours of collection. They will keep 4-5 days if they are deep frozen immediately.

Urine Early morning random specimen—this needs no preservative but must reach the laboratory within 2 hours of collection. Protect all specimens from light.

Potassium—Blood

[Clinical Chemistry] [Calvary]

Specimen required Lithium heparin (light green top),/Serum (gold top) tube

Reference range

<table>
<thead>
<tr>
<th>Age</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-7 d</td>
<td>3.2-5.7 mmol/L</td>
</tr>
<tr>
<td>8-31 d</td>
<td>3.4-6.0 mmol/L</td>
</tr>
<tr>
<td>1-6 m</td>
<td>3.5-6.0 mmol/L</td>
</tr>
<tr>
<td>6m-1y</td>
<td>3.5-6.0 mmol/L</td>
</tr>
<tr>
<td>1-12 y</td>
<td>3.3-4.7 mmol/L</td>
</tr>
<tr>
<td>Adult</td>
<td>3.2-5.0 mmol/L</td>
</tr>
</tbody>
</table>

Notes:
- Venostasis may cause up to 30% increase in 5 minutes.
- Potassium may be falsely increased by haemolysis.
• Haemolysis, refrigeration, prolonged standing of specimen, and squeezing of heel or finger (adding tissue fluid to the sample) will give elevated levels. If a specimen is found to be grossly haemolysed Potassium analysis will not proceed and the requesting area will be informed and a repeat collection suggested.

Potassium—Urine

[Clinical Chemistry] [Calvary]

Specimen required Random or 24 hour urine. No preservative.

Reference range 25-90 mmol/24 hours

Primidone

[Referred Specimen]

Specimen required Serum (gold top tube) taken immediately prior to next dose.

Note: The active metabolite is phenobarbitone which has a half life of 2-6 days. Requests for primidone will include a phenobarbitone level.
Progesterone
[Immunoassay Services]

Specimen required 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

Reference range
Adult Female:
- Follicular <4 nmol/L
- Midcycle 1-5 nmol/L
- Luteal 3-68 nmol/L
- Post menopausal <3 nmol/L
  Male <3 nmol/L

Analysed Daily

Prolactin
[Immunoassay services]

Specimen required 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

Reference range

<table>
<thead>
<tr>
<th>mIU/L</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant</td>
<td>73 - 325</td>
<td>1</td>
</tr>
<tr>
<td>Prepubertal</td>
<td>25 - 270</td>
<td>1</td>
</tr>
<tr>
<td>Peripubertal</td>
<td>31 - 316</td>
<td>1</td>
</tr>
<tr>
<td>Adult</td>
<td>&lt;650</td>
<td>&lt;450</td>
</tr>
</tbody>
</table>

Analysed Daily

Prostate Specific Antigen-total (PSA)
[Immunoassay Services]

Specimen required 5mL blood, Serum (gold top) tube.
Reference range (Adult):

- <50 years: <2.2 µg/L
- 50-60 years: <3.9 µg/L
- >60 years: <6.9 µg/L

Analysed: Daily

Note:

1) PSA levels may be transiently raised by rectal examination involving palpation or biopsy of the gland as well as in urinary tract infections.
2) Isolated serum PSA levels are not recommended as a screening test for prostatic carcinoma as 10% of patients with benign disease may have elevated levels and up to 30% of prostatic cancers may have normal PSA levels.

Prostate Specific Antigen-Free (FPSA)
[Immunoassay Services]

Specimen required: 5mL blood, Serum (gold top) tube.

Analysed: Daily

Protein C
[Haematology]

A clinical history must be provided. Specimens coming from other laboratories should be double spun and separated if not received in the laboratory within 4 hours. Specimens should be sent frozen.

Specimen required: 2.7 mL blood, Coagulation (blue top) tube.
Must be filled precisely to the line indicated on the label.

Reference range: Functional levels 70-130%
Protein S
[Haematology]

A clinical history in accordance with the MBS guidelines must be provided. Specimens coming from other collection centres should be double spun and separated if not received in the laboratory within 4 hours. Specimens should be sent frozen.

Specimen required: 2.7 mL blood, Coagulation (blue top) tube. Must be filled precisely to the line indicated on the label.

Reference range:
Female: Total 70-130%  Free 50-130%
Male: Total 70-130%  Free 70-150%

Protein, CSF
[Immunoassay Services] [Calvary]

Note: Send specimen to Microbiology for cell count first. Must not be blood stained.

Reference range:
Premature Baby 150-1300 mg/L
Full Term Baby 400-1200 mg/L

Adult Lumbar puncture 150-450 mg/L
Cisternal puncture 50-150 mg/L

Significant Change: 20% at 0.28 g/L
Analysed: Daily

Protein/Creatinine Ratio
[Immunoassay Services]

Specimen required: Random urine.
Analysed: Daily
Protein Studies
[Immunassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.
In cases of suspected paraproteinaemia both urine and blood are required.

Reference range: Interpretive comments given.
Analysed Daily

Note:
1) This study provides: Serum electrophoresis and band quantitation and identification of paraproteins and free light chains.
2) Immunoglobulin measurement must be specifically requested.

Protein –Total-Blood
[Clinical Chemistry] [Calvary]

Specimen required Lithium heparin (light green top), Serum (gold top) tube

Reference range:
Adults 60-80 g/L
Paediatric(up to 1 y)
  0-180d  40-75 g/L
  181-365 d 40-80 g/L

Significant Change: 5%
Note: Protein Total may be falsely increased by haemolysis.

Protein - Urine
[Immunassay Services]

Specimen required: Random or 24 hour urine. No preservative.
Reference range: <0.15 g/24hrs
Analysed Daily
Psittacosis (Chlamydia psittaci)
[Referred test]

*Specimen required:* 5mL blood, Serum (gold top) tube.

Note: For definitive diagnosis acute and convalescent samples should be collected.

Q Fever IgG Serology
[Referred Test]

*Specimen required:* 5mL blood, Serum (gold top) tube.

Quinidine
[Referred Test]

*Specimen required:* 5mL blood, Serum (gold top) tube (serum frozen).

*Reference range:* Provided by referral centre.

Red Cell Morphology—Urine
[Microbiology]

Requires a fresh urine specimen and has to be examined within 5 hours of collection.

*Specimen required:* Use yellow top container.

Note: Only performed during normal business hours

Reducing Substances—Urine
[Clinical Chemistry]

*Specimen required* Fresh random urine.

Deliver immediately to lab on ice. If there is a delay, freeze sample and deliver to lab frozen.

Reducing Substances—Faeces
[Clinical Chemistry]
Specimen required  2-5g faeces.
Deliver immediately to lab on ice. If there is a delay, freeze sample and deliver to lab frozen.

Note: A factsheet for medical practitioners is available through Customer Services on 6244 2932.

Renal Unit Profile (RUP)
[Clinical Chemistry] [Calvary]
Available only to the Renal Physicians.
Sodium, potassium, chloride, CO2, urea, creatinine, total protein, albumin, calcium, phosphate, alkaline phosphatase.
For individual test information refer to alphabetical listing.

Renin
[Imunoassay Services]
Specimen required:  Adults: 4 mL blood, EDTA (pink top) tube.
Analysed  Weekly
Note: Send at room temperature to the laboratory ASAP.

Respiratory Syncytial Virus (RSV)
[Microbiology]
Specimen required  Dry nasopharyngeal “flocked” swab (orange top) or Nasopharyngeal aspirate
Notes:
1) Send aspirate or swab promptly to the laboratory.
2) A nasal wash is also suitable for testing but is less sensitive than the preferred specimen type.
See also RSV PCR under Molecular Pathology

Respiratory Panel PCR
[Molecular Pathology]

Includes: Influenza, RSV, Adenovirus, Bordetella pertussis, Rhinovirus/Enterovirus, Parainfluenza, Human Metapneumovirus)

Specimen required: Nasopharyngeal “flocked” or dry swab (Also sputum, BAL, NPA).

Analysed: Monday-Friday

RSV (Respiratory Syncitial Virus) PCR

[Molecular Pathology]

Specimen required: Nasopharyngeal “flocked” or dry swab (Also sputum, BAL, NPA).

Analysed: Monday-Friday

Reticulocyte Count

[Haematology]

Specimen required: 4mL blood, EDTA (pink top) tube, or 1.0 paediatric EDTA tube.

Note: FBC should be ordered on the same specimen.

Rheumatoid Serology

[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube.

Reference range: <30 IU/mL

Analysed: Daily

Rickettsia

[Referred Test]

Specimen required: 5mL blood, Serum (gold top) tube.

Rivaroxaban
[Haematology]

Specimen required 2.7 mL blood, Coagulation (blue top) tube—must be filled precisely to the fill line indicated on the specimen tube.

Contact the laboratory to arrange testing.

Ross River Virus IgG and IgM Antibody
[Referred Test]

Specimen required: 5mL blood, Serum (gold top) tube.

Rotavirus/Adenovirus
[Microbiology]

For routine screen: Faeces specimen to Microbiology.
Note: only one Rotavirus/Adenovirus request will be processed per 7 days.

RPR (Syphilis serology)
[Immunoassay Services]

Specimen required: 5 mL blood, Serum (gold top) tube.
Analysed As required.
Note: this is used as a confirmatory and monitoring test only.

Rubella (IgG and IgM)
[Immunoassay Services]

Specimen required 5 mL blood, Serum (gold top) tube.
Analysed: IgG - Daily;
IgM – Monday- Friday.

Suspected rubella in pregnancy:
Obtain first specimen as soon as possible and send immediately to the laboratory. Accurate information on duration of pregnancy and date of contact is essential. Acute and convalescent specimens required for suspected contact.

Salicylate

[Clinical Chemistry] [Calvary]

*Specimen required*  Lithium heparin (light green top), Serum (gold top)

*Therapeutic range:*  1.1-2.2 mmol/L

*Toxic Range:*  >2.2 mmol/L

*Lethal:*  >5.1 mmol/L

*Serum Peak Level:*  1-2 hours after oral administration.

*Serum Half Life:*  Dose dependent—approximately 3-6 hours for low dose, 10-30 hours for high dose.

*Protein Binding:*  80-95 % (dose dependent).

*Note*:
1) Salicylate is only of value in patients receiving large doses or following overdose.
2) The serum half life is markedly prolonged when large doses are given or following overdose. It is also dependent on the glomerular filtration rate and urine pH.

Scabies Microscopy

[Microbiology]

Contact Microbiology Department, phone 6244 2514.

Selenium

[Referred test]

*Specimen required:*  6 ml Blood, trace element (royal blue top) tube.

*Reference range:*  Available with report

*Analysed:*  Weekly.
Sensitivities—Bacterial

[Microbiology]

Routinely performed on all significant bacterial isolates.

Sex Hormone Binding Globulin (SHBG)

[Immunoassay Services]

*Specimen required:* 5mL blood, Serum (gold top) or Lithium heparin (light green top) tube.

*Analysed:* Twice weekly

Sexually Transmitted Diseases

[Microbiology]

*Specimen required:* Neisseria gonorrhoeae: swab and transport media.

**Women**
- Cervix: insert swab into cervical canal.
- Anal canal: insert swab approximately 2.5 cm to sample anal crypts.
- Urethral Swab: should be inserted 1-2 cm into terminal urethra.
- High vaginal swabs: are unsuitable for the diagnosis of gonorrhoea and should only be used to confirm the diagnosis of candidiasis, trichomoniasis, gardnerella infection, or vaginitis in children.

**Men**
- Urethral: obtain material for smear and culture with urethral swab or a sterile bacteriologic loop. Swab or loop is used to inoculate medium directly and for preparing smears of exudates from men.
- Chlamydia trachomatis: See separate entry.

Skin Antibodies

[Immunoassay Services]
Specimen required: 5mL blood, Serum (gold top) tube.

Analysed: Weekly.

**Smooth Muscle Antibodies**

[Immunoassay Services]

Specimen required: 5mL blood, Serum (gold top) tube.

Analysed: Weekly

**Sodium—Blood**

[Clinical Chemistry] [Calvary]

Specimen required: Lithium heparin (light green top), Serum (gold top) tube

Reference ranges - serum / plasma.

<table>
<thead>
<tr>
<th>Age</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>137-145</td>
</tr>
<tr>
<td>0-7d</td>
<td>131-145</td>
</tr>
<tr>
<td>7-31d</td>
<td>132-142</td>
</tr>
<tr>
<td>1-6m</td>
<td>132-140</td>
</tr>
<tr>
<td>6m-1y</td>
<td>130-140</td>
</tr>
<tr>
<td>1-12y</td>
<td>132-140</td>
</tr>
</tbody>
</table>

Significant Change: 4%

**Sodium—Urine**

[Clinical Chemistry] [Calvary]

Specimen required: Random or 24 hour urine. No preservative.

Reference range: 130-250 mmol/day

The normal 24 hour output of sodium in urine varies greatly depending on intake.

**Sputum—Tracheal Aspirate**

[Microbiology]

Routine
Where possible, the aid of a physiotherapist should be sought, to ensure adequate sputum specimens. Do not send saliva to the laboratory as sputum. Specimens containing oral-pharyngeal material are unsuitable, and will not be processed. Repeat specimens will be requested. Sputum specimens are unsuitable for anaerobic bacteriology. Gloves, tissues or similar containing sputum will not be processed. No more than one satisfactory specimen will be processed for routine bacteriology.

**Tuberculosis**
Three consecutive early morning sputums are preferred for Tuberculosis. Repeat specimens are only relevant in Tuberculosis.

**Legionella**
Culture is not a routine test. Request specifically.

**Acid fast bacilli and Cytology**
Send separate specimens and forms for these tests as “splitting” of specimens will not be done.

*See also “Tuberculosis specimens” and “Cytology”.*

**Swabs**

[Microbiology]

Swabs should be limited to collecting material from skin and mucous membranes. Swabs should not be used to sample collections of pus. Pus should be sent in non-needled syringe or a sterile container.

Define the site of collection. Give full relevant clinical particulars.

Exclude indigenous flora by prior cleansing of surface with antiseptic.

1) General bacteriology: All sites.
2) Genital tract: See Sexually Transmitted Diseases.
3) ? Tuberculous pus: See Tuberculous specimens.
4) Virus: Swabs for virology must be placed in special viral transport medium.

**Sweat test (for cystic fibrosis)**
[Clinical Chemistry]

Phone The Canberra Hospital 6244 2816 for appointment.

Reference range:

Laboratory diagnosis of cystic fibrosis is based upon chloride measurement only. Sodium is reported as an internal check.

<table>
<thead>
<tr>
<th>Chloride Concentration (mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
</tr>
<tr>
<td>&lt;=6 months</td>
</tr>
<tr>
<td>&gt;6 months</td>
</tr>
</tbody>
</table>

Note: there is a substantial within-subject variation in sweat chloride. Results should only be interpreted in a clinical context.

Synacthen Stimulation Test

By appointment, phone Endocrinology The Canberra Hospital 6244 3794.

Syphilis test (Treponema pallidum CMIA)

[Immunoassay Services]

Specimen required: 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

Analysed: Daily

Note:
1) This test has replaced routine TPHA, and RPR on antenatal screens.
2) The RPR will be used as a confirmatory and monitoring test only.

Syphilis-Dark Field Examination

[Microbiology]
Contact Microbiologist on 6244 2514.

**T Cells (T and B Cell Markers for Immunosuppressed Patients)**

[Haematology]

*Specimen required* 9 mL yellow topped ACD tube—preferred tube.
Cells are suitable for analysis the following day, however must be received no later than 1 pm Friday.

*Analysed:* Monday to 1pm Friday only.

**Tacrolimus**

[Immunoassay Services]

*Specimen required:* 5mL blood, EDTA (pink top) tube specimen.
Minimum 0.5mL for infants – TROUGH.

*Analysed:* Monday and Thursday.

**Testosterone**

[Immunoassay Services]

*Specimen required* 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

*Analysed:* Twice weekly

**Tetanus Serology**

[Immunoassay Services]

*Specimen required* 5mL blood, Serum (gold top) tube.

*Analysed:* Fortnightly.

**Theophylline**

[Clinical Chemistry]
**Specimen required**  Lithium heparin (light green top), Serum (gold top)

**Therapeutic range:**
- Asthma: 56-111 µmol/L
- Neonatal apnoea: 28-55 µmol/L

The therapeutic range applies to steady state.

**Note:** Peak values are attained at:
- a) Slow release 5-6 hour post dose.
- b) Uncoated tablet 2 hour post dose.

The drug is toxic above the recommended therapeutic upper limits.

**Note:**
1) Cimetidine and erythromycin potentiate the effect of theophylline.
2) Smoking increases theophylline clearance and reduces serum half life.
3) Dose requirements should be based on ideal body weight.
4) Elimination of theophylline is decreased in chronic obstructive airways disease, congestive cardiac failure, acute pulmonary oedema and with reduced hepatocellular function.

**Throat Swab**

**[Microbiology]**

Swab tonsils, tonsillar areas, posterior pharynx, and areas of inflammation, exudation, ulceration or membrane formation.

Notify laboratory, phone 6244 2514, when diphtheria, or gonococcal pharyngitis is suspected clinically.

**Thrombophilia Tests**

**[Haematology]**

‘Thrombophilia Screen’ is not an available test under Health Insurance Act 1973. Tests for thrombophilia are listed individually in this book. The tests may include:
Protein C, Protein S, Anti-Thrombin (AT), Activated Protein C resistance (APCR), Lupus anticoagulant, Anticardiolipin antibodies, Factor V Leiden, Prothrombin gene mutation.

For information on the clinical relevance of these tests please contact a Haematologist or Haematology Registrar, phone numbers are available from this book under Department details, Haematology.

Note: A factsheet for medical practitioners is available on the website or through Customer Services on 6244 2932.

Thyroid Antibodies
[Immunoassay Services]

Specimen required 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.
Reference range:
- Anti-Thyroglobulin antibodies <5 kU/L
- Anti-Thyroid Peroxidase antibodies <6 kU/L

Analysed: Daily

Thyroid Function Tests
[Immunoassay Services]

Specimen required 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.
Analysed: Daily

Note: Free T4 and Free T3 will only be analysed on specific request or to clarify thyroid function results.

Thyroid Stimulating Hormone (TSH) (3rd Gen)
[Immunoassay Services]
Specimen required  5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

Analysed:  Daily

Reference range:

  Adult  0.40-4.00 mU/L
  0-14 days  30 mU/L

Note: The ultra sensitive assay for TSH has essentially replaced TRH stimulation for the confirmation of Hyperthyroidism. A normal Sensitive TSH result correlates well with a normal TRH response and virtually excludes Thyrotoxicosis. However a normal TSH coupled with a raised fT4 is suggestive of Euthyroid Hyperthyroxinemia due to illness, drugs or protein binding abnormalities. A result of less than 0.4 mIU/L is consistent with Thyroid Autonomy (eg Goitre), Hyperthyroidism or Thyroxine Treatment. TSH may be suppressed in otherwise euthyroid patients in cases of Non-Thyroidal Illness, drug therapy such as high dose corticosteroids and dopamine, first trimester pregnancy, goitre, thyroid autonomy and after major surgery.

**Thyroid Stimulating Immunoglobulin**

This test is no longer available in Australia and has been replaced by the TSH Receptor Antibody Test (TRAB) - see the separate entry.

**Thyroglobulin**

[Immunoassay Services]

Specimen required  5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

Note: Thyroglobulin analysis can be performed on FNA washings from thyroid nodules however this sample type has not been validated.

Analysis:  Weekly

**Tissue Antibodies**

[Immunoassay Services]
Specimen required: 10mL blood. Serum (gold top) tube.

Includes:
- anti-adrenal antibodies [Referred Specimen]
- anti-mitochondrial antibodies
- anti-gastric parietal cell antibodies
- anti-salivary gland antibodies [Referred Specimen]
- anti-smooth muscle antibodies

Tissues And Biopsies

[Microbiology]

All tissue and biopsy specimens for Microbiology should be sent in a sterile container. **Do not add formalin or other fixative.** Send infected area only. Separate formalin fixed specimens should be sent if Histology is required.

Tissue Typing

[Referred Test]

For Tissue Typing prior to transplant. Specimen types vary.

Must be booked in with Australian Red Cross Blood Service-6229 4459.

Toxoplasma IgG and IgM Serology

[Immuoassay Services]

Specimen required 5mL blood, Serum (gold top) tube.

Analysed: Batched (Monday – Friday)

TPN

[Clinical Chemistry] [Calvary]

Na, K, Creatinine, Albumin, Calcium, Phosphate, Magnesium
TPNS

[Clinical Chemistry] [Calvary]

TPNstart—used for patients commencing TPN.

TPNS (and TPNW) have the following tests: Sodium, potassium, urea, creatinine, chloride, CO2, albumin, total bilirubin, ALT, GGT, alkaline phosphatase, calcium, phosphate and magnesium.

For individual test information refer to alphabetical listing.

TPNW

[Clinical Chemistry] [Calvary]

TPN Weekly—used weekly on patients on TPN.

TPNW (and TPNS) have the following tests: Sodium, potassium, urea, creatinine, chloride, CO2, albumin, total bilirubin, ALT, GGT, alkaline phosphatase, calcium, phosphate and magnesium.

For individual test information refer to alphabetical listing.

Transferrin

[Immunoassay Services]

Specimen required 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

Reference range: 1.7-3.4 g/L

Analysed: Daily

Note: The best indicator of iron deficiency is serum Ferritin

Triglycerides

[Clinical Chemistry] [Calvary]

Specimen required Lithium heparin (light green top), Serum (gold top) tube
Reference range: < 1.5 mmol/L (fasting)  
(NHFrecommendation)

Notes:
1) This must be a 12 hour fasting specimen for the classification of a hyperlipidaemia.
2) Spurious values may occur after 24 hours and up to 1 month following myocardial infarction.

Troponin-I
[Immunooassay Services] [Calvary]

Specimen required: Lithium heparin (light green top) is the preferred specimen but serum will be accepted.

Reference range: <0.03 ug/L

Analysed: Daily

Tryptase
[Immunooassay Services]

Specimen required: Serum (gold top) tube ONLY

TSH Receptor Antibodies (TRAB))
[Immunooassay Services]

Specimen required: Serum (gold top) tube ONLY

Reference range: <1.5 IU/L

Analysed: Weekly

Tuberculosis
[Microbiology]

Urgent direct ZN stains are only performed after consultation. Positive cultures of acid-fast bacilli are reported immediately growth occurs (minimum 4 days), while negative culture results may not be available for eight weeks.
Please notify the laboratory by telephone, 6244 2514, when an urgent specimen is being sent.

**Urine**
Three early morning specimens in TB gastric-urine bottles or Aer bottles (an adequate specimen of 60 mL must be sent). 24 hour specimens will not be processed.

**Sputum**
Collect 3 samples on 3 different days, or 2 separate hourly collections on successive days into wide mouthed leak proof containers.

**Pus**
Aspirates or pus swabs should be sent to Microbiology, clearly labelled for TB.

**Bone marrow**
To be collected into a sterile container and inoculate into a special BACTEC bottle (red top) - obtain from Microbiology.

**C.S.F.**
The diagnosis of TB meningitis is initially a clinical one and not based on the result of the CSF ZN stain (ZN stains usually negative). The ‘gold standard’ test is culture. PCR and biochemical studies (adenosine deaminase) may be helpful on occasion whilst awaiting culture results. An accurate search is dependent upon the volume of CSF submitted. Minimum of 5 mL if possible. Repeat CSF’s may be needed.

**Tissue**
Small biopsy material should be placed in sterile saline or distilled water. Larger specimens in sterile pot with no additives. NO FORMALIN.

**Body fluids**
Pleural and other body fluids, including blood, to be collected into Special TB BACTEC bottles. Please contact Microbiology for information, phone 6244 2514.

**Blood culture**
Specimen of blood for mycobacteria require special media. (Red top BACTEC bottle labelled Myco/F lytic— inoculum size 1-5 mL).

Please consult with Microbiology Department, phone 6244 2514.

U&Es (EUC, UEC)

[Clinical Chemistry][Calvary]

Sodium, potassium, bicarbonate, chloride, urea, creatinine and glucose.

For individual test information refer to alphabetical listing.

Urate—Blood

[Clinical Chemistry] [Calvary]

Specimen required  Lithium heparin (light green top), Serum (gold top) tube

Reference range:  

<table>
<thead>
<tr>
<th></th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>260-440 µmol/L</td>
</tr>
<tr>
<td>Female</td>
<td>170-370 µmol/L</td>
</tr>
</tbody>
</table>

Significant Change:  8% at 420 µmol/L

Note:
1) Changes within the normal range may be significant in pregnancy.
2) Uric acid may be falsely increased by haemolysis.
Urate—Urine

[Clinical Chemistry]

**Specimen required** 24 hour urine. No preservative.

**Reference range:** 1.8-4.0 mmol/24 hours.

Urine urate excretion is influenced by diet. Increased levels are obtained on a high purine diet while lower levels are obtained on a high carbohydrate low protein diet.

Note: Samples collected in acid are not suitable

Urea—Blood

[Clinical Chemistry] [Calvary]

**Specimen required** Lithium heparin (light green top), Serum (gold top) tube

**Serum/Plasma Reference ranges.**

<table>
<thead>
<tr>
<th>Age</th>
<th>Reference range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>2.5-7.5</td>
</tr>
<tr>
<td>0-1w</td>
<td>0.3-3.5</td>
</tr>
<tr>
<td>1w-1 m</td>
<td>0.3-4.3</td>
</tr>
<tr>
<td>1-6m</td>
<td>0.3-3.2</td>
</tr>
<tr>
<td>6m-1y</td>
<td>0.3-3.8</td>
</tr>
<tr>
<td>1-4 y</td>
<td>1.1-4.6</td>
</tr>
<tr>
<td>4-13 y</td>
<td>1.6-4.6</td>
</tr>
</tbody>
</table>

**Significant Change:** 9% at 8 mmol/L  
6% at 30 mmol/L

Note: Haemolysis will give false low values.

Urea—Urine

[Clinical Chemistry]

**Specimen required** 24 hour urine. No preservative.

**Reference range:** 420-500 mmol/24 hours
Urea Breath Test (C14 Urea Breath Test)
This test is no longer performed at Canberra Hospital or ACT Pathology.

Urine—Microbiology/M/C/S

[Microbiology]

Specimen required  Early morning mid-stream urines into yellow sterile container.

Note: Record time of collection accurately and ensure immediate dispatch as unrefrigerated specimens more than 2 hours old are unsuitable.

(see Microbiology -Specimen Transport)

Mid-stream urines
To avoid contamination, a mid stream urine should be collected. Instructions to obtain a mid stream urine are;
1) Commence passing urine into the toilet
2) Collect a specimen of urine mid stream
3) Complete emptying the bladder into the toilet
4) Screw lid on firmly and label with full name, DOB and date and time of collection

Catheter urines
Clearly label catheter collection specimens including if IN/OUT catheter specimen.

Paediatric patients
0-1 yr suprapubic aspiration (bladder tap) is the preferred specimen for culture. These must be clearly labelled and note that any growth is significant, not just those greater than 105/mL. Paediatric bag urines are unreliable and results from them are usually difficult to interpret. Over 1 year of age, mid-stream specimens are satisfactory for culture.

Neonatal urines
See Cytomegalovirus.

Bacterial Antigen Tests—depends on clinical information
Group B Streptococcus.
Legionella.
Streptococcus pneumoniae

**Dysmorphic Red Blood Cells**
Fresh MSU required, has to be examined within 5 hour of collection. Please notify laboratory when specimen has been collected. Only performed during normal business hours. *Please notify the Microbiology laboratory of urgent specimens by telephone: 6244 2514.*

**M/C/S and Cytology**
Send separate specimens in yellow sterile containers. Require at least 20mls of urine in each container.

**Urobilinogen—Urine**

*[Clinical Chemistry]*

*Specimen required* Random specimen. Specimen should be protected from light.

*Reference range:* Qualitative—Comment on increased or decreased level.

**Vancomycin Resistant Enterococci (VRE) surveillance**

*[Microbiology]*

*Specimen required:* Perianal swab moistened with sterile water or normal saline.

*See Infection Control Manual for further information*

**Varicella Zoster PCR**

*[Molecular Pathology]*

*Specimen required:* Viral or dry swab, or CSF

*Analysed:* Twice weekly
Varicella Zoster IgG
[Immunoassay Services]
Specimen required 5mL blood, Serum (gold top) tube.
Analysed: Monday – Friday
Note: Varicella zoster IgM referred to Reference Laboratory.

Vasoactive Amines (VMA)
[Clinical Chemistry]
See also Hydroxy-Methoxy-Mandelic Acid (HMMA)
Specimen required: 24 hour urine collected into HCl. (Acid absolutely essential)
3 x 24 hour urine collections if index of suspicion is high. Random samples from children may be satisfactory if there is difficulty collecting a 24 hour specimen. In this case, the concentration will be related to creatinine output. Random urines should be forwarded immediately to the laboratory for acidification.

Reference range:

24 hour Urines

<table>
<thead>
<tr>
<th>Age</th>
<th>HMMA (VMA)</th>
<th>HVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 months</td>
<td>&lt;5.5µmol/24 hr</td>
<td>&lt;10 µmol/24 hr</td>
</tr>
<tr>
<td>1-3 ‘’</td>
<td>&lt;6.0 ‘’</td>
<td>&lt;16 ‘’</td>
</tr>
<tr>
<td>3-6 ‘’</td>
<td>&lt;13 ‘’</td>
<td>&lt;24 ‘’</td>
</tr>
<tr>
<td>6-10 ‘’</td>
<td>&lt;16 ‘’</td>
<td>&lt;26 ‘’</td>
</tr>
<tr>
<td>10-16 ‘’</td>
<td>&lt;26 ‘’</td>
<td>&lt;48 ‘’</td>
</tr>
<tr>
<td>Adult</td>
<td>&lt;35 ‘’</td>
<td></td>
</tr>
</tbody>
</table>

5 HIAA
Adult <32 µmol/24 hours
**Spot Urines**

<table>
<thead>
<tr>
<th>Age</th>
<th>HMMA(VMA)/creatinine</th>
<th>HVA/creatinine</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-60 months</td>
<td>0-10 mmol/mol creat</td>
<td>0-20 mmol/mol creat</td>
</tr>
<tr>
<td>61-120</td>
<td>0-5 ‘’</td>
<td>0-10 ‘’</td>
</tr>
<tr>
<td>121-160’</td>
<td>0-5 ‘’</td>
<td>0-5 ‘’</td>
</tr>
</tbody>
</table>

**Analysed:** Weekly, specimens to be in the laboratory by Monday pm.

**Viral Isolation**

[Referred Test]

**Full clinical details are essential.** This enables the laboratory to select appropriate tests and request additional specimens where necessary to establish the diagnosis.

**Recovery of infectious virus**

Correct specimen collection and handling is vital. Collect specimens as early as possible in the disease and send immediately to the laboratory.

- CSF—minimum 1mL. Collect into sterile CSF tube. Do not dilute.
- All swabs should be collected into virus transport medium.
- Stool specimens and urine into sterile container (no medium).

**Serology [Immunoassay Services]**

Request form must state which investigation is required (there is no such thing as a viral screen). Full clinical details, including date of onset of symptoms, ensure the correct
tests are carried out. 5 mL of clotted blood is generally sufficient. Paired sera should be obtained wherever possible

- acute sample—as early as possible in the illness.
- convalescent sample 2-3 weeks after onset.
- Electron Microscopy available on consultation. Appropriate specimens include vesicle fluid, scrapings, stool.

**Vitamin B12 (B12)**

[Immunoassay Services]

*Specimen required* 5 mL blood, Lithium heparin (light green top)/Serum(gold top)/ tube.

*Reference range*: 138 – 652 pmol/L

*Analysed*: Daily

**Vitamins (A, C, E)**

[Immunoassay Services][Referred Test].

*Specimen required* 5 mL blood, Serum (gold top) tube.

*Reference range* Provided by referral centre.

Note: Specimens for Vitamin A & E MUST be protected from light.

**Vitamin B1, B2 & B6**

[Referred Tests].

*Specimen required* EDTA (pink top) whole blood, MUST be protected from light and frozen ASAP.

**Vitamin D/25 Hydroxy vitamin D (Total)**

[Immunoassay Services]

*Specimen required*: 5mL blood, serum (gold top)

*Reference range*:

- < 60 nmol/L possible Vitamin D deficiency
- < 30 nmol/L significant Vitamin D deficiency
> 250 nmol/L toxicity

*Analysed* Monday – Friday

Note: for complete biochemical assessment of calcium status, Calcium, PTH, creatinine and Vitamin D should be ordered on same sample

**Vitamin D (1,25)/1-25 Hydroxy vitamin D**

[Referred Test]

This test is NOT the same as the Total Vitamin D (or 25 OH Vitamin D).

*Specimen required* 5mL blood, Serum (gold top) tube

**Von Willebrand Studies**

[Haematology]

Specimens coming from other laboratories should be double spun and separated if not received in laboratory within 2 hours. Specimens should be sent frozen.

*Specimen required* 2 x 2.7 mL blood, Coagulation (blue top) tube. Must be filled to precisely the line indicated on the label

**Adult reference range**

- FVIII:C  50-150%
- FVIII:RCoF  40-200%
- FVIII:VWFAg  40-200%
- FVIII:CBA  50-300%

**Voriconazole**

[Referred test]

*Specimen required:* Non- gel Serum (red top)

**Warfarin Therapy Guidelines**

For information to assist in safe prescribing and
management of warfarin therapy, please refer to CHHS Clinical Procedure “Anticoagulation Management”. CHHS15/131.

For Warfarin monitoring see INR

**Water Deprivation Test—Blood and Urine**

[Clinical Chemistry]

For investigation of polyuria and polydipsia. By arrangement. Phone Endocrinology 6244 3794.

**White Blood Cell Count (WBC)**

[Haematology]

*Specimen required* 4 mL blood, EDTA (pink top) tube or 1ml paediatric.

*Adult Reference Range:* 4 -11 x 10⁹/L

Note: Full age reference range available on all reports

**Worms**

[Microbiology]

Please send the whole worm or segments in a plain jar (Not in Formalin).

**XDP—Crosslinked Fibrin Degradation Products (D Dimer)**

[Haematology] [Calvary]

*Specimen required:* 2.7 mL blood, Coagulation (blue top) tube. Must be filled precisely to the line indicated on the label.

**Yersinia Serology**

[Referred Test]
Specimen required 5 mL blood, Serum (gold top) tube.
Acute and convalescent.

Zinc—Blood
[Referred test]

Specimen required: 6 ml Blood, Trace element (royal blue top) tube
Analysed: Weekly