





### PATHOLOGY HANDBOOK

HOSPITAL SULTANAH NUR ZAHIRAH
5th EDITION 2018





**CHEMICAL PATHOLOGY** 



**DRUG OF ABUSE** 



**HISTOPATHOLOGY** 



**CYTOPATHOLOGY** 



**BLOOD TRANSFUSION SERVICES** 



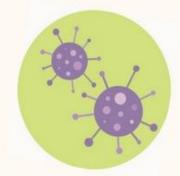
**HAEMATOLOGY** 



**MICROBIOLOGY** 







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### FOREWORD - HOSPITAL DIRECTOR



I would like to congratulate the Head of Pathology Department HSNZ and the team of staffs for this revised Pathology Handbook 2018. This is in line with the development and advances in laboratory technology and greater clinical expectations.

This handbook contains the latest information, including policy and procedural guidelines, about the Pathology services in Hospital Sultanah Nur Zahirah Kuala Terengganu and would be of great help for the clinicians and other users.

I hope this Pathology Handbook 2018 will be well utilized by all of us.

Thank you very much.

### DR. NOR AZIMI BT YUNUS

Director Hospital Sultanah Nur Zahirah Kuala Terengganu

### **FOREWORD – HEAD OF PATHOLOGY DEPARTMENT**

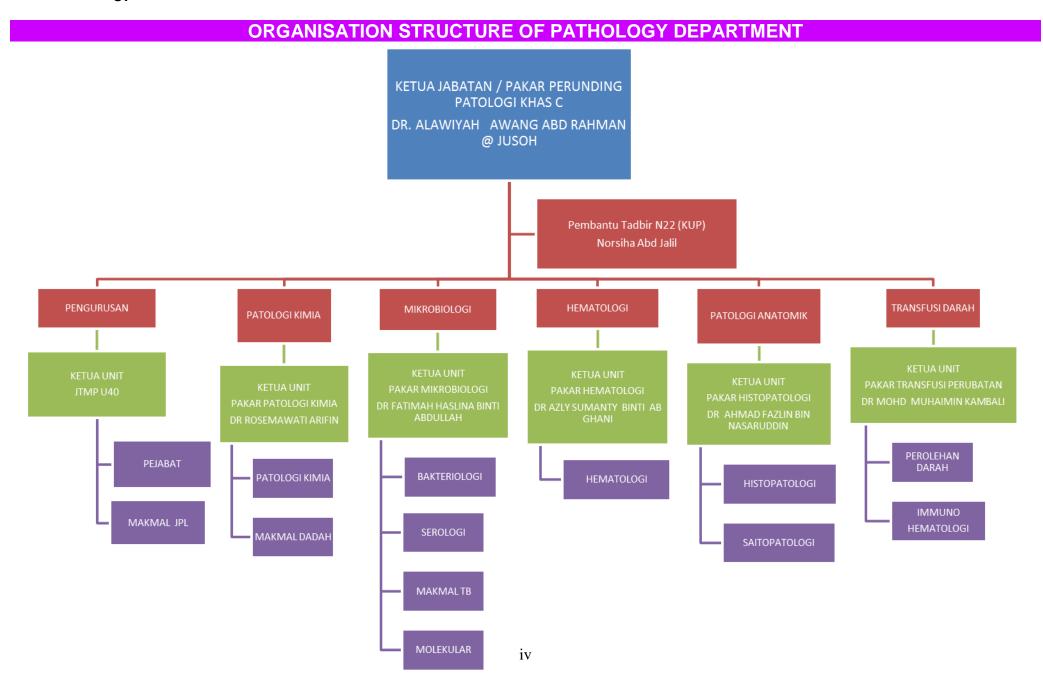


My heartiest congratulations to all committee members for completing editing of the Pathology Handbook 2018. This handbook is to be considered as service agreement between Pathology Department HSNZ KT and its clients. It is not the replica of the previous edition but it was value added as well as was updated with the latest information, so that the users will have more useful information for their references. Special thanks to all Head of Units and contributors for reviewing and updating the relevant sections.

I hope our department will continue to strive in improving the quality of services provided.

### DR. ALAWIYAH AWANG ABD RAHMAN @ JUSOH

Senior Consultant Pathologist, Head of Pathology Department, Hospital Sultanah Nur Zahirah, Kuala Terengganu, Terengganu.



### **VISION OF PATHOLOGY DEPARTMENT**

The Pathology Department as an excellent diagnostic and transfusion service center in accordance to a conducive working environment and cultures that comply to the quality principle.

### **MISSION OF PATHOLOGY DEPARTMENT**

Provide diagnostic services and production of efficient and quality products through the usage of appropriate technologies and skilled human resources to our customers in this region, taking into consideration the local culture and the national quality standards.

### **OBJECTIVES OF PATHOLOGY DEPARTMENT**

- Provide diagnostic services that satisfy the customer needs and in accordance to MS ISO 15189
- 2. Provide diagnostic services in accordance to Good Laboratory Practice principle, MS ISO 15189 standard and other related standards.
- 3. Achieve quality indicator as stated in National Indicator Approach.
- 4. Develop knowledgeable, efficient and skilled human resources through continuous education.
- 5. Provide conducive working environment and satisfy the requirement of relevant regulations.

CONTACT NUMBERS

Important contact numbers for Department of Pathology, HSNZ,
Kuala Terengganu.

Kuala Terengganu.				
LOCATION	EXT			
Head of Pathology Department				
Head Of Department	2032			
General Office of Pathology				
General Office	2469			
JTMP U40	2131			
JTMP U38	2106			
Histopathology / Cytopathology Unit	·			
Head of Histopathology Unit	2730			
Head of Cytopathology Unit	2725			
Histopathology Lab	2150/2155			
Cytopathology Lab	2878			
Cytopathology Screening Room	2731			
Medical Officer	2724			
Biomedical Scientific Officer	2728			
Specimen Receiving Counter	3000			
Chemical Pathology Unit				
Head of Chemical Pathology Unit	2864			
Biochemistry Scientific Officer	2717			
Chemical Pathology Lab	2976/2977			
Integrated Lab Counter	2120			
Drug Lab	2865			
Scientific Officer (Drug Lab)	2716			
Microbiology Unit				
Head of Microbiology Unit	2117			
Microbiology Scientific Officer	2999/2998			
Microbiology Lab	2112/2065/2014			
Serology Lab	2105/2103			
Molecular H1N1 Lab	2254			
TB Lab	2366			
Haematology Unit				
Head of Haematology Unit	2111			
Haematology Lab	2877			
Haematology Scientific Officer	2717			
Blood Transfusion Service Unit				
Head of Blood Transfusion	2041			
Blood Transfusion office	2449			
Blood Transfusion Medical Officer (MO)	2874			
Scientific Officer (Biochemistry)	2717			
Scientific Officer (Microbiology)	2449			
Blood Bank (Lab)	2974			
Massive Transfusion Protocol Alert (ONLY)	2722			
Blood Donation Centre (OPD)	3057/3052			
PRO Office	3047/3049			
Satellite Lab				
OPD Lab	3034			
O. D Lab	J 000 <del>-1</del>			

### **PATHOLOGY HANDBOOK COMMITTEE 2018**

ADVISOR : Dr. Alawiyah Awang Abd Rahman

(Consultant Pathologist & Head Of Pathology Department)

CO-ORDINATOR : Dr. Rosemawati Arifin

(Pathologist - Chemical Pathologist)

SECRETARY : Cik Noornatisha Salleh

(Scientific Officer Biochemistry)

: Hjh. Roselina Mohamad

(Senior Medical Lab Technologist)

COMMITTEE : Dr. Fatimah Haslina Abdullah (Microbiology)

MEMBERS (Pathologist - Clinical Microbiologist)

Dr. Rosemawati Arifin (Integrated & Chemical Pathology)

(Pathologist - Chemical Pathologist)

Dr. Mohd Muhaimin Kambali (Blood Transfusion Service)

(Transfusion Medicine Specialist)

Dr. Ahmad Fazlin Nasaruddin (Anatomic Pathology)

(Pathologist – Anatomic Pathologist)

Dr. Azly Sumanty Ab Ghani (Haematology)

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(Scientific Officer Biomedical, Anatomic Pathology (Histopathology))

Pn. Haryani Hashim

(Scientific Officer Biochemistry, Haematology)

Pn. Nurul Hidayah Mohamad

(Scientific Officer Biomedical, Anatomic Pathology (Cytopathology))

Cik Noornatisha Salleh

(Scientific Officer Biochemistry, Chemical Pathology (Drug Lab))

# GENERAL OPERATING POLICIES



### **GENERAL OPERATING POLICIES**

### INTRODUCTION

Department of Pathology Hospital Sultanah Nur Zahirah (HSNZ), Kuala Terengganu provides diagnostic laboratory services for HSNZ and other health facilities in Terengganu.

The Pathology Department consists of 5 units namely:

- a) Chemical Pathology (Chemical Pathology and Drug Laboratory)
- b) Microbiology (Bacteriology, Serology, Molecular and TB laboratory)
- c) Anatomic Pathology (Histopathology & Cytology)
- d) Haematology
- e) Transfusion Services

### **OPERATIONAL HOURS**

LABORATORY	OPERATIONAL HOURS		
Main Counter / Integrated Laboratory & Blood	Weekdays (Sun – Thu)	Open 24 hours	
Transfusion Service	Weekend and Public Holiday	Open 24 hours	
Drug Laboratory &	Weekdays (Sun – Wed)	8.00 am – 1.00 pm 2.00 pm – 5.00 pm	
Anatomic Pathology (Histopathology and Cytopathology)	Thursday	8.00 am - 1.00 pm 2.00 pm - 3.30 pm	
Cytopatriology)	Weekend and Public Holiday	Close	
Outpatient Department	Weekdays (Sun – Wed)	7.30 am – 1.00 pm 2.00 pm – 9.00 pm	
Laboratory	Saturday	8.00 am - 12.00 pm	
	Friday and Public Holiday	Close	
	Weekdays (Sun – Wed)	8.00 am – 4.30 pm	
Blood Donation Centre	Thursday	8.00 am - 3.00 pm	
Blood Donation Centre	Saturday	8.00 – 12.00 pm	
	Friday and Public Holiday	Close	
	Weekdays (Sun – Wed)	8.00 am - 1.00 pm 2.00 pm - 5.00 pm	
TB Laboratory	Thursday	8.00 am – 1.00 pm 2.00 pm – 3.30 pm	
	Weekend and Public Holiday	Close	

### **URGENT TEST REQUEST**

Urgent request shall be clearly indicated in request form or HIS system and clinically justified.

### **URGENT Lists for Chemical Pathology**

- a) BUSE (Urea, Na, K, Cl)
- b) Creatinine
- c) Glucose
- d) Bilirubin (Paediatric)
- e) AST
- f) LDH
- g) CKMB
- h) Amylase
- i) Calcium
- j) Magnesium
- k) CK

- I) Ammonia (By Appointment)
- m) Lactate (By Appointment)
- n) CSF Biochemistry
- o) UPT (Ectopic Pregnancy)
- p) Urine Analysis
- q) BHCG (Ectopic Pregnancy) By appointment with Chemical Pathologist on-call
- r) TFT (Thyroid Storm) By appointment with Chemical Pathologist on-call

### **URGENT Lists for Therapeutic Drugs Monitoring (TDM)**

- a) Acetaminophen
- b) Salicylate

### **URGENT Lists for Haematology**

- a) Full Blood Count
- b) Coagulation Test-PT/APTT

### **URGENT List for Microbiology**

- a) BFMP
- b) CSF: Microscopic & Antigen Detection
- c) Infectious Screening For Organ Procurement
- d) Corneal Scrapping For Gram Stain

### **URGENT List for Blood Bank**

a) Emergency Crossmatch

Urgent samples shall reach the laboratory immediately.

Please consult Head of Department, Head of Unit, Scientific Officer or Medical Officer for urgent tests that are not listed.

### PRE-ANALYTICAL REQUIREMENTS

### 1. REQUEST BY HOSPITAL INFORMATION SYSTEM (HIS)

All requests shall be ordered by a doctor from the ward or clinic. The labeling of specimen is using barcode printed label, and shall be done by the ward or clinic. Hardcopy request form only needed for Blood Transfusion tests (Group and Crossmatch (GXM), Group, Screen and Hold (GSH), Blood Component Request & Reaction Transfusion Investigation), Microbiology tests (Mers CoV and H1N1 only) and all outsource tests.

Clinical summary and diagnosis must be clearly entered and abbreviations are discouraged.

Certain test request shall require prior appointment / scheduling. Provision shall be made available for acceptance of appointment. Any cancellation or rescheduling of test must be immediately informed to the laboratory personnel.

### 2. REQUEST FORM

Request forms are required for all external requests and for internal requests; only Blood Transfusion tests (Group and Crossmatch (GXM), Group, Screen and Hold (GSH), Blood Component Request & Reaction Transfusion Investigation), Microbiology tests (Mers CoV and H1N1 only), drugs of abuse and all outsource tests.

A standard laboratory request form i.e PER-PAT 301 is used for all categories of tests or otherwise stated. The request forms should be sent in duplicate.

All request forms shall be filled legibly. The completed forms shall be signed by requesting doctor and accompanied by a properly collected specimen.

The following information shall be provided for every request:

a) Patient's detail : Name, identity card (IC) number, sex and age

b) Source : Ward, clinics and name of hospital

c) Patient's clinical summary : Relevant clinical summary including provisional

diagnosis and treatment. Abbreviations are

discouraged.

d) Test details : Date and time of specimen collection. Type of

specimen and anatomic site (if relevant).

e) Requestor's detail : Doctor's name, signature and official stamp.

Mark ( $\sqrt{}$ ) at the appropriate box for the test required. For anatomic pathology and microbiology the type of specimen should be stated under the appropriate column. Tests which are not listed in the request form should be stated under the column OTHERS.

### 3. COLLECTION AND SPECIMEN HANDLING

- a) All samples / specimens should be collected and dispatched to the laboratory in the appropriate container as specified.
- b) The entire specimen container should be placed in one biohazard plastic bag and the barcode should be fixed correctly to the container. The status of the specimen should be 'dispatched' for request made through HIS.
- c) The entire specimen container should be transported in biohazard plastic bag. Please put the request form into another compartment in biohazard plastic bag (for external specimen or specimen for outsource). Do not staple request form together.
- d) The following are minimum information that must be provided on the labels of specimens:

Name of patient :			
•			
I/C No. or MRN:			
Ward :			
Name of test:			
Date :			

### Note:

- Use new I/C number for Malaysian Patient (12 digits).
- Passport number should be used for non-Malaysia patient.
- Nombor tentera or nombor polis can be used when necessary.
- For pediatric patient whom myKid is not yet available, mother's I/C number can be used and must be clearly stated.

### Collection of blood samples

### Factors to be considered

### A. Selection of a suitable vein

- Most satisfactory method is to obtain venous blood.
- In certain circumstances capillary puncture may be preferable.
- Blood from different sites may vary considerably, not only in respect of oxygen saturation but also in the relative proportions of plasma and cells, e.g. capillary blood has a lower ratio of cells to plasma than venous or arterial blood.
- A limb into which an intravenous infusion is being given must not be selected as the site
  of venipuncture, and specimens should only be collected from an infusion site after the
  needle or cannula has been thoroughly flushed out with blood.

### B. Amount of venous stasis

- Temporary venous stasis is frequently necessary to reveal a vein prior to venipuncture.
- It is important to avoid prolonged venous stasis as this can markedly raise the concentration of plasma proteins and other non-diffusible substances.
- It is desirable to release the tourniquet, if used, after entering the vein and before collecting the sample of blood.

### C. Avoid haemolysis

- Careful attention to the technique of blood collection is essential.
- Collect the specimen with only moderate suction.
- Remove the needle from the syringe before transferring blood to the specimen container.
- The transfer should perform slowly.
- For vacutainer tube, let the blood flow through the needle into the container without any pressure from outside.
- Avoid vigorous mixing.

### D. Avoid clot formation

- Ensuring a smooth venipuncture and steady flow of blood into the syringe.
- Introducing blood in the anticoagulant bottle as soon as blood is withdrawn.
- Immediately mix gently by inverting tube at least 6-10 times.

### Note:

Sample collection should always take place under standardized conditions, e.g fasting, position (seated or recumbent), about the same time of day and following brief venous stasis.

### E. Technique of blood collection

### i) Skin cleansing

- For blood collection other than blood culture and sensitivity cleaning with 70% alcohol will be adequate.
- Refer to specific aseptic technique for blood collection.

### ii) Capillary puncture

- Separate sterile lancet is used for each patient.
- The sites should be warm and free from obvious circulatory stasis.
- The puncture should ideally produce a free flow of blood but often slight pressure is necessary and is acceptable practice.
- The first two or three drops may be discarded.
- Squeezing not only dilutes the blood sample with tissue fluid but increases the risk of causing haemolysis.

### iii) Venipuncture

- The arm or hand vein is usually selected.
- Puncture is facilitated by application of a tourniquet to restrict the venous return.
- Gently mix the blood in tubes containing additives or clot activators.
- Apply sterile cotton to the venipuncture site while removing the needle.

### iv) Sampling from artery

- The common sites of arterial puncture are the radial artery, brachial artery and femoral artery. Other sites include scalp arteries in infants and the umbilical arteries during the first 24 to 48 hours of life.
- Arterial puncture is necessary when venous blood does not permit the measurement of the relevant concentration of the desired analyte (e.g. blood gases, pH).

### G. Order Of Draw

- i) When collecting multiple specimens, blood collection tubes should be filled drawn in the following order; and mix all tubes by inversion 6 8 times:
  - Blue top (sodium citrate)
  - Red top (no additive) and Gold top (SST)
  - Green top (heparin)
  - Lavender tube (EDTA)
  - Black top ESR-Vacuum tube
  - Gray top (sodium fluoride)
- ii) Follow strictly to the volume of blood required for the type of test specified on the container's label.

### H. Storage and transport of specimen

- i) The specimens should be transported to the laboratory as specified according to the type of test in appropriate time frame and according to transport requirement for the test.
- ii) Avoid storing of whole blood for test used serum / plasma for analysis in the refrigerator.
- iii) Retention period for post analytical specimen (primary specimen) as listed below :

UNIT	TYPE OF SPECIMEN	RETENTION PERIOD	
Chemical	Serum / Plasma / Whole Blood	2 days after issue of report / result	
Pathology	Urine / Body fluid / Stool	24 hours after test is done	
Drug Lab	Urine	Positive – 2 months after issue of report / result.  *For request from PDRM & AADK, the specimens are returned to the requestor after issue of report / result.  Negative – 2 days after issue of report / result.	
	All specimens except urine, stool & blood	7 days after issue of report / result	
	Urine & Stool	Discard after issue of report / result	
Microbiology	Blood C&S	Positive - 1 month after issue of report / result Negative - Discard after issue of report / result	
	Serum / Plasma for serology	1 month after issue of report/result	
	Slide i. Wet preparation	Discard after issue of report / result  2 days after issue of report / result	
	ii.Stained / Immunofluorescence slides	**except BFMP and TB smear for rechecking	
	Remaining tissue removed at surgery	1 month after issue of report	
Histopathology	Remaining tissue removed at autopsy	3 month after issue of autopsy report	
Cutanathalagu	Sputum, urine, CSF and other body fluids	2 days after issue of report	
Cytopathology	Specimens received in liquid based fixative	1 month after issue of report	
	Blood samples except for Full Blood Picture (FBP)	2 days after test is done	
Haematology	Blood samples for FBP	1 week from sample received.	
	Full Blood Picture slides	3 years after issue of report	
	Bone marrow slides	7 years after issue of report	
Blood Transfusion	Samples of material examined	7 days after test is done	

### 4. REJECTION OF SPECIMENS

Sample that does not fulfill lab requirement will be rejected. Criteria for rejection include :

- a) Specimen is not accompanied with the request form (*Tiada borang*)
- b) No specimen received (Tiada specimen)
- c) Wrong request form (Salah borang)
- d) Specimen type not stated at the form (Tiada jenis spesimen di borang)
- e) Hemolysed specimen (Spesimen hemolysis)
- f) Clotted specimen (Spesimen beku)
- g) Insufficient volume (Spesimen isipadu tidak sesuai)
- h) Wrong container (Spesimen salah bekas)
- i) Leaked specimen (Spesimen bocor)
- j) Test not offered (Ujian tidak ditawarkan)
- k) Inadequate information at specimen label (Maklumat tidak lengkap pada label specimen)
- I) No clinical diagnosis (or inadequate) (Tiada ringkasan klinikal / diagnosis (atau tidak lengkap)
- m) Inadequate information at the form (Maklumat tidak lengkap / jelas pada borang)
- n) Not clinically indicated (Ujian tidak perlu)
- o) Inappropriate retesting interval (Retesting interval tidak sesual)

### 5. RECEPTION SPECIMENS

The specimen reception counters are described in the following table :

RECEPTION COUNTER	RECEPTION TIME		TYPE OF TEST
Integrated Lab Counter (ext. 2120)	24 hours including weekends and public holidays		Routine / URGENT (Chemical Pathology, Haematology, Microbiology)
Drug Lab Counter	Sun – Wed	8.00 am – 12.30 pm 2.00 pm – 4.30 pm	Routine / URGENT
(ext. 2865)	Thursday	8.00 am – 12.30 pm 2.00 pm – 3.00 pm	(For Legal Purposes)
Anatomic Pathology (Histo / Cyto) Counter	Sun – Wed	8.00 am – 5.00 pm	Routine / URGENT
(ext. 3000)	Thursday	8.00 am – 3.30 pm	Roddine / ORGENT
OPD Lab Counter	Sun – Thu	8.00 am – 9.30 pm	Specimens from OPD
(ext. 3034)	Saturday	8.00 am – 12.00 pm	Specimens nom Or D
Blood Transfusion Service Counter (ext. 2974)	24 hours including weekends and public holidays		Routine / URGENT
	Sun – Wed	8.00 am – 4.30 pm	
Blood Donation Centre (ext. 3057 / 3052)	Thursday	8.00 am – 3.00 pm	For blood donation only
	Saturday	8.00 am – 12.00 pm	

### 6. RESULTS

### Reporting the Results

- a) The test results for Internal Specimen (specimen registered through HIS) can be viewed once it is validated by the lab personnel.
- b) The test results for external specimen will be printed and will be dispatched through the pigeon hole at the main counter of Pathology Department unless otherwise stated (refer relevant section).
- c) Certain results will be released to the patient/relatives in OPD department and Integrated laboratory following standard procedure.
- d) Critical result will be informed immediately to the requestor.
- e) Tracing of result via telephone is NOT RECOMMENDED. This is to avoid miscommunication and transcription error.



### CHEMICAL PATHOLOGY



### **CHEMICAL PATHOLOGY**

### 1. INTRODUCTION

The Chemical Pathology provides diagnostic and consultative services for patient management in Hospital Sultanah Nur Zahirah, district hospitals and health clinics in Terengganu. The services cover analysis of biochemical changes in body fluids for screening, diagnostics and monitoring of diseases. Tests which are not provided in house will be outsourced to other referral laboratories for analysis.

### 2. SERVICES

Test categories provided are urgent, routine and special tests. The special tests include tests that are run in batches or by appointment only for example HbA1c and selected immunoassay tests.

### 3. RECEIPT OF SPECIMEN

All specimens are received at Integrated Lab Counter.

### 4. REFERENCE INTERVALS

Reference intervals are provided on all test results. These are differentiated by age and sex when clinically important or available.

### 5. SPECIAL TESTS PROCEDURE

### 5.1 Ammonia

Collection of a satisfactory specimen for ammonia analysis requires special procedure to prevent changes in ammonia concentration while and after the specimen is drawn. Test can only be done with appointment (ext. 2977).

### **Procedure of collection**

- a) A venous specimen is best drawn without a tourniquet or immediately after the tourniquet has been applied.
- b) If the tourniquet has been applied long enough, it should be removed after puncture has been performed and blood allowed circulating for at least 2 minutes before the blood is withdrawn.
- c) 2.5 ml of blood is collected in a container with EDTA as anticoagulant/0.5 ml of blood in pediatric EDTA tube.

### Notes:

- Sample should be chilled in a slurry ice bath and send to the laboratory immediately.
- Separation of cell at the laboratory is done through centrifugation within 30 minutes after collection.
- Stability of plasma : 2 hours at 4°C (after separation from cell).
- Assay on plasma must be performed immediately to avoid interference.
- Haemolysed specimen may affect results.

### 5.2 Lactate

Collection of a satisfactory specimen for lactate analysis requires special procedure to prevent changes in lactate concentration while and after the specimen is drawn. The test can only be done with appointment (ext. 2977).

### Procedure of collection

- a) Patient should be fasting and at complete rest.
- b) A venous specimen is best drawn without a tourniquet or immediately after the tourniquet has been applied.
- c) If the tourniquet has been applied very long, it should be removed after the puncture has been performed and blood allowed circulating for at least 2 minutes before the blood is withdrawn.
- d) 2 ml of blood is collected in a container with sodium fluoride as anticoagulant (blood glucose container).

### Notes:

- Sample should be chilled in a slurry ice bath and sent to the laboratory immediately after collection.
- Separation of cell at the laboratory is done through centrifugation within 30 minutes after collection.
- Stability of plasma: 2 hours at most 4°C (after separation from cell).
- Assay on plasma must be performed immediately to avoid interference.
- Haemolysed specimen may affect results.

### 5.3 Modified Oral Glucose Tolerance Test (MOGTT)

### Procedure of collection

- a) Fast the patient overnights (10 12 hour).
- b) Fasting specimen e.g 8.00 am : Collect fasting blood specimen.
- c) Give patient 75 g Glucose in 250 ml water and drink within 5 minutes. For children the Glucose dose is 1.75 g/kg body weight to a maximum of 75 g.
- d) 2<sup>nd</sup> blood specimen is taken after 2 hour of glucose intake (e.g 10.00am)

### Notes:

- Dietary preparation.
  - The oral carbohydrate intake should be 150 g on each of the three days immediately preceding the test. No food or energy supplying substances in any form should be consumed for at least eight hours prior to the test but the patient must not be fasted longer than 16 hours. Water is permitted throughout this period and during the rest.
- The patient must rest for 30 minutes before and also during the test and smoking is not allowed.
- Drugs such as steroids, oral contraceptives, diuretics, nicotinic acid, thyroid hormones and dilantin that may affect test should be avoided.
- Refer to CPG Management of Type 2 Diabetes Mellitus.

### 5.4 HbA1c

### Procedure of collection

2 ml of blood is collected in the container with EDTA as anticoagulant.

### Notes:

- Test should be performed for monitoring of patients diagnosed with diabetes mellitus.
- Repeated testing should be done only on a 3 monthly basis or longer as the HbA1c measurement is dependent on the lifespan of red cells in circulation.
- Refer to CPG Management of Type 2 Diabetes Mellitus (5th edition, 2015. <a href="http://www.moh.gov.my/penerbitan/CPG/CPG%20T2DM%202015.pdf">http://www.moh.gov.my/penerbitan/CPG/CPG%20T2DM%202015.pdf</a>). Presence of Hb variants may interfere with HbA1c measurement.

### 5.5 24 - hour urine collection

It is important that timed urine collection (e.g. 24 - hour collections) should be done with great care.

Precise instructions to the patients are essential.

### Procedure of collection

- a) At the start of the collection period (note the time), the patient should empty the bladder completely. This urine specimen should be discarded.
- b) All urine passed during the next 24 hours must be collected and stored in the container provided. If the preservative has been included, the bottle should be shaken after each urine addition to mix the contents.
- c) At the end of the collection period (at approximately the same time the following day) the patient should empty his bladder completely. This last specimen must be kept and added to the total urine collection.
- d) Label the bottle as directed and send immediately to the laboratory. For best result, refrigerate the urine  $(2 8^{\circ}C)$  if possible.

### 5.6 Creatinine Clearance Test

Specimen requirement:

- a) 24-hour urine sample refer 5.5 for proper 24-hour urine collection.
- b) Draw blood for creatinine either at the beginning or end of the urine collection.
- c) Send both specimens to the laboratory.

### 5.7 Stool For Occult Blood

- 1. Patient should follow a special diet for 2 days.
- 2. Diet should exclude red and rare meats, horseradish, and such raw fruits and vegetables as broccoli, cauliflower, red radishes and other high peroxidase containing vegetables which cancause false positives.
- 3. Diet could include cooked fruit and vegetables such as spinach and corn and also lettuce, prunes, grapes and apples.

4. Cereals and well-cooked poultry or fish are also acceptable. Certain medication such as aspirin, indomethacin, phenylbutazone, reserpine, corticosteroid and nonsteroidal anti-inflammatory drugs can cause gastrointestinal bleeding and thus give positive reactions.

### 6. OUTSOURCE TESTS

### **SPECIAL TESTS PROCEDURE**

### 6.1 24-hours urine catecholamine

### Procedure of collection

- a) Please refer to procedure 24-hour urine collection to collect urine for 24-hr urine catecholamine.
- b) Please note that 10 ml of 25% HCl has been added to the urine bottle to preserve the analytes. It is important that the requesting physician advise the patient not to discard the preservative.

### Notes:

- Abstain from bananas, coffee, pineapples and walnuts one day prior to end during the 24-hour urine collection.
- Certain drugs such as alpha 2 agonists, calcium channel blockers, ACE inhibitors, bromocriptine, methyldopa, monoamine oxidase inhibitors, alpha blockers and beta blockers, phenothiazines, and tricyclic antidepressants alter the metabolisms of catecholamines. It is advisable to stop such medication at least 48 hours prior to urine sampling.
- Please advise patient to avoid stress, exercise and smoking prior to and during urine collection.
- Request only by specialist (Rujukan HSNZ.PAT.15-9(317)JLD 4 bertarikh 25 Januari 2016 dan Surat Jabatan Patologi HKL/PAT/98/180/5 Jilid 20(30).

### 6.2 IEM (Inborn Error Metabolism)

### a) Screening of Inborn Error Metabolism (IEM)

No.	Biochemical Genetics Test	Method	Indications	Pre-Analytical Procedure
1	Screening for IEM (Amino acids & Acylcarnitines in blood spot)	Quantitative by Tandem Mass Spectrometry	Neonatal screening of 30 IEM diseases:  Organic acidurias  Fatty acid oxidation defects  Hypoglycaemia  Amino acids disorders	3 circles of 1cm diameter of dried blood spot on Whatmann 903 special filter paper. Properly dried at RT for 4 hours before putting in plastic bag. Transport at RT.
2	Galactosemia screening (Total Galactose & Galactose-1- uridyltransferase)	Quantitative by enzyme assay	Suspected disorders of galactose metabolism:  • Acute liver failure, prolonged jaundice, cataract, hypoglycaemia	3 circles of 1cm diameter of dried blood spot on Whatmann 903 special filter paper. Properly dried at RT for 4 hours before putting in plastic bag. Transport at RT.
3	Biotinidase	Enzymatic	Suspected Biotinidase deficiency	3 circles of 1cm diameter of dried blood spot on Whatmann 903 special filter paper. Properly dried at RT for 4 hours before putting in plastic bag. Transport at RT.
4.	Urine metabolic screening (UTMS)	Quantitative by Tandem Mass Spectrometry	Screening for organic acids disorders and amino acids disorder	Collected in sterile bottle without preservative. Transport frozen in dry ice.

### b) Amino acid Disorders

No.	Biochemical Genetics Test	Method	Indications	Pre-Analytical Procedure
1.	Plasma amino acids	Quantitative by HPLC	<ul> <li>Selective screening</li> <li>Hyperammonemia</li> <li>Metabolic acidosis</li> <li>Amino acids disorders</li> <li>Mitochondrial disorders</li> <li>Epileptic</li> <li>Encephalopathy</li> </ul>	2 ml of heparinized plasma. Morning (fasting) or 4 hours after last meal. Centrifuge and freeze immediately. (Transport frozen in dry ice)
2.	Urine amino acids (after consultation only)	Quantitative by HPLC	<ul> <li>Hyperammonemia (Cystinuria, HHH, LPI, Hperlysinemia)</li> <li>Renal disorders</li> </ul>	2 ml random urine collected in sterile bottle without preservative. (Transport frozen in dry ice)
3.	CSF amino acids	Quantitative by HPLC	<ul> <li>Epileptic</li></ul>	1 ml CSF in sterile bottle. Must send together with plasma. Freeze immediately. (Transport frozen in dry ice)
4.	Urine Orotic acids	Quantitative by HPLC	Suspected:  • Urea Cycle defects  • Hyperammonemia,  • Purine & pyrimidine disorders  • Suspected OTC carrier: Vomiting, protein intolerance, mildly retarded	5 ml urine, no preservative in sterile bottle. (Transport frozen in dry ice)
5.	Urine Sulfocysteine	Quantitative by Ion-Exchange HPLC	Suspected:  • 2 ulphide oxidase  • Molybdenum cofactor deficiency  • Dystonia  • Seizure	2 ml random urine collected in sterile bottle, no preservative. (Transport frozen in dry ice)
6.	Total Plasma Homocysteine	Quantitative by reverse-phase HPLC with FLD	Suspected homocystinuria:  Marfan-like syndrome Epilepsy Mental retardation Progressive myopia Thromboembolism Cobalamin disorders	2 ml of plasma. Separate plasma immediately & freeze immediately. (Transport frozen in dry ice)

### c) Organic Acidurias and Fatty Acids Oxidation Defects

No.	Biochemical Genetics Test	Method	Indications	Pre-Analytical Procedure
1.	Urine Organic Acids analysis	Qualitative by GCMS	<ul> <li>Selective screening</li> <li>Organic acidurias</li> <li>Amino acids disorders</li> <li>Fatty acids oxidation</li> <li>Mitochondrial disorder</li> <li>Unexplained metabolic crisis, acidosis, ketosis, high anion gap, hypoglycaemia</li> <li>Systemic intoxication, coma, seizures</li> <li>Undiagnosed hepatopathy</li> <li>Neurological/neuromus cular disorders</li> <li>Epileptic Encephalopathy</li> <li>Multi-systemic disorders</li> <li>Unexplained mental retardation.</li> </ul>	5 ml random morning urine collected in sterile bottle, freeze immediately and transport frozen in dry ice to prevent bacterial overgrowth and loss of volatile substances.
2.	Urine Succinylacetone	Quantitative by GCMS	Suspected     Tyrosinemia Type I	5 ml urine collected in sterile bottle without preservative (protect from light). Transport frozen in dry ice.
3.	Total and free Plasma Carnitine	End-point enzymatic assay	<ul> <li>Carnitine deficiency (primary or secondary)</li> <li>Fatty acids oxidation defects</li> <li>Organic acidurias.</li> </ul>	2 ml heparinized plasma. Freeze immediately. Transport frozen in dry ice.

### d) Pterins and Neurotransmitter Disorders

No.	Biochemical Genetics Test	Method	Indications	Pre-Analytical Procedure
1.	Urine Pterins (Screening)	Qualitative by reverse- phase HPLC with FLD	<ul> <li>Suspected         neurotransmitter         disorders</li> <li>BH4 deficiency         (GTPCH, PTPS,         DHPR and PCD         deficiency)</li> </ul>	2 ml random urine collected in sterile bottle, wrap with aluminium foil to protect from heat and light. Transport frozen in dry ice.
2.	Urine Biogenic Amines (Screening)	Qualitative by reverse- phase HPLC with ECD	<ul> <li>Suspected neurotransmitter disorders.</li> <li>Catecholamine &amp; serotonin metabolism deficiency.</li> </ul>	2 ml random urine collected in sterile bottle, wrap with aluminium foil to protect from heat and light. Transport frozen in dry ice.
3.	CSF Pterins	Qualitative by reverse- phase HPLC with FLD	<ul> <li>Suspected neurotransmitter disorders.</li> <li>BH4 deficiency. (GTPCH, PTPS, DHPR and PCD deficiency)</li> </ul>	0.5 ml of CSF collected in clean universal bottle, wrap with aluminium foil to protect from heat and light.  Transport frozen in dry ice.
4.	CSF Biogenic Amines	Qualitative by reverse- phase HPLC with ECD	<ul> <li>Suspected neurotransmitter disorders.</li> <li>Catecholamine &amp; serotonine metabolism deficiency.</li> </ul>	2 ml of CSF collected in sterile tube, wrap with aluminium foil to protect from heat and light. Transport frozen in dry ice.

### e) Lysosomal Storage Diseases

No.	Biochemical Genetics Test	Method	Indications	Pre-Analytical Procedure
1.	Urine Mucopolysacchari des (Screening of GAGS and HRE)	Dimethyl-methylene blue and High Resolution Electrophoresis	<ul> <li>Suspected         lysosomal storage         diseases /         mucopolysaccharid         osis.</li> <li>Done together with         HRE.</li> </ul>	5 ml early morning urine in sterile bottle. No preservative. Transport frozen in dry ice).
2.	Bloodspot for LSD Screening	Quantitative by Tandem Mass Spectrometry	<ul> <li>Screening for 5         lysosomal storage         diseases (Pompe,         Fabry, Gaucher,         Krabbe and         Niemann Pick).</li> </ul>	3 circles of 1 cm diameter of dried blood spot on Whatmann 903 special filter paper. Properly dried at RT for 4 hours before putting in plastic bag. Transport at RT.
3.	Lysosomal Acid Alpha Glucosidase (POMPE)	Enzymatic	<ul> <li>Suspected lysosomal storage disease or pompe disease.</li> </ul>	3 circles of 1cm diameter of dried blood spot on Whatmann 903 special filter paper. Properly dried at RT for 4 hours before putting in plastic bag. Transport at RT.
4.	Urine Oligosaccharide	Thin Layer Chromatography	Suspected lysosomal storage disease / oligosaccharidosis	5 ml 1 <sup>st</sup> morning urine collected in universal bottle without preservative. Transport frozen in dry ice.
5.	Urine Sialic acid	Quantitation spectrophotometer	Suspected for LSD / Sialidosis	5 ml 1 <sup>st</sup> morning urine collected in sterile bottle, freeze immediately.  Transport frozen in dry ice.
6.	MPS Enzyme assays (after consultation only) Galactose-6- sulphatase	Enzyme activity	Coarse facies, Hepatomegaly dystosis multiplex, scoliosis, other clinical suspicion of MPS.	6 ml whole blood (EDTA). Transport in ice. DO NOT SPIN & SEND WHOLE BLOOD.
7.	LSD Enzyme assays (after consultation)	Enzyme activity	<ul> <li>Neurorgression, leucodystrophy, organ enlargement, dysmorphism.</li> </ul>	5 ml whole blood (EDTA). Transport in ice. DO NOT SPIN & SEND WHOLE BLOOD.

### f) Other Biochemical Genetic Testing

No.	Biochemical Genetics Test	Method	Indications	Pre-Analytical Procedure
1.	Urine Delta ALA	Quantitative By HPLC	Suspected:  Tyrosinemia Type I  Porphyrias	2 ml of random / 24 hours urine, collected in sterile bottle, without preservative. Transport frozen in dry ice. Protect from light.
2.	Urine Porphyrin / Porphobilinogen/ Corpophophyrin	Qualitative	Suspected:  Tyrosinemia type I  Porphyrias	5 ml fresh random urine in universal bottle (protect from light). Transport frozen in dry ice.
3.	Plasma VLCFA & Phytanic acids	Quantitative by GCMS	Suspected Peroxisomal disorders: FTT Neuroregression Seizure Facial dysmorphism Skeletal abnormalities Hepatopathy Hypotonia	1 ml of plasma (EDTA) / Heparin. Freeze immediately. Transport frozen in dry ice.
4.	Plasma pipecolic acid	Quantitative by ion- exchange HPLC	To differentiate     between     peroxisomal     biogenesis disorder     and peroxisomal     beta oxidation.	2 ml of heparinized plasma collected 4 hours after meal, centrifuge and freeze immediately. Transport frozen in dry ice.
5.	Urine 5-HIAA	Quantitative by reverse phase HPLC with ECD	Carcinoid     syndrome, flushing     of face, neck and     upper body,     diarrhea, liver     tumor, colicky     stomach ache.	2 ml of 24 hours urine. 24 hours urine preserved in 10 ml 25% HCL. Record 24 hours urine volume on the request form. Transport frozen in dry ice.
6.	Urine Myoglobin and hemoglobin	Qualitative	Suspected leptospirosis, fatty acid oxidation defect, compartment syndrome.	5 ml fresh urine collected in universal bottle. Transport in ice.

### 6.3 Plasma Renin Aldosterone

The test is to screen for primary hyperaldosteronism in hypertensive patients with spontaneous or diuretic-induced hypokalaemia. Suggested candidates for screening are ;

- Patients with hypertension and hypokalemia.
- Patients with resistant hypertension.
- Young hypertensive (age < 40).</li>
- Patients with adrenal incidentaloma.

The renin-aldosterone axis is primarily regulated by renal blood flow. Subjects under investigation should, therefore, not be taking any drugs that interfere with fluid balance or potassium. Patient preparations are as follows;

- Drugs to avoid : spironolactone, ACE inhibitors, ARB, beta-blockers, cyclic progestogens, estrogens and licorice.
- Drugs that do not interfere with the renin-aldosterone axis include : prazosin, verapamil and terazosin.
- Subject should be normally hydrated and has an adequate oral intake of sodium.
- Avoid hypokalaemia as it suppresses aldosterone secretion. Give potassium replacement (Slow K tabs) sufficient to raise plasma potassium >4.0 mmol/L. Replacement should be stopped on the day of the test.
- Spironolactone must be stopped for 6 weeks to be certain that any elevation in plasma renin activity is not due to its inhibition of aldosterone.
- All interfering drugs should be stopped, but if this is impractical, a best pragmatic approach is to stop ACE inhibitors, beta-blockers for 2 weeks and to avoid Cachannel blockers on the day of the test.

### Requirements

- Pottasium EDTA (K<sub>2</sub>EDTA) tube for renin (DRA).
- Potassium EDTA (K<sub>2</sub>EDTA) tube for aldosterone.
- Blood samples should be sent rapidly to the laboratory but **not in ice** (within 30 minutes) as cooling would cause cryoactivation, leading to falsely raised renin.

### **Procedure of collection**

- a) The patient should remain seated for 10 minutes prior to venipuncture.
- Collect samples into 2 tubes of EDTA. (Please use different tubes for Renin and Aldosterone. Suggest to collect minimum 3ml blood per sample, as at least 500ul plasma need for each analsis)
- c) Fill up the PER.PATH 301 form. Only single form is required for requesting Aldosterone Renin Ratio (ARR).
- d) Patient's clinical history and drug history are MANDATORY.
- e) Test should be requested by Specialist / Endocrine Specialist only.
- f) Please record patient's posture whether supine or upright.
  - Supine sample : sample taken in the early morning before the subject arises, if feasible.
  - Uprights sample: subject should be upright for ≥ 2 hours prior to sampling.
- g) Samples should be taken between 8 am to 10 am.

### Notes:

- Plasma must be separated immediately (transfer the plasma into a plastic tube).
- Minimum volume for plasma renin and plasma aldosterone is 500ul of plasma for each analyte.
- Samples for both renin and aldosterone should be frozen as soon as possible (-20°C or lower).
- Sample tubes should each have with the following information (barcode label or manual labeled).

### 6.4 Stool For Reducing Sugar

### **Procedure**

- a) Collect stool sample into stool container and fill up the PER.PATH 301 form.
- b) Sent both sample and form to the lab immediately.



## DRUGS OF ABUSE SPECIMENS







### **DRUGS OF ABUSE SPECIMENS**

### 1. INTRODUCTION

The role of this laboratory is as followed;

- a) To carry out analysis of drugs of abuse in urine :
  - Screening test for Opiate.
  - · Screening test for Cannabinoids.
  - Screening test for Amphetamine Type Stimulants (ATS).
  - Confirmation test for Morphine.
  - Confirmation test for Cannabinoids (11-nor-delta-9-tetrahydrocannabinol-9carboxylic acid).
  - Confirmation test for ATS.
- b) To provide consultation services in the area of drugs testing.

### 2. REQUEST FOR DRUG ANALYSIS

- a) The request form used for drugs of abuse analysis is Borang Permintaan Ujian Pengesanan Dadah Dalam Air Kencing.
- b) All requests for drug analysis should be accompanied with the drug analysis request form for at least 2 copies. For ATS analysis, the request form must be issued separately (also in 2 copies).
- c) All request form should be completed by requesting officer for the drug analysis.
- d) The authorized personnel to request for drug analysis:
  - Registered Medical Officer.
  - Police Officer (not below the rank of Sergeant or any other officer in charge of a police station).
  - Rehabilitation Officer from the Agensi Anti Dadah Kebangsaan (AADK).
  - Customs Officer.
- e) Completed form should be signed and stamped with the departmental stamp.
- f) Name and Identity Card (I/C) number of the suspect should be clearly printed as on his / her identity card.
- g) Name and I/C number of the officer supervising the collection and the person dispatching the specimen should be printed clearly.

### 3. URINE COLLECTION

- a) Samples shall be collected by authorized trained personnel of the :-
  - Outpatient Department / Clinic, Accident and Emergency Department, Psychiatric Clinic and wards of the hospitals.
  - Police Department, Rehabilitation Centers and (AADK).
  - Other centers / agencies that are authorized by the government for collection of samples for the purpose of drugs of abuse testing.
- b) Laboratory personnel shall not be involved in the sample collection.
- Suitable toilet facilities must be available before collection of urine is considered.
- d) The toilet must be surveyed for any contraband which can be used to invalidate the sample. Toilet facilities can be set up without soap dispenser or cleaning agents.
- e) The volume of urine sample should be sufficient for analysis or at least **30ml**. This is to ensure that further analysis can be carried out to confirm the presence of drugs in the urine.
- f) After the urine is collected, the bottles should be securely stoppered and labeled as follows:

Name:

I/C Number:

Date of collection:

Test requested:

Labeling of the bottles should be made in front of the suspect.

g) The stopper of the bottle should be sealed with sealing wax stamped with the departmental seal.

### 4. SECURITY OF THE SPECIMEN

- a) The security of samples as well as empty cups, request forms, labels and other packing materials is critical.
- b) Suspect should not be allowed to have any involvement in the collection, labeling and packing or transporting of samples to the laboratory.
- c) It is important that the suspect witness the sealing of the bottle and sign or initial the seal.
- d) Accurate and complete records of all individuals involved in the urine collection, storage and transport should be maintained.

- e) Specimen label should be affixed to the urine container not to the lid. This will prevent accidental or intentional switching of specimens and identifying labels.
- f) Proper Chain of Custody should be maintained.

### 5. TRANSPORT OF SAMPLES TO DRUG LABORATORY

a) After the request form has been completed, the samples with the forms are given to the dispatch person to be sent to the drug laboratory.

**Reminder**: Suspect should never be permitted to transport samples to the laboratory.

- b) Samples shall be transported in a container, which shall be securely sealed or locked. Ice pack shall be used when necessary.
- c) In the laboratory, the lab personnel receive, check the samples against the forms, and sign the dispatched book.
- d) After examining the samples and request forms, the dispatch person has to fill the Chain of Custody form provided by Drug Laboratory.
- e) Urine specimen should be stored at 2°C- 8°C and locked if analysis is delayed.
- f) Specimens collected by police / outside personnel should be sent to the laboratory immediately.

### 6. REPORTING OF RESULTS

- Screening and confirmation results shall be reported by Pathologist / Biochemist.
- b) Any amendment of reports shall be crossed, signed and dated.
- c) Laboratory Turn Around Time for tests shall be:
  - Screening: Not more than 3 working days.
  - Morphine and Cannabis confirmation : Not more than 5 working days.
  - ATS Confirmation: Not more than 7 working days (URGENT only).
     Not more than 1 month (NOT URGENT).
- d) Results shall be reported according to the drugs tested.
  - i) Positive results shall be reported as:-
    - ADA MENGANDUNGI 11-nor-delta-9-tetrahydrocannabinol-9-carboxylic acid (Kaedah Thin Layer Chromatography)
    - ADA MENGANDUNGI MORPHINE (Kaedah Thin Layer Chromatography)

- ADA MENGANDUNGI AMPHETAMINE (Kaedah Gas Chromatography Mass Spectrometry)
- ADA MENGANDUNGI METHAMPHETAMINE (Kaedah Gas Chromatography Mass Spectrometry)
- ADA MENGANDUNGI 3,4-METHYLENEDIOXYAMPHETAMINE (MDA) (Kaedah Gas Chromatohraphy Mass Spectrometry)
- ADA MENGANDUNGI 3,4-METHYLENEDIOXYMETHAMPHETAMINE (MDMA)
   (Kaedah Gas Chromatography Mass Spectrometry)
- ii) Negative results shall be reported as:-
  - TIDAK MENGANDUNGI MORPHINE (Kaedah Immunoassay)
  - TIDAK MENGANDUNGI 11-nor-delta-9-tetrahydrocannabinol-9-carboxylic acid (Kaedah Immunoassay)
  - TIADA MENGANDUNGI AMPHETAMINE TYPE STIMULANTS (ATS) (Kaedah Immunoassay)
  - TIDAK MENGANDUNGI MORPHINE (Kaedah Thin Layer Chromatography)
  - TIDAK MENGANDUNGI 11-nor-delta-9-tetrahydrocannabinol-9-carboxylic acid (Kaedah Thin Layer Chromatography)
  - TIDAK MENGANDUNGI AMPHETAMINE (Kaedah Gas Chromatography Mass Spectrometry)
  - TIDAK MENGANDUNGI METHAMPHETAMINE (Kaedah Gas Chromatography Mass Spectrometry)
  - TIDAK MENGANDUNGI 3,4-METHYLENEDIOXYAMPHETAMINE (MDA) (Kaedah Gas Chromatohraphy Mass Spectrometry)
  - TIDAK MENGANDUNGI 3,4-METHYLENEDIOXYMETHAMPHETAMINE (MDMA)
     (Kaedah Gas Chromatography Mass Spectrometry)

#### 7. DISPATCHING OF RESULTS

- a) Results are dispatched to the identified and authorized personnel only.
- b) Means of dispatching results:
  - By hand (single sealed envelope)
  - By post (double sealed envelope).

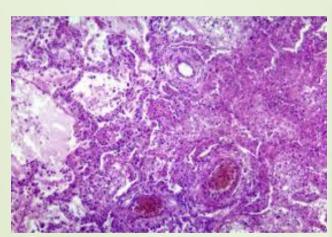
Note: Sealed envelope (wax seal / Lakri Rasmi with departmental stamp)

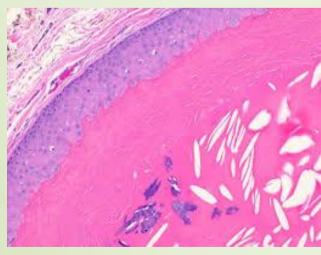
c) The name and signature of personnel collecting the results are recorded in the Chain of Custody form with the date the results were taken.

#### 8. LIST OF TESTS UNDER DRUG LAB - Office Hour only

TEST	CONTAINER	VOLUME	FORM
<ul><li>Opiates (Morphine)</li><li>Cannabinoids</li><li>Amphetamine Type Stimulants (ATS)</li></ul>	Universal Sterile Container	30 ml (2 bottles) (Medicolegal-seal)	Borang Permintaan Ujian Pengesanan Dadah Dalam Air Kencing. (4 copies)
<ul><li>Opiates (Morphine)</li><li>Cannabinoids</li></ul>		30 ml (1 bottle) (Medicolegal-seal)	Borang Permintaan Ujian Pengesanan Dadah Dalam Air Kencing. (2 copies)
Amphetamine Type Stimulants (ATS) Only		30 ml (1 bottle) (Medicolegal-seal)	Borang Permintaan Ujian Pengesanan Dadah Dalam Air Kencing. (2 copies)

# HISTOPATHOLOGY







#### HISTOPATHOLOGY

#### 1. INTRODUCTION

This unit provides tests on tissue specimen. The specimen is in the form of surgical or non-surgical removed tissue specimen or fresh tissue for frozen section.

Routine histopathological examination specimens are received during office hours but if unavoidable it should be sent to the Integrated Lab counter.

#### 2. TEST REQUEST

- a) Urgent request should be stated in HIS. For requests from external, it should clearly be stated at the top corner of the request form PER-PAT 301.
- b) Appointment for Frozen Section service is to be made at least 3 days before operation or at the discretion of the pathologist. Prior discussion between the pathologist and clinical specialist / Medical Officer is needed before agreeing on a frozen section request.

Please inform the laboratory when:

- The patient is wheeled into the operation room.
- The frozen section examination is cancelled.
- c) Refer to point 10 for procedures requesting clinical post mortem.

#### 3. HISTOPATHOLOGY SPECIMENS

The correct handling of specimens for morphological assessment is critical. When ir doubt consult the pathologist.

Complete patient data, pertinent clinical information and remark of specimen must be included in the HIS or request form if using PER-PAT 301. Type of specimens:

- a) Surgically removed tissue
- b) Non-surgically removed tissue
- c) Frozen section

#### 4. HANDLING HISTOPATHOLOGY SPECIMENS

- a) All specimens for routine histological examination are to be fixed in 10% neutral buffered formalin contained in suitable leak-proof containers.
- b) The volume of formalin **MUST BE MORE THAN** 10 times that of the specimen to be fixed.
- c) **DO NOT** put large specimens in small containers as this would prevent proper fixation of the tissue and also distort the specimen.

- d) For adequacy of surgical excision in malignant neoplasm, the margins must be marked accordingly by sutures or by diagrammatic representation of the excised specimens.
- e) All specimens should have the same identification as that written on the request forms.
- f) Specimen for frozen section is sent fresh without fixative or in gauze moistened with normal saline to prevent drying; in closed containers.
- g) Specimen for Immunofluorescence studies MUST be put in phosphate buffer solution (PBS).

#### 5. RECEPTION OF SPECIMEN

- a) Specimen for routine histological examination should be sent directly to Histopathology Counter.
- b) Specimen for frozen sections **MUST BE** sent immediately upon removal to the laboratory by the Medical Officer.
- c) Specimens for Immunofluorescence studies **MUST BE** sent immediately to the Histopathology laboratory.

#### 6. SERVICE - AFTER OFFICE HOURS

Routine specimen shall be sent in office hour only. If unavoidable, it shall be sent to the Integrated Lab counter.

#### 7. REJECTION OF SPECIMEN

- a) The specimen will be rejected / hold if it is not suitable for analysis or if any discrepancy noticed.
- b) Correction should be done by the responsible ward or clinic staff as soon as possible.

#### 8. DISPATCH OF REPORT

- a) Report for internal specimen can be viewed via HIS system.
- b) Reports for external specimens from district hospitals and *pusat kesihatan* will be printed and can be collected directly from the laboratory.
- c) Tracing of result via telephone is not encouraged. However, if required, only pathologist is allowed to verbally inform the result to the respective clinician.

#### 9. LABORATORY TURN AROUND TIME

- a) Within 3 working days of urgent biopsies.
- b) Within 14 working days of urgent big specimens.

#### These Turn Around Time is not applied for:

- a) Complex cases.
- b) Further Tests (Deeper, Special Stain, Immunohistochemistry and regrossing).
- c) Cases that require consultation.

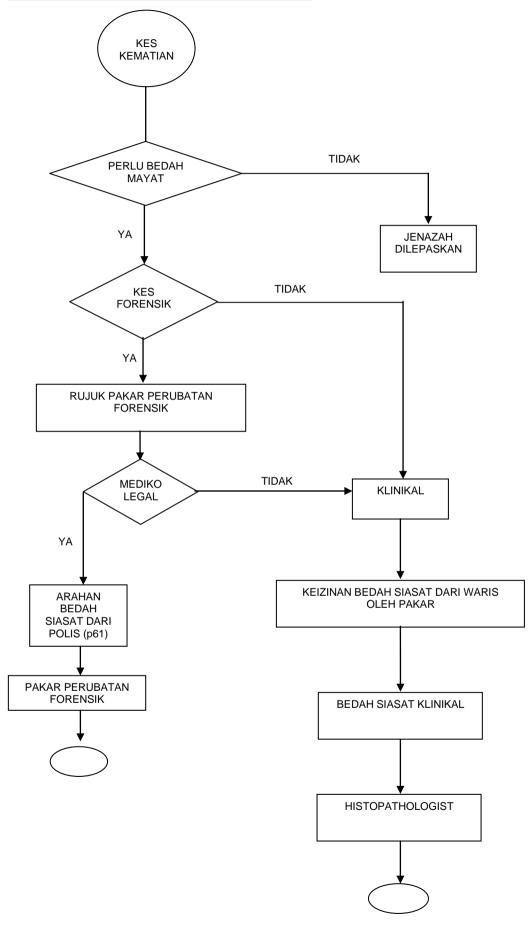
#### 10. CLINICAL POST - MORTEM

The post-mortem is conducted to ascertain the cause of death and study the effects of treatment in clinical (non-medico legal) cases.

The following procedures should be followed:

- a) The requesting clinician will first obtain written consent from the next of kin by completing the "Consent Form for Clinical Post-Mortem Examination".
- b) Request should then be communicated directly to the pathologist on call.
- c) Clinical summary and case notes are prepared and made available to pathologist on duty.
- d) The requesting clinician should be present during the autopsy.

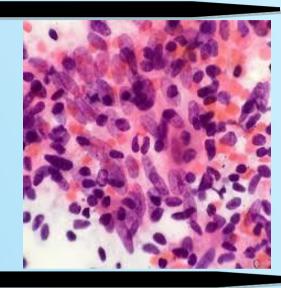
#### **CARTA ALIRAN PERMOHONAN BEDAH MAYAT**

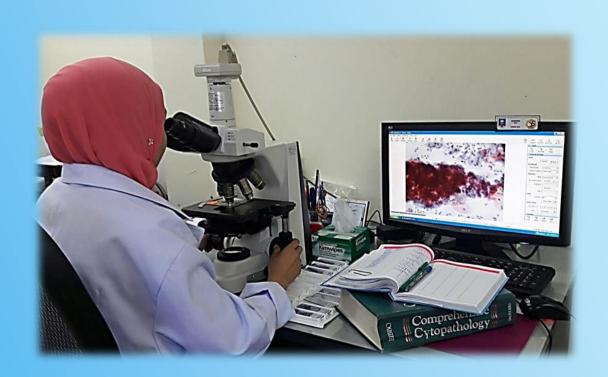


#### SENARAI KES-KES YANG PERLU DIRUJUK KEPADA / MENGHUBUNGI PAKAR PERUBATAN FORENSIK

- Kes bunuh Homicides, suicides.
- Kematian yang mencurigakan.
- Mayat yang dijumpai di lokasi awam tidak dapat dipastikan sebab / punca kematian.
- Kematian tanpa saksi (Unwitnessed Death) contohnya kematian langgar lari.
- Semua kematian yang disyaki disebabkan oleh racun.
- Kematian kanak-kanak.
- Penderaan dan pengabaian kanak-kanak.
- Kematian dalam tahanan (mahkamah/polis).
- Kematian dalam institusi (sekiranya terdapat keraguan jenayah).
- · Kematian ibu mengandung.
- Kematian "anaesthetic", "perioperative" dan kemungkinan kecuaian hospital.
- Rangka manusia.
- Kematian warga asing.
- Kematian beramai-ramai (contoh : Bencana Ramai-Mangsa).
- Mayat yang digali semula (exhumation of dead bodies).

## CYTUPATHULUGY





#### **CYTOPATHOLOGY**

#### 1. INTRODUCTION

This unit provides tests for:

- a) Gynaecology (Pap smear)
- b) Non-gynaecology
- c) Fine Needle Aspirate (FNA)

Routine cytology specimens are received during office hours at histo / cyto counter but if unavoidable / after office hour it should be sent to the Integrated Lab counter.

#### 2. REQUEST FORMS:

- a) Internal request: using HIS system. For Gynaecology sample, a copy of the request form (PS 1/98 (Pindaan 2007)) must be printed from HIS and send together with the sample to the laboratory.
- b) External request (from Klinik Kesihatan and district hospital):
  - i) PS 1/98 (Pindaan 2007) for Gynaecology test (Pap smear).
  - ii) PER-PAT 301 for FNA and Non-Gynaecology test.

#### 3. CYTOLOGY SPECIMENS:

- a) Gynaecology (Pap smear).
- Non-gynaecology (Body fluid, sputum, urine, bronchial brushing and washing, and others fluid).
- c) Fine needle aspirate.

#### 4. HANDLING CYTOLOGY SPECIMENS

#### a) Gynaecology:

- i) Use only frosted-end slide for Pap Smears. Write patient name and identification number on the frosted-end using pencil.
- ii) The smear should be placed immediately in 95% alcohol for at least 15 minutes.
- iii) If more than one slide is to be placed in the same container during fixation, please ensure that they are not facing one another.
- iv) Send the smear together in a suitable container with completed form (PS/1/98 (pindaan 2007).

#### b) Non-Gynaecology:

- i) Fluids are best collected into a dry container and properly labeled.
- ii) Send immediately to the within office hours.
- iii) If delay in transportation to the laboratory is unavoidable kept refrigerated at 2°C 8°C (72 hours) and send immediately to the lab the next morning. If a longer delay is expected, preservation at the time of collection with 50% ethanol equal to the volume of the specimen is suggested.
- iv) For internal request, the type of specimen should be written in the 'Remarks' field. For external request, the type of specimen must be clearly written in the request form.
- v) For CSF specimen, the sample should be sent in a fresh state to the lab, without stored in the room temperature or refrigerated.

#### c) Fine Needle Aspirate :

- i) The clinic is run twice a week (Sunday and Tuesday morning) at the surgical clinic from 10.00 am to 12.30 noon.
- ii) The appointment booking should be requested via HIS or telephone. For patient from district hospital, the appointment should be made directly to the medical officer on FNAC call.
- iii) The order request should be ordered via HIS.
- iv) Only medical officers or specialist can request for FNAC.
- v) To ensure the quality in doing the FNAC, the number of cases is limited to 15 per session.
- vi) Urgent cases where the test is required on any other day than Sunday or Tuesday, the request should be made directly to the Pathologist or Medical Officer in charge at least one day before.
- vii) Written consent is required for the procedure.
- viii) For district hospital running their own Fine Needle Aspiration procedure, they can send slides to the lab together with PER-PAT 301 form.

#### 5. SERVICE AFTER OFFICE HOUR

Cytopathology unit only operate during office hour. After office hour, the specimen should be sent to the Integrated Lab Counter. In other circumstances (wherever applicable), please keep non-gynae sample at 2°C – 8°C and send to Cytopathology unit the next morning.

#### 6. REJECTION

The specimen will be rejected if not suitable for the analysis or if any discrepancy is noticed.

#### **Rejection Criteria**

- 1. For Non-Gynae, the type of specimen is not stated in 'Remarks' field.
- 2. Identification card number and name on the form or system not tally with the label on the specimen.
- 3. The test requested is not available in the Cytopathology Unit.
- 4. Broken slide beyond repair.
- 5. Empty or no visible smear on the slide.
- 6. Slide smeared on both side.
- 7. No label on the specimen or slide.
- 8. External sample not accompanied with request form.
- 9. No request form accompanied internal Pap smear request.
- 10. No HIS barcode accompanied internal request.
- 11. No specimen or slide accompanied request form.

#### 7. DISPATCH OF REPORT

- a) Report is readily viewed from HIS system for internal specimens.
- b) As for district hospital, the results will be dispatched to the pigeon hole of the respective district hospital or Klinik Kesihatan.
- c) Tracing of result via telephone is not encouraged. However, if required only Pathologist and/or medical officer is allowed to verbally inform the result to the respective clinician.

#### 8. LABORATORY TURN AROUND TIME

- a) Urgent Non-Gynaecology and Fine Needle Aspirate (FNA)
  - Within 5 working days
- b) Routine Non-Gynaecology and Fine Needle Aspirate (FNA)
  - Within 14 working days
- c) Gynaecology (Pap smear)
  - Within 21 working days

# BLOOD TRANSFUSION SERVICE





#### **BLOOD TRANSFUSION SERVICE**

#### 1. INTRODUCTION

Blood Transfusion Unit is divided into two different sections, Blood Donation and Laboratory section. The Laboratory section provides 24 hours services.

#### 2. BLOOD DONATION SECTION

The function of this section is for collecting blood from blood donors by :

i. Mobile Sessions

These donations groups usually organized by non-government organization, universities or colleges, private companies or from government departments.

ii. In house (Walk In) Blood Donations

Individual or a group of donors come to the unit to donate blood during office hours or by appointment.

#### 3. LABORATORY SECTION

The function of this section is to ensure that safe, appropriate and adequate blood and blood products are provided to the patients. This section is divided into 3 smaller sections.

#### 3.1 Crossmatching Section

It carries out full blood grouping and cross matching tests in order to ensure compatible blood is given to patients.

#### 3.2 Immunohematology Section

A more complex blood serology tests as well as workout for incompatible blood are being carried out here. A list of tests includes:

- i. Direct Coomb's Test
- ii. Indirect Coomb's Test
- iii. Antibody Identification
- iv. Red cell phenotyping
- v. Anti-D titer
- vi. Transfusion Reaction Investigation

#### 3.3 Components Preparation Laboratory

This section prepares and stores blood components for patient's use whenever indicated. The blood components that are available are whole blood, packed red cells, Fresh Frozen Plasma (FFP), cryoprecipitate, random and apheresis platelets.

Note: Screening tests for Transfusion Transmitted Infectious disease for donors are done in National Blood Centre Kuala Lumpur.

#### 4. ORDERING BLOOD

- 4.1 Prescribing blood and blood products is the responsibility of the doctor managing the patient. However, the doctors need to consult Blood Bank Medical Officer to facilitate the request.
  - a) The request form, Borang Permohonan Transfusi Darah (PER-SS-BT 105) should be filled in completely and contain relevant patient information, i.e. name, identity card number, sex, reason for transfusion, blood group (if known), previous transfusion reaction and any other relevant information
  - b) The hospital registration number (MRN) should be used on the request form of patients who, at the time of admission, cannot be reliably identified. This MRN must be 'unique' and any investigations for this patient must be identified using this number. When the patient's full and correct details are available the ward personnel should accurately communicate this to the Blood Bank.
  - c) The approximate time when the blood would be required must be stated. Requests for blood to be made available "as soon as possible" should be avoided as this would not assist the blood bank personnel in determining priorities.
  - d) The quantity of the blood / blood component required should be written on the request form.

The request form should be signed by the requesting doctor and his/her name should be stamped or written in capital letters clearly.

#### 4.2 Group, Screen and Hold (GSH)

A GSH protocol consists of determination of the ABO and RhD grouping, and screening for unexpected red cell antibodies. The patient's serum or plasma is subsequently retained for 72 hours in the blood bank in the event that cross matched blood is required within that period.

In circumstances where the likelihood of blood needed for transfusion, is minimal a GSH protocol is recommended in the first instance. If blood is required following GSH, matched blood should be made available for issue on time (30 minutes for urgent request). A GSH protocol should be in conjunction with Maximum Surgical Blood Ordering Schedule (MSBOS).

## 4.3 Blood samples requirement for blood components such as platelet, fresh frozen plasma and cryoprecipitate :

- a) All requests must be approved by Blood Bank Medical Officers. A new request for blood components other than red cells shall be accompanied by a blood sample taken in EDTA tube.
- b) A new blood sample need NOT accompany the request form for blood components for a patient with at least 2 previous blood grouping records at blood bank.
- c) The blood components should only be collected when needed.

#### 5. RECEIVING REQUEST

Blood bank staff must ensure that the request form is properly filled and the corresponding samples are correctly labeled before accepting the request.

#### 6. COLLECTION OF BLOOD SAMPLE

- a) The collection of blood samples, for blood grouping and compatibility tests must be taken from the correct patient by the doctor in charge.
- b) The doctor who takes the blood, whenever possible, ask the patient to state his/her full name. Please ensure the name correspond to the name on Bed Head Ticket (BHT) and wrist band tag.
- c) Unconscious patient MUST be identified by the information given on the identity band, such as the wristband.
- d) The person who takes the blood and the person who labeled the blood sample MUST be the same person.
- e) The label should include the patient's full name, hospital registration number, or identity card (IC) number, date and time of collection and the initial/signature of the person taking the blood.
- f) Each sample tube must be labeled clearly and immediately at the patient's bedside after blood is collected from each patient.

Note: NEVER collect more than one patient sample at a time. This is to prevent mix up samples and the risk of incorrect blood and blood component transfused.

#### 7. SPECIMEN COLLECTION AND HANDLING

#### 7.1 Infant (less than 4 months of age)

- a) Infant blood sample should be accompanied by mother's blood sample.
- b) 1 ml blood sample in EDTA Tube from the infant and 3-5 ml blood sample in EDTA tube from the mother shall be sent using one request form.

- c) The baby's ABO group is determined from the red cells alone since the corresponding antibodies will be weak or absent in the serum. The maternal serum should be screened for the presence of atypical antibodies and a direct antiglobulin test (DAT) done on the neonate's red cells.
- d) If the maternal blood is unavailable a neonatal sample should be screened to exclude atypical antibodies. The serum may contain passively transferred maternal antibodies.

#### 7.2 Adult and children (patient above 4 months age)

- a) 3-5 ml blood sample in EDTA tube sample accompanied by request form.
- b) In cases of massive bleeding when many units of blood / components are required, more samples and request forms may be needed.
- c) If the patient requires repeated transfusion during the current admission, a new blood sample with request form is needed for each request.

Note: Blood sample together with completely filled request form (PER-SS-BT 105) must be sent to the Blood Bank without any delay.

#### 7.3 Outsource Sample

All outsource samples will be sent through Blood Bank HSNZ to National Blood Centre, Kuala Lumpur after consultation with Medical Officer / Transfusion Medicine Specialist in charge.

For Platelet Antibody Investigation, please refer Borang Permohonan Rujukan Ujian Platelet Immunologi (PDN/IH/QP-03/03).

#### 8. COLLECTION OF BLOOD FOR TRANSFUSION

The blood can be collected from the MLT who is responsible for issuing the blood in the Blood Bank at any time (24 hours). The blood will reserved for the patient up to 48 hours from the time the blood is required.

'Blood Collection slip' (printed from HIS) must be presented during blood and component collection.

## 9. PROCEDURE OF GROUP AND CROSS MATCH IN EMERGENCY SITUATION

The procedure for the identification of patients, labeling of tubes and filling of request forms in an emergency must be strictly followed.

- a) The request for emergency must be taken and sent by a doctor.
- b) All emergency requests should be accompanied by phone call to the doctor on-call in the blood bank to assist the process.

- c) Blood with emergency cross-match can be provided within 30 minutes.
- d) The names of the persons who made the request and who receive the request should be documented.
- e) If patient's condition fulfills Massive Transfusion Protocol Criteria, activate Massive Transfusion Protocol (refer appendix 2).
- f) Although emergency blood has been released for use, full group and cross matching procedures must still be undertaken immediately. Problems encountered during the cross matching must be notified to the clinician concerned immediately to enable timely patient intervention.

Table 1: Estimated time needed for the different type of blood requests

Turn-around time	Type of request		
Immediately	No cross matching. Safe O given.		
Within 30 min	- Emergency Cross matching		
	- Convert from GSH (URGENT)		
2 hours	Complete/ full cross matching		
	(May take longer time in presence of RBC antibody)		

## 10. TRANSPORT, STORAGE AND TRANSFUSION OF BLOOD / BLOOD COMPONENT TO WARD

- a) Blood and blood component must be kept at the appropriate temperature.
- b) Blood and blood component should not be stored in the ward refrigerator BUT should be returned to the blood bank as soon as possible if not transfused.
- Refer appendix 1 (Instructions On Proper Handling Of Blood And Blood Components In The Ward) for details.
- d) The transfusion of blood should start within 30 minute after it is removed from laboratory blood refrigerator and must be completed not more than 4 hours to prevent bacterial contamination.
- e) Prior to transfusion, personnel in charge shall perform a positive patient identification.
- f) Before transfusion, the checking and the counter checking shall be done and documented as in transfusion checklist form.
- g) DO NOT transfuse if there is any non-compliance to the requirements.
- h) The patient shall be closely observed and monitored during blood transfusion.

#### 11. USED BLOOD OR REMNANT OF BLOOD

Blood discontinued for any reason must not be used again and must be returned to the Blood Bank as soon as possible. All discontinued blood must be labeled 'USED BLOOD' before it is returned to the Blood Bank. The details of the transfusion and the reasons for discontinuing the transfusion must be recorded.

#### 12. RETURN OF BAGS

#### 12.1 Used blood bags

Upon completion of blood transfusion, the ward personnel must complete transfusion event (IV Therapy) in HIS. The completed transfused blood bag must be returned to the Blood Bank together with the label attached at the biohazard plastic bags for proper identification. Should a recipient develop a delayed transfusion reaction, these bags can be retrieved for further investigation.

#### 12.2 Unused blood bags

All unused blood bags issued to the ward must be sent back to the blood bank immediately if the transfusion is delayed or cancelled together with 'Borang Senarai Semak Pemulangan Semula Darah'.

#### 13. RESERVATION OF CROSS-MATCHED BLOOD

Blood which has been cross-matched for any patient will be kept in reserve for 48 hours only. In the absence of specific instruction to the officer in charge of Blood bank, the blood will be returned (released) to the general pool automatically.

If it is known that the reserved blood is no longer required, the ward personnel must inform the MLT in charge of Blood Bank as early as possible so that it can be released.

#### 14. TRANSFUSION REACTION

All transfusion reactions must be investigated. Refer Transfusion Practice Guidelines for Clinician and Lab Personnel, 4th edition 2016 National Blood Center for various types of transfusion reaction and their management.

If an adverse transfusion reaction is suspected, the transfusion should be stopped immediately. The doctor in charge of the patient must be informed urgently to assess the patient. Further management depends on the type and severity of the reaction.

The following steps have to be taken to allow investigation into the reaction, especially for cases suspected to have acute or delayed hemolytic transfusion reaction:

#### <u>Labeled as Post-transfusion 1 (immediately):</u>

- a) Blood samples (at least 8-10 ml) should be taken in a EDTA tube for
  - i. Repeat ABO/Rh grouping
  - ii. Repeat crossmatching
  - iii. Direct and indirect antihuman globulin test (Coombs)
- b) Urine samples for haemoglobin and red cell.
- These specimens shall be accompanied by a request form for investigation of transfusion reaction.
- d) Blood for culture and sensitivity should be sent for reaction suspected to be due to bacterial contamination.
- e) In addition, for cases suspected of hemolytic transfusion reactions, further investigation should include full blood picture (FBP), liver function test (LFT) and lactate dehydrogenase (LDH).

#### Labeled as Post-transfusion 2 (after 24 hours):

- a) Second sample are required post reaction, which are:
  - 8-10 ml of blood sample in EDTA tube
  - 10 ml of urine sample for hemoglobinuria

**Important:** The blood bag (with the remaining blood) and infusion set (with all attached labels) should be preserved for culture. Secure it properly to prevent spillage and send immediately to Blood Bank together with the following forms which must be completely and accuracy filled.

#### 15. FURTHER INFORMATION

For further information about transfusion, user can refer to Transfusion Practice Guidelines for Clinicians and Laboratory Personnel 4<sup>th</sup> edition 2016 by National Blood Center.

#### Appendix 1: INSTRUCTIONS ON PROPER HANDLING OF BLOOD AND COMPONENTS IN THE WARD

	Whole blood / Red Cell	Platelet Concentrate	Plasma components
Supply	After Crossmatch	No Crossmatching required	<ul><li>No Crossmatching required</li><li>Should be thawed</li></ul>
Collection	Blood Box with Ice	Blood Box without Ice	Blood Box with Ice
Use	As Soon As Possible	Transfuse Immediately	Transfuse Immediately
Allowable Storage Temperature	2°C to 6°C	20°C to 24°C on agitator Do not store in fridge	More than -25°C (should not be stored or kept in the ward)
Return of unused blood to blood bank	Return immediately with borang pemulangan darah dan komponen	Return Immediately with borang pemulangan darah dan komponen	Return Immediately with borang pemulangan darah dan komponen
Return of used blood to blood bank	Return within 24 hour with label pembekalan darah attached to biohazard plastic bags.	Return within 24 hour with label pembekalan darah attached to biohazard plastic bags.	Return within 24 hour with label pembekalan darah attached to biohazard plastic bags.

#### Appendix 2:

#### MASSIVE TRANSFUSION PROTOCOL



## Massive Transfusion Protocol



#### Criteria for activation of MTP

- Blood loss more than 150ml/min
- Blood loss more than 50% of blood volume in less than 3 hours
- Persistence of class III shock despite of 2 L fluid resuscitation (1 L Crystalloid and 1 L Safe O blood)
- Trauma-associated Severe Hemorrhage (TASH) scoring ≥ 16
- Transfusion of more than 40 m ls blood/kg in a child

#### Activation done by

- Call MTP Hotline Blood Bank Ext. 2722
- MTP Coordinator to inform Blood Bank Specialist Oncall / MO

#### Information Required

MTP Coordinator's contact no Patient's detail: Name, RN / IC Cause of bleeding & Location

Sample Required (MTP Kit) 3 EDTA tube and 2 GXM Form Order Massive Transfusion Protocol (MTP) in HIS

- Bring copy of GXM form each time collect blood from blood bank
- Appoint runner to collect blood products throughout MTP
- Use blood warmer/rapid infuser device to prevent hypotherm ia

#### Optimise

- Oxygenation Tissue perfusion
- Monitor (60 min) - FBC. - Coagulation Profile
- Metabolic Cardiac output - ABG - Calcium

#### Aim For

- Plate let > 50 x 109/L PT/APTT < 1.5 x Normal IN R ≤ 1.5
  - Fibrinogen >100mg/dl Temperature > 35°C
- pH > 7.2 Base excess < -6 Lactate < 4 mm ol/L Ca2+ > 1.1 mol/l

#### ACTIVATE MTP (EXT. 2722)

Use 2 units Safe O available on site Consider Tranexamic acid in trauma

#### 1st PACKAGE (15 MIN)

- 4 units Safe O or 4 units Emergency Crossmatched Packed Cells (if sample available)
- 4 units FFP

#### 2<sup>nd</sup> PACKAGE (< 45 MIN)

- 4 units Packed Cells (Full/EM CXM)
- 4 units FFP
- Consider 4 units Platelet and/or 6 units Cryoprecipitate (on request)

#### SUBSEQUENTLY

Based on request

#### STOP (CALL 2722 TO DEACTIVATE)

Bleeding arrested or DNAR order or patient death





#### **HAEMATOLOGY**

#### 1. INTRODUCTION

The Haematology Laboratory provides routine and specialized haematology testing for HSNZ and referred samples from District Hospitals and Health Clinics in Terengganu.

For the offered tests, please refer to the 'List Of Tests Available At Pathology Department' and 'List Of Tests To Referral Laboratories'.

#### 2. REQUEST FORMS

- a) No request form is used for internal requests as order can be made from HIS.
- b) Use PER\_PAT 301 for external requests i.e samples from District Hospitals and Health Clinics in Terengganu.
- c) For the outsource test request form, please refer to the 'List Of Tests To Referral Laboratories'.

#### 3. METHOD OF SAMPLE COLLECTION

#### 3.1 Full Blood Count / Full Blood Picture / Reticulocyte count / Kleihauer test

- Collect blood in EDTA tube and fill up to the mark as instructed by the manufacturer.
- Mix gently to ensure good anticoagulation.
- Cap the tube tightly.
- Send to the laboratory within 2 hours of sample collection (EDTA changes start to set in after 2 hours of sample collection).

#### 3.2 PT/ APTT/ Fibrinogen/ D-Dimer/ DIC Screen

- In DIC screen; PT, APTT, Fibrinogen, D-Dimer test are included.
- Collect the exact volume of blood in trisodium citrate tube up to the mark as instructed.
- The blood volume to anticoagulant ratio of 9:1 is critical.
- Mix well by inverting the tube gently for 3-4 times.
- Send the samples to the laboratory within 2 hours of sample collection to avoid incorrect result due to stored sample.

#### 3.3 ESR

- Collect blood sample in ESR tube up to the mark as instructed.
- Mix thoroughly by gentle inversion to avoid clot formation.
- Align specimen barcode properly to avoid incorrect reading by the analyzer.

#### 3.4 Haemoglobin Analysis

- Collect blood sample in EDTA tube.
- Mix gently to ensure good anticoagulation.

- Please review Full Blood Count and provide the results on the Hb Analysis request to avoid unnecessary request.
- Please provide relevant information for family study. Details of index cases must be provided, which include name, relation to the patient, type of thalassaemia, I/C number and lab diagnosed.
- Requests with normochromic normocytic RBC indices and inadequate clinical history will be rejected.
- To discuss with Haematologist for complicated cases.

## 3.5 Special coagulation tests (Factor VIII assay/ Factor IX assay/ Lupus Anticoagulant/ Von Willerbrand study/ Thrombophilia study etc)

- Consult Haematologist before sending samples.
- Please refer to 'List Of Tests Available At Pathology Department' and 'List Of Tests To Referral Laboratories' for detail instruction.
- For sample collection, fill up sample to the mark as instructed. The blood volume to anticoagulant ratio of 9:1 is critical.
- Mix well by inverting the tube gently for 3-4 times of complete inversion.
- Send the samples to the laboratory within 2 hours of collection to avoid incorrect result due to stored sample.
- Requests with inadequate patient samples or clinical history will be rejected.

#### 3.6 Bone Marrow Aspiration

- Please call ext. no. 2877 for appointment as well as to arrange for other related test (eg. immunophenotyping, cytogenetic study, molecular study).
- Please call the lab technologist when patient is ready for the procedure.
- Lab technologist will help to smear the film and bring the specimen to the laboratory.

#### 3.7 CD4 / CD8 Enumeration

- This test is ONLY offered to patients with confirmed HIV positive (by ELISA) and not less than 3 months interval. The request made less than 3 months interval will be rejected.
- Analysis is carried out every Monday and Wednesday (except on Public Holiday)
- Fresh sample is preferred. Please send samples within 24 hours of draw.
- If sample is to be sent to HSNZ the following day, please maintain the sample at 20-25°C.
- Collect blood in EDTA tube and fill up to the mark as instructed.
- Mix gently by inverting the tube 6-10 times and place in biohazard plastic bag.
- Send sample to the laboratory as soon as possible. Samples must reach Haematology Laboratory by 11 am on Monday and Wednesday.
- NEVER use these samples:
  - Previously refrigerated specimen, as it can give aberrant results.
  - Samples obtained from patient taking *immunosuppressive drugs* as it can yield poor resolutions.

#### 3.8 Osmotic Fragility Test

- By appointment only.
- Collect blood into 1 lithium heparin tube and 1 EDTA tube.
- Mix well by inverting gently the tubes few times.
- Cap tube tightly and send to the laboratory as soon as possible.

#### 3.9 NAP Score

 Make appointment with laboratory so that direct smear can be done by lab technologist.

#### 3.10 Test for Cytogenetic / Chromosomal Study (Bone marrow)

- Collect bone marrow aspiration specimen in sodium heparin tube.
- Mix well by inverting gently the tube.
- Fill in the form for Chromosomal Study. (refer to the 'List Of Tests To Referral Laboratories')
- Lab technologist will bring the sample to Haematology lab together with the bone marrow slides.
- Sample will be sent to referral laboratory.

#### 3.11 Test for Cytogenetic / Chromosomal Study (Blood)

- Make an appointment with referral laboratory before sending the sample to Haematology Laboratory.
- Collect sample in 1 lithium heparin tube and 1 EDTA tube.
- Mix well by inverting gently the tube.
- Fill in the form for Chromosomal Study. (refer to the 'List Of Tests To Referral Laboratories').
- Sample must be freshly collected.
- Send sample with complete request forms to Haematology laboratory.
- Sample must reach Haematology lab by 11 am on Wednesday. To call haematopathologist if need special arrangement.
- Sample will be sent to referral laboratory.

#### 3.12 Immunophenotyping

- Consult Haematologist before sending samples.
- Samples must be freshly collected.
- Collect blood / bone marrow aspirates in 2 EDTA tubes.
- Mix well to avoid clot formation.
- Fill in Borang Permohonan Ujian PER\_PAT 301.
- Sample must reach Haematology lab by 11 am.
- Avoid sample collection on Thursday. To call haematopathologist if need special arrangement.
- Sample will be sent to referral laboratory.

#### 3.13 Molecular study

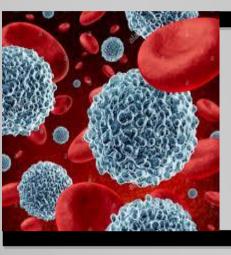
- Collect blood / bone marrow aspirates in EDTA tube.
- Mix well to avoid clot formation.
- Fill in request form.
- Sample must be freshly collected.
- Sample must reach Haematology Laboratory by 11 am.
- Avoid sample collection on Thursday. To call haematopathologist if need special arrangement.
- Sample will be sent to referral laboratory.
- Examples of molecular study available; BCR-ABL, PML- RARA, JAK2.

#### 4. SPECIMEN CONTAINER

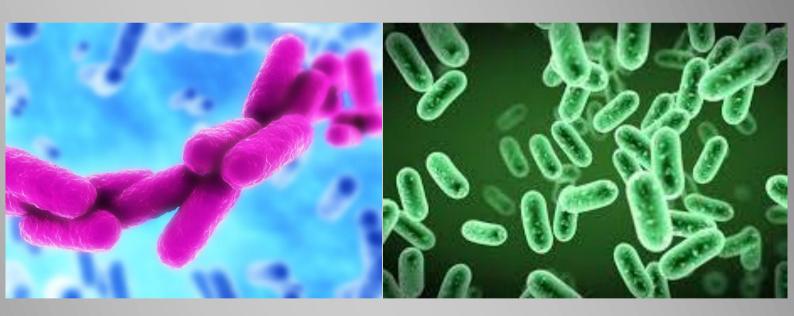
Specimen containers for the hematological tests can be obtained from the counter.

#### 5. RECEIPT OF SPECIMEN

All specimens will be received at the main counter, except for Bone Marrow Aspirates.



# MICRUBIULUGY



#### 1. INTRODUCTION

Microbiology unit in HSNZ consists of Bacteriology, Serology, Mycobacteriology and Molecular specifically are particularly involved in isolation or establishing the causative agents as well as monitoring and screening of the diseases.

#### 2. LIST OF SERVICES

Microbiology unit provides the following services:

- Diagnostic microbiological and consultancy services which comprise of bacteriology, mycology, parasitology, serology and immunology.
- Participations in hospital wide infection control activities related to surveillance, control and prevention of nosocomial infections.
- Provision of microbiologic studies of the hospital environment, outbreak management and sterility testing.

#### 3. SPECIMEN COLLECTION AND HANDLING

#### 3.1 General Guidelines

- Use universal precautions for collecting and handling all specimens.
- Whenever possible, collect all culture specimens prior to administration of any antimicrobial agents. Utilize appropriate collection devices, sterile equipment, and aseptic technique to collect specimens
- · Avoid contamination with indigenous flora.
- Swabs are convenient but inferior to tissue and fluid. All swabs are to be kept moist in a transport medium after the specimen is collected. Tissue and fluid are essential for fungal and mycobacterial culture.
- All specimens must be appropriately labeled with two patient identifiers or other specific hospital specimen label. A requisition needs to accompany each different specimen type.
- Specimens for bacterial culture should be transported at room temperature. Specimens for viral culture must be transported to the laboratory immediately on ice. Various types of transport media are provided depending on the type of culture required. See specific specimen and culture type for detailed collection and transport guidelines.
- Specimens should be in tightly sealed, leak proof containers and transported in sealable, leak-proof plastic bags. Specimens should not be externally contaminated. Specimens grossly contaminated or compromised may be rejected.

- If anaerobic culture is requested, make certain to use proper anaerobic collection containers
- Deliver all specimens to the laboratory as soon as possible after collection. This ensures
  the survival and isolation of fastidious organisms and prevents overgrowth by more hardy
  bacteria. It also shortens the duration of specimen contact with some local anesthetics
  used in collection procedures that may have antibacterial activity.

#### 3.2 Specific Collection Guidelines

#### 3.2.1 BLOOD CULTURE

Blood cultures should only be taken when there is a clinical reason to suspect a septicaemia. Blood cultures should not be taken for routine assessment or for the investigation of a localised infection. The emphasis should be on obtaining specimens of adequate volume, the performance of suitable numbers of blood cultures, and the use of strict aseptic technique. Blood cultures should be taken before administration of antibiotics.

An automated blood culture system is available to cater for different types of bottles according to age and tests. See appendix for different blood culture bottle and indication.

#### Collecting blood culture:

- a) Prepare blood collection set using aseptic non-touch technique (ANTT).
- **b)** Position the patient's that provides adequate exposure of the planned venipuncture area.
- c) Thoroughly clean the site.
- **d)** Remove the cap of blood culture bottle and clean the rubber, allowing the alcohol to evaporate for 30 seconds before proceeding with bottle inoculation.
- e) Inject the blood into each bottle through the rubber cap with the needle.
- f) Please send the inoculated bottle as soon as possible, ideally within 48 hours of collection, keep in room temperature, do not refrigerate the bottle.
- g) Label the blood culture bottles accurately and make sure the request tally.
- h) Do not cover barcode on bottles with patient labels.

#### 3.2.2 CSF CULTURE

The proper collection and transport of clinical specimens is critical for the isolation, identification, and characterization of agents that cause bacterial meningitis. Optimally, clinical specimens should be obtained before antimicrobial therapy commences in order to avoid loss of viability of the etiological agents. Cerebrospinal

fluid (CSF) should be processed in a microbiology laboratory within 1 hour after collection.

#### **Collecting CSF:**

- In view of the danger of iatrogenic bacterial meningitis, thorough disinfection of the skin is mandatory.
- b) Approximately 1.5 2 ml of CSF should be collected in sterile container or bijou bottle (available at Microbiology lab) for microbiological examination including culture. The CSF for other unit examination need different container.
- c) The specimen should be delivered to the laboratory at once, and processed immediately, since cells disintegrate rapidly. Any delay may produce a cell count that does not reflect the clinical situation of the patient.
- d) Test include:
  - Cell count
  - India Ink's
  - Gram stain
  - Latex agglutination for CSF antigen
  - Cryptococcus Antigen (by request)
- e) Except for Cryptococcus antigen, all CSF examination is done for first sample only, subsequent sample received within 1 week will proceed for culture and gram stain only.

#### 3.2.3 OTHER STERILE BODY FLUID (EXCEPT URINE)

- a) The specimens include synovial, pleural, pericardial and peritoneal.
- b) Send specimen immediately to the lab for processing.
- c) Specimen received more than 4 hours is not suitable for processing.

#### 3.2.4 RESPIRATORY SPECIMEN

#### a) Nasal Swab

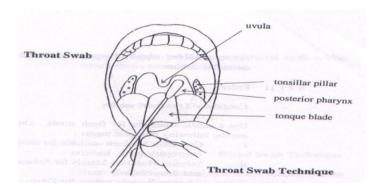
For detection of *Methicillin Resistant Staphylococcus aureus* (MRSA) carrier. Usually advised to swab the mucosal lining of the anterior nares.

#### b) Nasopharyngeal Swab

- i) This is especially for capturing *Bordetella pertussis*, the etiologic agent whooping cough.
- ii) It uses a nasopharyngeal swab, which is a curved flexible wire swab.
- iii) This swab must be inquired from bacteriology lab.

#### c) Throat Swab

- i) This is obtained to recover Group A β-hemolytic streptococcus or *Corynebacterium diphtheriae*.
- ii) Site to take the specimen is the tonsilar area and the mucosa on the post pharyngeal wall behind the uvula.
- iii) Ideally to ask patient to rinse mouth with water before sampling.



#### d) Sputum

Sputum is best collected early in the morning; if possible. Do make sure the patient gargle with water immediately prior to obtaining the specimen to reduce the number of contaminating oral pharyngeal bacteria.

#### e) Bronchial alveolar lavage (BAL)/ brushing/ biopsies

- i) Obtained via bronchoscopy. More representative of lower respiratory tract.
- ii) Besides C&S, BAL also is the best specimen looking for pneumocystis carinii pneumoniae.

#### 3.2.5 URINARY SPECIMEN

Careful attention to proper collection of urine sample is vital in ensuring the optimal recovery of bacteria from the urinary tract and the elimination of potential contamination.

Urine is an excellent nutrient medium for supporting the rapid growth of many microorganisms, specimen of urine should therefore, be sent to the laboratory without delay.

If delay is unavoidable, urine specimen may be stored in the refrigerator (2-8°C) for up to 2 hours. Early morning urine is preferable. This is to enable the organism to multiply in the bladder before collection. If this is not possible, a period of 3 hours

must elapse after the last nicturation. The specimen is MID-STREAM urine, whether from a male or a female.

Submit the mid-stream urine sample in a sterile screw-capped container. Specimen should be sent immediately after collection, the best is within ½ hour-1 hour after collection.

#### a) Midstream Urine

#### **Male Patients**

- 1. Before actual sampling, withdraw the prepuce and clean the glans penis thoroughly with water.
- 2. Pass the first few milliliters of urine to flush out the bacteria from the urethra, and then collect the mid-stream portion (about 2-5 ml) in a sterile container.
- 3. Close the container tightly and send immediately to laboratory.

#### **Female Patients**

- 1. Before actual sampling, clean the perineum thoroughly with water.
- Hold the labia apart, voiding and pass the first few milliliters of urine to flush out the bacteria from the urethra and collect the midstream portion (about 2-5 ml) in a sterile container.
- 3. Close the container tightly and send immediately to laboratory.

#### Note:

When culture for tubercle bacilli is required collect as least 50ml of early morning midstream urine on 3 consecutive mornings into sterile universal bottles. Label the specimens and store them in refrigeration. Transport the specimens packed with ice to the laboratory.

#### b) Catheterized urine

- 1. Clamp the foley's catheter for ½ hour.
- 2. Unclamp the foley's, discard the initial urine.
- 3. Catheterized urine specimen should be taken by aseptic puncture of the catheter conduit and syringe out into a sterile container.
- 4. Urine from catheter bags is generally unsuitable for culture.
- 5. Urinary catheter tip will not be processed as a specimen.

#### c) Bladder urine specimen

- 1. This obtained via suprapubic aspiration or cyctoscopically under aseptic technique.
- 2. Urine is collected in sterile container.

#### 3.2.6 GENITAL SPECIMENS

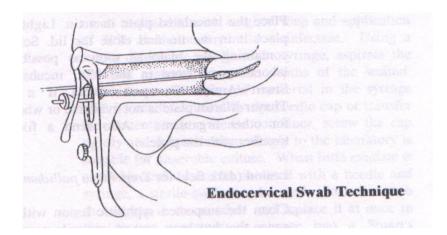
- a) Collection of urethral discharge for N.gonorrhoea from male patients.
- 1. Cleanse around the urethral opening using a swab moistened with sterile saline.
- Gently massage the urethra from above downwards. Using a swab, collect a sample of discharge. Make a smear of the discharge on a microscope slide by gently rolling the swab on the slide.
- Spread the exudatis over an area about 1-2 cm in diameter, in the middle of a clean microscope slide.
- 4. Make sure the slide is air-dried before sending to the lab (if patient recently passed urine, allow 2-4 hours before collecting the specimen).
- For culture, collect a sample of pus on a sterile cotton-wool swab, insert the swab in a transport medium, and send to the lab.

#### b) Collection of cervical specimen for *N.gonorrhoea* from female patients.

- 1. The best specimen is from endocervical canal.
- 2. Use a speculum to examine the cervix and collect the specimen (do not use lubricate with a gel that may be bactericidal).
- Pass a sterile swab 20-30mm into the endocervical canal and gently rotate the swab.
- 4. Slide and culture as from male patient above.

#### c) High Vaginal Swab

- 1. This is the specimen for other diagnosis of candidiasis and other causes of vaginitis but NOT gonorrhea in the female.
- 2. Using a sterile speculum lubricated with sterile normal saline and not antiseptic cream, collect the vaginal exudates by simple swabbing from posterior fornix.
- 3. Insert the swab into Amies transport media and send the specimen to the lab as soon as possible.



#### 3.2.7 STOOL SPECIMEN

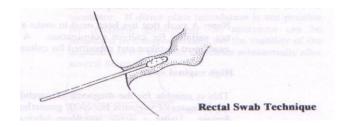
#### a) Container / Transport media

Use a sterile container for fresh stools. Otherwise use the following transport media :

- 1. Cary Blair Medium suitable for most enteropathogenic bacteria.
- 2. Selenite Medium Mainly for Salmonella and some Shigella.
- 3. Alkaline Peptone water- for Vibrio cholera and other vibrios.
- 4. Sterile container- for Campylobacter detection.

#### b) Collection and Dispatch

- 1. Using a small spoon or swab, collect a portion of faeces (about 1 gm), taking care to include material containing mucus, pus or blood if any present.
- Place the spoon or swab with faeces into a sterile universal container and screw on the cap tightly.
- Sent it promptly for processing. Prolonged storage will cause the drop in pH
  which will be sufficient to inhibit the growth of most Shigella sp. and some
  Salmonella spp. If a delay is anticipated, place the stool specimen in transport
  media. Store transport media at room temperature.
- 4. If faeces are not available, a rectal swab may be taken but this provides a less satisfactory specimen.
- 5. Insert a sterile swab into the anus beyond the anal sphincter.
- 6. Rotate the swab to ensure contact with faecal material within the rectum and replace it at once in the appropriate transport media. A satisfactory rectal swab is one which shows some faecal staining.



7. If stool is collected in a sterile bedpan, it must not be contaminated with urine or residual soap or disinfectant.

#### c) Stool Ova and Cysts/Cryptosporidium and Isospora /E. histolytica.

- Collect feaces into a clean wide-mouth container with a tight fitting lid to prevent accidental spillage and maintain moisture. The specimen should not be contaminated with water and urine.
- 2. Place in the plastic bag, label properly, accompanied by a request form and should be sent to the lab **within 1 hour.**
- 3. If **rectal swab** used for *E.histolytica* detection, it should be moistened with physiological saline.

#### Note:

Fecal specimen from patient on antacids, barium and bismuth oil or antibiotics may not suitable for identifying protozoa.

#### 3.2.8 PUS / TISSUE / WOUND SPECIMEN

#### a) Pus / Tissue / Swab Specimen Collection

- 1. The surfaces of cutaneous or decubitus ulcers are frequently colonized with bacteria.
- Clean and decontaminate the area as much as possible with water and disinfectant.
- 3. Using a sterile disposable needle and syringe, aspirate the purulent material from the depths of the wound.
- 4. Either leaves the aspirated material in the syringe without its needle or transfers the contents into a sterile container, screw the cap tightly and dispatch immediately to the laboratory.
- 5. When little exudates is available and cannot be obtained with a needle and syringe, a sterile swab may be used.
- Soak the swab thoroughly in the exudates and replace it at once in the transport medium.
- 7. Send immediately to the laboratory for processing. DO NOT STORE IN THE REFRIGERATOR.

8. Tissue should be send in a sterile container and please make sure the moist is taken care of.

Note: A 'dry' swab may fail to yield organisms in smear or culture.

#### b) Ear

#### i. External

- 1. Clean the external meatus with mild detergent or sterile normal saline.
- 2. Obtain specimen (swab, scraping or fluid aspiration) from active margin, preferably including fresh secretions from deeper areas.

#### ii. Internal

- 1. Clean the external meatus with mild antiseptic or sterile normal Saline.
- Using a sterile swab collect specimen through sterile Funnel from ear drum or beyond.

#### c) Eye

#### i. Eye discharge

- 1. Clean skin around eye with mild antiseptic.
- 2. Make sure no makeup / ointment left.
- 3. Collect the exudates with a sterile swab.
- For isolation of Neisseria gonorrhoeae, 2 swabs are preferable. 1 to inoculate into transport media, the other are to make a glass slide smear, air dried and send to the laboratory.
- 5. For isolation of other organism, inoculate into transport media and send to the laboratory.

#### ii. Corneal scrapping

- Use local anesthetic and spatula with a thin blunt end, scrap the whole of the conjunctiva.
- 2. If the media is available, lawn the specimen onto the media, make sure do not break the agar so that the specimen will be on the surface not inside the media.
- 3. After streaking onto the media, the residual specimen should be spread onto the glass slide, and send to the lab after complete air dry.

#### iii. Aqueous tap

- 1. This is especially for endophthalmitis cases.
- 2. Collect specimen aseptically in a sterile tube.
- 3. Label carefully.

#### iv. Other eye specimen

These include contact lens, iris, foreign body, all should be send in a sterile container and make sure the moist is taken care.

#### Note: Specimen for anaerobic culture

- 1. Any specimen suspicious for anaerobic organism should be collected properly.
- 2. Do not send swab specimen for anaerobic culture.
- 3. Specimen may be send using a syringe (approximately 10cc) or more, send immediately to the lab without the needle.

#### 3.2.9 AUTOPSY MATERIAL

#### a) Blood:

- Aspirate 10 ml of right heart blood from the right heart either through the skin and chest wall or (through unopened heart) from right ventricle after removal of sternum into a set of blood culture broths.
- 2. Avoid contamination with bacteria from the water faucet and with enteric bacteria. A block of splendid tissue may be submitted in lieu of a blood culture.

#### b) Tissue:

- 1. Best collected before body is handled too much or opened.
- 2. Decontaminate skin or sear surface of heart or other organ before inserting needle or cutting out tissue block.
- Collect 6ml (if possible) with one serosal or other surface and place in a sterile container. Large piece is preferred because aseptic collection is difficult in the laboratory.
- 4. 1 cm cube will be aseptically from the suspicious area including some normal tissue for processing.

### 3.2.10 MYCOLOGICAL EXAMINATION

#### Skin, nails and hair

Clean cubtaneous and scalp lesion with 70% alcohol prior to sampling as this will improve the chances of detecting fungus on microscopic examination, as well as reducing the likelihood of bacterial contamination of cultures. Prior cleaning is essential if ointments, creams or powders have been applied to the lesion. Skin, nails and hair specimens should be collected into folded squares of paper or directly onto on agar plate.

### a) Nails

- 1. Nail specimen should be taken from any discolored, dystrophic or brittle parts of the nail.
- 2. Specimen should be cut as far as possible from the edge of the nail and should include the full thickness of the nail.

#### b) Skin

Materials should be collected from cutaneous lesions by scraping outwards from the margin of the lesion with the edge of a glass microscope slide or a blunt scalpel.

#### c) Hair

- 1. Specimen from the scalp should include hair roots, the contents of plugged follicles and skin scales.
- 2. Hairs should be plucked from the scalp with forceps or the scalp is brushed with a plastic hairbrush and collected onto an agar plate.

#### d) Ear

Scraping of material from the ear canal is to be preferred although swabs can also be used.

#### e) Ocular specimen

- Material from patients with suspected fungal infection of the cornea (keratomycosis) should be collected by scraping the ulcer. The entire base of the ulcer, as well as the edges, should be scraped. (Swabs are not suitable for sampling corneal lesion).
- 2. The material is collected directly onto agar plates for culture and to a glass slide for microscopic examination.

### f) Blood

- 1. Blood culture for fungal is collected in the same manner as for blood culture for bacterial using a specified blood culture bottle.
- 2. The request for fungal culture should be indicated clearly on the sample remark in HIS or request form and a total of two weeks incubation will be carried out.

#### g) Cerebrospinal fluid

CSF specimen (3-5ml) should be collected in a bijoux bottle for microscopy and culture.

#### h) Bone marrow

- 1. This specimen is helpful for making the diagnosis in a number of deep fungal infections, including histoplasmosis and cryptococcosis.
- 3-5 ml of aspirated material should be collected and transferred into blood culture bottle.

### i) Pus

- 1. Pus from undrained subcutaneous abscesses or sinus tracts should be collected with aseptic technique using sterile needle and syringe.
- If grains are visible in the pus (as in mycetoma), these must be collected and sent for culture and sensitivity. In mycetoma, if the crusts at the opening of the sinus tracts are lifted, grains can often be found in the pus underneath.

### j) Tissue

- 1. If possible materials should be obtained from both the middle and the edge of the lesions.
- 2. Small cutaneous, subcutaneous or mucosal lesions can often be excised completely.
- 3. Tissue specimen should be placed in a sterile container without formalin.

### k) Sputum

- Collect the sputum in a sterile container and send it immediately to the laboratory.
- 2. Do not refrigerate sputum to prevent suppression of temperature sensitive organism'. Example : Streptococcus penumoniae and Haemophlius influenza

#### I) Urine and other body fluids

Collect the specimen in a sterile container and sent it immediately to the laboratory.

Note: Delayed specimens may not yield reliable results because

- Bacterial overgrowth including normal flora reduce the chances of isolation of true pathogens.
- Some sensitive fungi may not remain viable even sent less than 24hrs e.g : Histoplasma

### 3.2.11 BLOOD FILM FOR MALARIAL PARASITE (BFMP)

### a) Blood film for Malaria Parasite

- 1. Clean a new glass slides with absolute alcohol.
- Select the third finger from the thumb (big toe can be used for infant). Clean the finger with cotton wool pledge soak in 70% alcohol. Dry the finger with cotton towel.
- 3. With a sterile lancet, puncture the ball of the finger using quick rolling action.
- 4. By applying gentle pressure to the finger, express the first drop of blood and wipe it away with dry cotton wool.

#### How to prepare thick blood film.

- Apply gently pressure to the finger and collect a single drop of blood on the surface of clean slide.
- Using the corner of another glass slide as a spreader quickly spread the blood to make an even, thick film. The blood is spread in a circular motion with 3-6 movements, and spread over 20mm diameter.
- 3. Label the slide with patient's registration number and date of collection with grease pencil.
- 4. Place the blood film in a slide tray to air dry at room temperature.

#### How to prepare thin blood film.

- 1. With another gentle pressure to the finger and collect a small drop of blood on the surface of clean glass, about 5 mm away from the edge of the slide.
- 2. Rest the blood slide on a firm, flat surface. Use another slide as a spreader. Touch the drop of blood with a spreader and allow the blood to run along its edge. Keep the spreader at an angle of 30-45° and in steady movement, firmly push the spreader forward to prepare a thin smear.
- 3. Label the slide with patient's registration number and date of collection with grease pencil.
- 4. Place the blood film in a slide tray to air dry at room temperature.

#### b) Blood for Microfilaria

Preparation of smear:

- 1. Collect a big drop of blood by pricking a finger or ear lobe. Blood collection must be done at night after 9.00 pm.
- 2. Make an oval thick blood film (3 x 1 cm) on a clean glass slide.
- 3. Dry it in a horizontal position, taking care to protect it from dust and pests.
- 4. Send immediately to the laboratory.

**Note**: A good smear is one which on drying still shows the hands of a watch placed beneath.

#### 4. SPECIMEN FOR SEROLOGICAL TEST

To comprise of serological test in bacteriology, virology, parasitology and immunology.

#### 4.1 Method of blood collection

- a) Draw 3-5 ml of blood into a Plain Gel Tube with gel.
- b) Clot at ambient temperature.
- c) Dispatch to the laboratory within 4 hours of collection for serum separation by centrifugation.

#### Note:

Haemolysed, icteric or lipaemic specimen invalidates certain tests. If such specimens are received, the samples will be rejected to assure that results are of clinical value.

#### 4.2 Molecular Specimen

- a) Use universal precautions for handling all the specimens.
- b) Throat swab must be place in the Viral Transport Medium (VTM) and keep cool in ice.
- c) Specimens should be in tightly sealed, leak proof containers. All specimens must be appropriately labeled with the requisition number sticker from the corresponding requisition if available or with the patient's name and patient's identifier.
- d) Dispatch the specimen in ice container along with the request form.

#### 5. OUTSOURCE TEST

#### 5.1 Outsource test

Tests which do not available in HSNZ will be outsourced to selected referral laboratories and should follow the procedure below :

- a) All outsource specimen must be sent with appropriate request form (Note: Some test may requires specific request form).
- b) The following information must be provided on the request form:-Patients' details including name, identity card (i.c) no, sex and age, ward or clinic.
- c) Adequate and relevant clinical summary.
- d) The test requested should be written in full.
- e) Date and time specimen is collected.
- f) The name of the requesting doctor and contact number should be clearly written on the request form. The request form must be signed by the doctor concerned.
- g) For HIV Viral Load Test:
  - 1. Blood should be collected in four (4) EDTA bottle; volume must be adequate.
  - 2. Specimen must be accompanied by PER-PAT 301.
- h) For HIV PCR Test:
  - 1. Bottle should be collected in EDTA bottle, 2.5ml from baby, 2.5 ml from mother.
  - 2. Specimen must be accompanied by 'Ujian PCR untuk HIV di kalangan bayi (IMR/VIRUS/NARL2).
- Specimen outsource will be carried out every SUNDAY and WEDNESDAY. All specimens must be arrived at Serology laboratory before 12 PM to avoid unnecessary delay in specimen transportation.

Transportation of specimen to the outsourced laboratory and handling of the results/ reports will be managed by the department of pathology.

Pathology department has the right to reject the specimen / requests which do not fulfill the mentioned requirements.

#### 5.2 Reporting of result

All the outsource result will be reported via Laboratory Information System (LIS).

- a) For internal request (In patient and HSNZ clinic), result can be accessed from Hospital Information System (HIS).
- b) For external request (District Hospital and Health Clinic), result will be dispatched to the requestor.

#### 6. MEDICOLEGAL CASES

- 6.1 Specimen should be sealed and send directly to pathology department. Chain of custody should be maintained at all times by the LIS system.
- 6.2 List of specimens and tests which can be sent for medicolegal cases :

### a) High and Low vaginal swabs

For examination of gram negative diplococci and spermatozoa, submits 2 specimens collected in sterile normal saline or submit 2 heat fixed smears of the vaginal secretions in 2 separately sealed envelopes.

#### b) Endocervical swab

This is preferred or a vaginal swab or a urethral swab for the culture of *Neisseria gonorrhoae*. Place the swab in Amies Transport media and sealed appropriately.

### c) Rectal Swab (For sodomy cases)

Place the swab in Carry Blair Transport media and sealed appropriately.

### d) Infectious Screening (RPR, Anti-HIV, HBsAg and anti-HCV)

Collect 5 ml of venous blood aseptically in a sterile plain bottle/tube. Label and seal each specimen correctly and dispatch the blood sample promptly.

**Note:** All specimens must reach the laboratory within 12 hours of collection.

### 7. REPORTING OF RESULT

- 7.1 All results shall be validated by the Officer I/C (Clinical Microbiologist, Medical Officer, Science Officer or others designated personnel.
- 7.2 Computer generated results will be released for all requested test base on turnaround time.
- 7.3 Below are the lists of critical findings for Microbiology test. Convey of the result via phone will be on case basis:

TEST	CRITICAL FINDINGS
Cerebrospinal Fluid Culture &	Microscopy Result (Normal or Abnormal)
Sensitivity	Wilcloscopy Nesult (Normal of Apriormal)
Cerebrospinal Fluid Antigen	Positive rapid antigen detection
Detection	rositive rapid antigen detection
Blood Culture	Positive result from gram stain or / and culture
Sterile Body Fluids	Positive result from gram stain or culture
Acid Fast Bacilli	Positive smear result or / and culture
Malaria Parasite on Blood Film	Presence of malaria parasite
Stool Culture	Salmonella typhi, Vibrio Cholerae and Shigella
Any type Culture	ESBL, MRSA, Muti Resistant Organism (eg:
Any type Culture	CRE, VRE, VRSA)
Antigen Detection	Legionella spp
Pernasal Swab	Bordetella pertussis, Corynebacterium diphteria

### 8. DISPATCH OF RESULT

- 8.1 All results can be obtained from pigeonholes of designated ward, located at the entrance of the department of Pathology.
- 8.2 Anti-HIV result can be obtained directly from Serology laboratory. Result will be provided in sealed envelope. Evidence of receipt documented in the record/ dispatch book.

### 9. AFTER OFFICE HOURS SERVICES

To facilitate the pathology services, Bacteriology laboratory offers 24 hours support. Certain serology test (eg: Infective screening for organ procurement requires consultation with Clinical Microbiologist on call.



NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
1	Acetaminophen	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	1 hour	24 hours	
2	Activated Partial Thromboplastin Time (APTT)	Haematology	Blood	Trisodium citrate tube (1 tube)	1.8 ml	60 minutes	24 hours	Fresh sample needed
3	AFP (α-Feto protein)	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
4	Albumin	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
5	ALP (Alkaline Phosphatase)	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
6	ALT (Alanine Aminotransaminase)	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
7	Amikacin	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	6 hours	Office hours	
8	Ammonia	Chemical Pathology	Blood	EDTA Tube	Paeds - 1.5 ml Adult - 3.5 ml	1 hour	By appointment Call before collecting sample (ext. : 2976 / 2977)	Refer Chemical Pathology Section 5.1 Special Tests Procedure
9	Amylase	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
10	Amylase peritoneal fluid	Chemical Pathology	Peritoneal Fluid	Universal Sterile Container	Paeds - 10 ml Adult - 10 ml	1 working day	Office hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
11	Amylase pleural fluid	Chemical Pathology	Pleural Fluid	Universal Sterile Container	Paeds - 10 ml Adult - 10 ml	1 working day	Office hours	
12	Amylase urine	Chemical Pathology	Random Urine	Universal Sterile Container	Paeds - 10 ml Adult - 10 ml	3 - 7 working days	Office hours (Weekly)	
13	Anti - Cardiolipin Antibody	Microbiology	Blood	Plain Gel Tube	3.5 ml	14 working days	Office hours	
14	Anti - Double Stranded DNA Antibody (DsDNA)	Microbiology	Blood	Plain Gel Tube	3.5 ml	14 working days	Office hours	Done if ANA positive homogenous pattern
15	Anti - Extractable Nuclear Antigen (ENA)	Microbiology	Blood	Plain Gel Tube	3.5 ml	14 working days	Office hours	Done if ANA positive with specific pattern
16	Anti - Neutrophil Cytoplasmic Antibody (ANCA)	Microbiology	Blood	Plain Gel Tube	3.5 ml	14 working days	Office hours	
17	Anti - Nuclear Antibody (ANA)	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
18	Anti - Rheumatoid Factor	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
19	Anti - Streptolysin 'O' Titre (ASOT)	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
20	Anti-A, Anti-B Titer	Blood Transfusion Service	Blood	EDTA Tube	Paeds -1.5 ml Adult - 3.5 ml	2 working days	Office hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
21	Antibody Identification	Blood Transfusion Service	Blood	EDTA Tube	3.5 ml x 2 tubes	2 weeks (HSNZ)	Office hours	May take more than 1 month if refer to PDN.
22	Antibody Screening	Blood Transfusion Service	Blood	EDTA Tube	Paeds -1.5 ml Adult - 3.5 ml	1 day	24 hours	
23	Anti-D Titer	Blood Transfusion Service	Blood	EDTA Tube	Paeds -1.5 ml Adult - 3.5 ml	2 working days	Office hours	
24	Antigen Detection Adenovirus / Rotavirus	Microbiology	Stool	Sterile Container	15 - 30 ml	On the same day	24 hours	
25	AST (Aspartate Aminotransferase)	Chemical Pathology	Blood	Plain Gel Tube	Peads - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
26	Beta Human Chorionic Gonadotrophin (βHCG)	Chemical Pathology	Blood	Plain Gel Tube	Peads - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	For URGENT request (ectopic pregnancy), please contact Chemical Pathologist On-Call
27	Bilirubin - Direct	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	Automatically done if Bilirubin Total > 40 µmol/L (Adults). Avoid exposure to direct light.
28	Bilirubin - Total	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	Avoid exposure to direct light
29	Blood Component Request (Platelet Concentrate, Fresh Frozen Plasma, Cryoprecipitate etc.)	Blood Transfusion Service	Blood	EDTA Tube	Peads - 1.5 ml Adult - 3.5 ml	Within 15 min	24 hours	(REFER PARA 4.3 BLOOD TRANSFUSION SERVICE PAGE 43) FORM: Borang Permohonan Transfusi Darah (PER-SS-BT105)
30	Blood Group and Rh	Blood Transfusion Service	Blood	EDTA Tube	Peads - 1.5 ml Adult - 3.5 ml	1 day	24 hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
31	Bone Marrow Aspiration Test	Haematology	Bone marrow aspirate	Clean glass slides (at least 10)	NA	Urgent : 48 hours Routine : 7 working days	Office hours	By appointment (ext: 2877) MLT will do the smear
32	BUSE - Urea - Sodium - Potassium - Chloride	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	1 day	24 hours	
33	C3, C4	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	2 working days	Office hours	
34	CA125	Chemical Pathology	Blood	Plain Gel Tube	Peads - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
35	Calcium	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
36	Calcium, urine	Chemical Pathology	Random Urine	Universal Sterile Container	Peads - 10 ml Adult - 10 ml	7 working days	Office hours (Weekly)	
37	Calcium, urine 24hr	Chemical Pathology	24hr Urine	24hr Urine Container	24hr collection	7 working days	Office hours (Weekly)	
38	Carbamazepine	Chemical Pathology	Blood	Plain Gel Tube	Peads - 1.5 ml Adult - 3.5 ml	6 hours	Office hours	
39	CD4/CD8 T-cell enumeration test	Haematology	Blood	EDTA tube (1 tube)	2.0 ml	7 working days	Monday & Wednesday	
40	CEA	Chemical Pathology	Blood	Plain Gel Tube	Peads - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
41	Chloride	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
42	Chloride urine	Chemical Pathology	Random Urine	Universal Sterile Container	Peads - 10 ml Adult - 10 ml	7 working days	Office hours (Weekly)	
43	Chloride, urine 24hr	Chemical Pathology	24hr Urine	24hr Urine Container	24hr collection	1 working day	Office hours (Weekly)	
44	Cholesterol HDL	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
45	Cholesterol total	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
46	CK (Creatine Kinase)	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
47	СК-МВ	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	1 day	24 hours	
48	Clostridium Difficile - Toxin Detection	Microbiology	Stool	Sterile Container	15 - 30 ml	On the same day	24 hours	
49	Coombs Test (ABO RH & Direct)	Blood Transfusion Service	Blood	EDTA Tube	Peads - 1.5 ml Adult - 3.5 ml	1 day	24 hours	
50	Coombs Test (Direct & Indirect)	Blood Transfusion Service	Blood	EDTA Tube	Peads - 1.5 ml Adult - 3.5 ml	1 day	24 hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
51	Coombs Test (Direct)	Blood Transfusion Service	Blood	EDTA Tube	Peads - 1.5 ml Adult - 3.5 ml	1 day	24 hours	
52	Coombs Test (Monospecific)	Blood Transfusion Service	Blood	EDTA Tube	Peads - 1.5 ml Adult - 3.5 ml	1 day	24 hours	
53	Cortisol (Afternoon)	Chemical Pathology	Blood	Plain Gel Tube	Peads - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
54	Cortisol (Morning)	Chemical Pathology	Blood	Plain Gel Tube	Peads - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
55	Cortisol (Random )	Chemical Pathology	Blood	Plain Gel Tube	Peads - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
56	Creatinine	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
57	Creatinine Clearance - Creatinine blood - Creatinine, urine 24 hr	Chemical Pathology	Blood 24hr Urine	Plain Gel Tube 24hr Urine Container	Peads - 1.5 ml Adult - 3.5 ml 24 hr collection	7 working days	Office hours (Weekly)	The barcode must be fixed accordingly to the sample. Refer to Chemical Pathology Section 5.6 Special Tests Procedure
58	Creatinine urine	Chemical Pathology	Random Urine	Universal Sterile Container	Peads - 10 ml Adult - 10 ml	7 working days	Office hours (Weekly)	
59	Creatinine, urine 24hr	Chemical Pathology	24hr Urine	24hr Urine Container	24 hr collection	7 working days	Office hours (Weekly)	
60	CRP	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Peads - 1.5 ml Adult - 3.5 ml	2 working days	Office hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
61	CSF FEME	Chemical Pathology	CSF	Universal Sterile Container	1 ml	1 hour	24 hours	
62	Culture - Air Sampling	Microbiology	Air Sampling	Plate	Not Applicable	24 - 48 hours	24 hours	
63	Culture - Attest Ampoule	Microbiology	Attest ampoule	Not Applicable	Whole amount	24 - 48 hours	24 hours	
64	Culture - Non TPN Material	Microbiology	Non TPN	Sterile Container	Whole amount	24 - 48 hours	24 hours	
65	Culture - TPN	Microbiology	TPN	Sterile Container	Whole amount	24 - 48 hours	24 hours	
66	Culture & Sensitivity - Aspirate	Microbiology	Aspirate	Amies Transport Media	Swab	48 - 72 hours	24 hours	
67	Culture & Sensitivity - Blood Aerobe	Microbiology	Blood	Blood Culture Bottle	As required on the bottle	5 - 8 days	24 hours	
68	Culture & Sensitivity - Blood Anaerobe	Microbiology	Blood	Blood Culture Bottle	As required on the bottle	5 - 8 days	24 hours	
69	Culture & Sensitivity - Blood Fungal	Microbiology	Blood	Blood Culture Bottle	As required on the bottle	Myco F - 42 days Aerobe - 30 days	24 hours	
70	Culture & Sensitivity - Blood Paediatric	Microbiology	Blood	Blood Culture Bottle	As required on the bottle	5 - 8 days	24 hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
71	Culture & Sensitivity - Body Fluid	Microbiology	Body Fluid	Sterile Container	Whole amount	48 - 72 hours	24 hours	
72	Culture & Sensitivity - Bone	Microbiology	Bone	Sterile container	Whole amount	48 - 72 hours	24 hours	
73	Culture & Sensitivity - Bone Marrow	Microbiology	Bone Marrow	Sterile container	Whole amount	48 - 72 hours	24 hours	
74	Culture & Sensitivity - CSF a) Latex Antigen detection of Strep. Pneumo, E.Coli, H. Influenza, N.meningitiditis, Gp B Streptococcus. b) Cryptococcal ag c) Culture sensitivity d) India's Ink e) CSF (C&S) f) Cell Count	Microbiology	CSF	Bijoux Bottle	1.5 - 2.0 ml	For microscopic finding will be reported on the same day, for C&S 48 - 72 hours after specimen received	24 hours	
75	Culture & Sensitivity - Dialysate	Microbiology	Dialysate	Sterile Container	Whole amount	48 - 72 hours	24 hours	
76	Culture & Sensitivity - Endotracheal	Microbiology	Endotracheal	Sterile Container	Whole amount	48 - 72 hours	24 hours	
77	Culture & Sensitivity - Eye	Microbiology	Eye swab	Send 2 specimens : 1) Amies transport media 2) Make smear on slide	Swab / Smear	48 - 72 hours	24 hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
78	Culture & Sensitivity - High Vaginal Swab	Microbiology	High Vaginal Swab	Amies transport media	Swab	48 - 72 hours	24 hours	For rape case - also make smear on slide.
79	Culture & Sensitivity - Low Urethral Swab	Microbiology	Urethral Swab	Amies transport media	Swab	48 - 72 hours	24 hours	
80	Culture & Sensitivity - Low Vaginal Swab	Microbiology	Low Vaginal Swab	Amies transport media	Swab	48 - 72 hours	24 hours	For rape case - also make smear on slide.
81	Culture & Sensitivity - Nasal Swab	Microbiology	Nasal Swab	Amies Transport Media	Swab	48 - 72 hours	24 hours	
82	Culture & Sensitivity - Others	Microbiology	Other than listed specimen	Amies transport media/ Sterile Container	Not Applicable	48 - 72 hours	24 hours	
83	Culture & Sensitivity - Peritoneal Fluid	Microbiology	Peritoneal Fluid	Sterile Container	Whole amount	48 - 72 hours	24 hours	
84	Culture & Sensitivity - Pleural Fluid	Microbiology	Fleural Fluid	Sterile Container	Whole amount	48 - 72 hours	24 hours	
85	Culture & Sensitivity - Pus	Microbiology	Pus Swab	Amies Transport Media	Swab	48 - 72 hours	24 hours	
86	Culture & Sensitivity - Rectal Swab for All Pathogens	Microbiology	Rectal Swab	Carry Blair Transport Media	Swab	2 - 5 days	24 hours	
87	Culture & Sensitivity - Rectal Swab for Cholera	Microbiology	Rectal Swab	Carry Blair Transport Media	Swab	2 - 5 days	24 hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
88	Culture & Sensitivity - Rectal Swab for Salmonella Shigella	Microbiology	Rectal Swab	Carry Blair Transport Media	Swab	2 - 5 days	24 hours	
89	Culture & Sensitivity - Stool	Microbiology	Stool	Sterile container	5.0 - 10.0 ml watery stool	2 - 5 days	24 hours	
90	Culture & Sensitivity - Throat Swab	Microbiology	Throat Swab	Amies Transport Media	Swab	48 - 72 hours	24 hours	
91	Culture & Sensitivity - Tissue	Microbiology	Tissue	Sterile container	Whole amount	48 - 72 hours	24 hours	
92	Culture & Sensitivity - Urine	Microbiology	Urine	Sterile container	10 - 20 ml	48 - 72 hours	24 hours	Must reach to lab within 3 hours after collection
93	Culture & Sensitivity - Wound	Microbiology	Wound	Amies transport media	Swab	48 - 72 hours	24 hours	
94	Culture & Sensitivity - Nasopharyngeal	Microbiology	Nasopharyng eal Swab	Amies Transport Media	Swab	48 - 72 hours	24 hours	
95	Culture & Senstivity - Brohchial Alveolar Lavage (BAL)	Microbiology	BAL	Sterile container	Whole amount	48 - 72 hours	24 hours	
96	Culture & Senstivity - Sputum	Microbiology	Sputum	Sterile container	Whole amount	48 - 72 hours	24 hours	
97	Cyclosporine	Chemical Pathology	Blood	EDTA Tube	Paeds - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
98	D-Dimer	Haematology	Plasma	Trisodium citrate tube (1 tube)	1.8 ml	4 hours	Office hours	
99	Dialysate FEME	Chemical Pathology	Dialysate	Universal Sterile Container	10 ml	7 working days	Office hours (Weekly)	
100	Dialysate Profile, 24hr	Chemical Pathology	Dialysate, 24hr	Universal Sterile Container	24hr volume	7 working days	Office hours (Weekly)	
101	Dialysate Profile, 2hr	Chemical Pathology	Dialysate, 2hr	Universal Sterile Container	10ml	7 working days	Office hours (Weekly)	
102	Dialysate Profile, 4hr	Chemical Pathology	Dialysate, 4hr	Universal Sterile Container	10ml	7 working days	Office hours (Weekly)	
103	Dialysate Profile, 6hr	Chemical Pathology	Dialysate, 6hr	Universal Sterile Container	10ml	7 working days	Office hours (Weekly)	
104	Dialysate Profile, random	Chemical Pathology	Dialysate, random	Universal Sterile Container	10ml	7 working days	Office hours (Weekly)	
105	Digoxin	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	6 hours	Office hours	
106	Drugs of Abuse : - Opiate (Morphine) - Cannabis	Drug Laboratory	Urine	Universal Sterile Container	30 ml	Screening: 3 working days Confirmation: 5 working days	Office hours	Refer Drugs Of Abuse Specimen Section. FORM: Borang Permintaan Ujian Pengesanan Dadah Dalam Air Kencing.
107	Drugs of Abuse : -Amphetamine Type Stimulants (ATS)	Drug Laboratory	Urine	Universal Sterile Container	30 ml	Screening: 3 working days Confirmation: - 7 working days (URGENT) - 1 month (Not Urgent)	Office hours	Refer Drugs Of Abuse Specimen Section. FORM: Borang Permintaan Ujian Pengesanan Dadah Dalam Air Kencing.

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
108	Elution Test	Blood Transfusion Service	Blood	EDTA Tube	3.5 ml x 2 tubes	2 weeks (HSNZ)	Office hours	Blood bank will request for sample if needed
109	Erythrocyte Sedimentation Rate	Haematology	Blood	Specific ESR tube	1.2 ml	4 hours	Office hours	Ref. Haematology 3.3
110	Estradiol	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
111	Factor Assay (FVIII, FIX)	Haematology	Plasma	Trisodium citrate tube (1 tube)	1.8 ml	Urgent : 24 hours Non urgent : 2 weeks (run in batch)	Office hours	Consult Haematologist for urgent request.
112	Factor VIII / Factor IX inhibitor assay	Haematology	Blood	Trisodium citrate tube (3 tubes)	5.4 ml	Urgent : 24 hours Non urgent : 2 weeks (run in batch)	Office hours	Consult Haematologist for urgent request.
113	FEME Urine, Morning (Urinalysis)	Chemical Pathology	Morning Urine	Universal Sterile Container	10 ml	1 working day	24 hours	
114	FEME Urine, Random (Urinalysis)	Chemical Pathology	Random urine	Universal Sterile Container	10 ml	1 working day	24 hours	
115	Ferritin	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
116	Fibrinogen	Haematology	Blood	Trisodium citrate tube (1 tube)	1.8 ml	Urgent : 2 hours Non-urgent : 4 hours	24 hours	Fresh sample needed
117	FNAC	Cytology	Aspirates	Cases accepted on an appointment basis Ext:2724	Slide smear	Urgent : 5 working days Routine : 14 working days	Sunday and Tuesday- 10.00 am- 12.30 noon SOPD. Cases depend on patient appointment with SOPD.	Consult pathologist/ medical officer for in ward FNAC

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
118	Folate / B12	Chemical Pathology	Blood	Plain Gel Tube	3.5 ml	14 working days	Office hours (Biweekly)	
119	Free T3	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	3 working days	Office hours	
120	Free T4	Chemical Pathology	Cord Blood	Plain Gel Tube	3.5 ml	3 working days	Office hours	
121	Free T4 Cord Blood	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	2 working days	Office hours	Done if Cord Blood TSH >21 pmol/L
122	Frozen section	Histopathology	Fresh Tissue	Plain container		30 minutes	Office hours	By appointment (Ext : 2150)
123	FSH	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
124	FSL (Fasting Serum Lipid) - Cholesterol Total - Triglycerides - Cholesterol LDL (Calculated) - Cholesterol HDL	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
125	Full Blood Count	Haematology	Blood	EDTA tube (1 tube)	2.0 ml	Urgent : 45 minutes Routine : 3 hours	24 hours	Fresh sample needed
126	Full Blood Picture	Haematology	Blood	EDTA tube (1 tube)	2.0 ml	Urgent : 24 hours Non-urgent : 10 working days	24 hours	Call MO/ Haematologist for urgent request.
127	Fungal Culture - Hair	Microbiology	Hair	Sterile Container	Whole amount	Within 14 days	24 hours	
128	Fungal Culture - Nail	Microbiology	Nail	Sterile Container	Whole amount	Within 14 days	24 hours	
129	Fungal Culture - Others	Microbiology	Other than listed specimen	Sterile Container	Whole amount	Within 14 days	24 hours	
130	G6PD Screening	Haematology	Blood	Blood drop on filter paper	2 to 3 cm in diameter	24 hours	Office hours & weekend (8am-1pm)	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
131	Gamma Glutamyl Transferase (GGT)	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
132	Gentamicin	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	6 hours	Office hours	
133	Glucose, 1HPP	Chemical Pathology	Blood	Flouride Oxalate Tube	2.5 ml	1 working day	24 hours	
134	Glucose, 2HPP	Chemical Pathology	Blood	Flouride Oxalate Tube	2.5 ml	1 working day	24 hours	
135	Glucose, Fasting	Chemical Pathology	Blood	Flouride Oxalate Tube	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
136	Glucose, Post-Dinner	Chemical Pathology	Blood	Flouride Oxalate Tube	2.5 ml	1 working day	24 hours	
137	Glucose, Pre-Bed	Chemical Pathology	Blood	Flouride Oxalate Tube	2.5 ml	1 working day	24 hours	
138	Glucose, Pre-Dinner	Chemical Pathology	Blood	Flouride Oxalate Tube	2.5 ml	1 working day	24 hours	
139	Glucose, Pre-Lunch	Chemical Pathology	Blood	Flouride Oxalate Tube	2.5 ml	1 working day	24 hours	
140	Glucose, Random	Chemical Pathology	Blood	Flouride Oxalate Tube	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
141	Group and Crossmatch (GXM)	Blood Transfusion Service	Blood	EDTA Tube	Paeds - 1.5 ml Adult - 3.5 ml	Emergency Crossmatch : 30 min Full Crossmatch: 2 hours	24 hours	FORM : Borang Permohonan Transfusi Darah (PER-SS-BT105)
142	Group, Screen and Hold (GSH)	Blood Transfusion Service	Blood	EDTA Tube	Paeds - 1.5 ml Adult - 3.5 ml	1 day	24 hours	FORM : Borang Permohonan Transfusi Darah (PER-SS-BT105)
143	Gynecological cytology	Cytology	Cervical scraping	Fix slide in 95% alcohol	Smear	21 working days	Office hours	FORM : ps 1/98 (pindaan 2007)
144	Haemoglobin Analysis	Haematology	Blood	EDTA tube (1 tube)	2.0 ml	1 month (run in batches)	Office hours	Refer Haematology Section 3.4
145	HbA1c, (Glycated Hb)	Chemical Pathology	Blood	EDTA Tube	Paeds - 1.5 ml Adult - 3.5 ml	3 working days	Office hours	Refer Chemical Pathology Section 5.4 Special Tests Procedure
146	Histo-Pathological Examination (HPE) - Urgent Biopsy - Urgent Big Specimens	Histopathology	Tissue	Container 10% Buffered Formalin	Tissue formalin ratio 1:10 - 20	- Urgent Biopsy : 3 working days - Urgent Big Spec : 14 working days	Office hours	
147	Iron	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
148	Iron binding capacity, Total - Iron - UIBC - TIBC (Calculated)	Chemical Pathology	Blood	Plain Gel Tube/Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
149	Kleihauer Test	Haematology	Blood	EDTA tube (1 tube)	2.0 ml	7 working days	Office hours	By appointment (ext. no. 2877)
150	Lactate	Chemical Pathology	Blood	Flouride Oxalate Tube	Paeds - 1.5 ml Adult - 3.5 ml	1 hour	By appointment Call before collecting sample (Ext: 2976 / 2977)	Refer to Chemical Pathology Section 5.2 Special Tests Procedure

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
151	Lactate CSF	Chemical Pathology	CSF (Cerebrospin al Fluid)	Universal Sterile Container	1.0 ml	1 hour	By appointment	
152	LDH	Chemical Pathology	Blood	Plain Gel Tube/Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
153	LDH peritoneal fluid	Chemical Pathology	Peritoneal Fluid	Universal Sterile Container	10 ml	1 working day	Office hours	
154	LDH pleural fluid	Chemical Pathology	Pleural Fluid	Universal Sterile Container	10 ml	1 working day	Office hours	
155	Leukocytes Alkaline Phosphatase (NAP score)	Haematology	Blood	EDTA tube (1 tube)	2.0 ml	7 working days	Office hours	By appointment (ext. no. 2877)
156	LH	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
157	Lithium	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
158	Lupus Anticoagulant screen	Haematology	Blood	Trisodium citrate tube (4 tubes)	7.2 ml	1 month (run in batches)	Office hours	To consult Haematologist
159	Magnesium	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
160	Magnesium, urine 24hr	Chemical Pathology	24hr Urine	24hr Urine Bottle	24hr collection	7 working days	Office hours (Weekly)	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
161	Methotrexate	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
162	Microalbumin urine	Chemical Pathology	Random Urine	Universal Sterile Container	10 ml	7 working days	Office hours	
163	Microscopy - Cryptosporidium/ Cyclospora/Microsporidium/ Isospora	Microbiology	Stool	Sterile Container	Whole amount	On the same day	24 hours	
164	Microscopy - Filaria	Microbiology	Smear	Slide	Not Applicable	On the same day	24 hours	
165	Microscopy - Malaria	Microbiology	Smear (Thick & Thin)	Slide	Not Applicable	1 hours	24 hours	
166	Microscopy - Other Parasite	Microbiology	Stool	Sterile Container	Whole amount	On the same day	24 hours	
167	Microscopy - Ova & Cyst	Microbiology	Stool	Sterile Container	Whole amount	On the same day	24 hours	
168	Microscopy - Pneumocystis carini	Microbiology	BAL	Sterile Container	Whole amount	On the same day	24 hours	
169	Microscopy - Slit Skin Smear (Leprosy)	Microbiology	Smear	Slide	Not Applicable	48 hours	24 hours	
170	Mixing Test (APTT or PT)	Haematology	Blood	Trisodium citrate tube (1 tube)	1.8 ml	24 hours	Office hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
171	MOGTT - Glucose, Fasting - Glucose, 2HPP	Chemical Pathology	Blood	Flouride Oxalate Tube	2.5 ml	1 working day	Office hours	Refer Chemical Pathology Section 5.3 Special Tests Procedure
172	Molecular - H1N1	Microbiology	Throat Swab	VTM	Not Applicable	7 working days	Office hours	FORM: H1N1 Form
173	Molecular - Mers-COV	Microbiology	Sputum Throat Swab	Sterile Container VTM	Whole amount Not Applicable	24 hours	24 hours	After consultation only. FORM : Mers Cov Form
174	Molecular - TB Genome	Microbiology	Sputum, Tissue, Eye, Body Fluids, BAL, Trephine Biopsy	Sterile Container	Whole amount	7 working days	Office hours	After consultation only
175	Non-gynecological cytology	Cytology	CSF and urgent fluid	Universal Sterile Container	Whole amount	5 working days	Office hours	
176	Non-gynecological cytology	Cytology	Routine	Universal Sterile Container	Whole amount	14 working days	Office hours	
177	Non-gynecological cytology	Cytology	Bronchial brushing	Send at least 2 slides a) 1 slide-fix with 95% alcohol b) 1 slide-dry in room temperature	Smear	Urgent : 5 working days Routine : 14 working days	Office hours	
178	Osmolality Blood	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	3 working days	Office hours	
179	Osmolality Urine	Chemical Pathology	Random urine	Universal Sterile Container	10 ml	3 working days	Office hours	
180	Osmotic Fragility Test (OFT)	Haematology	Blood	Lithium heparin tube (1 tube) and EDTA tube (1 tube)	4.0 ml (Lithium Heparin) & 2.0 ml (EDTA)	7 working days	Office hours	By appointment (ext. no. 2877)

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
181	Other Fluid FEME	Chemical Pathology	Other Body Fluid	Universal Sterile Container	10ml	7 working days	Office hours (Weekly)	
182	Pericardial Fluid FEME - LDH others (pericardial, synovial)	Chemical Pathology	Pericardial Fluid / Synovial Fluid	Universal Sterile Container	10ml	7 working days	Office hours (Weekly)	
183	Peritoneal Fluid FEME - LDH others (pericardial, synovial)	Chemical Pathology	Pericardial Fluid / Synovial Fluid	Universal Sterile Container	10ml	7 working days	Office hours (Weekly)	
184	Phenobarbitone	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	6 hours	Office hours	
185	Phenytoin	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	6 hours	Office Hour	
186	Phosphate inorganic (Phosphorus)	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
187	Phosphate, urine	Chemical Pathology	Random Urine	Universal Sterile Container	10ml	7 working days	Office hours (Weekly)	
188	Phosphate, urine 24hr	Chemical Pathology	24hr Urine	24hr Urine Bottle	24hr collection	7 working days	Office hours (Weekly)	
189	Pleural Fluid FEME	Chemical Pathology	Pleural Fluid	Universal Sterile Container	10 ml	7 working days	Office hours (Weekly)	
190	Post I (Reaction Transfusion Investigation)	Blood Transfusion Service	i) Blood bag ii) Blood iii) Urine	i) Secured the blood bag ii) EDTA Tube iii) Urine bottle	10 ml (blood) 10 ml (Urine)	2 weeks	Office hours	FORM: BTS/TR/2/2016 & BTS/HV/3/2016

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
191	Post II (Reaction Transfusion Investigation)	Blood Transfusion Service	i) Blood bag ii) Blood iii) Urine	i) Secured the blood bag ii) EDTA Tube iii) Urine bottle	10 ml (blood) 10 ml (Urine)	2 weeks	Office hours	FORM : BTS/TR/2/2016 & BTS/HV/3/2016
192	Potassium	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
193	Potassium urine	Chemical Pathology	Random Urine	Universal Sterile Container	10 ml	7 working days	Office hours (Weekly)	
194	Potassium, urine 24hr	Chemical Pathology	24hr Urine	24hr Urine Bottle	24hr collection	7 working days	Office hours (Weekly)	
195	Pregnancy Test (UPT) Urine	Chemical Pathology	Random Urine	Universal Sterile Container	10ml	1 working day	24 hours	
196	Progesterone	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
197	Progesterone Day 21, (Progesterone 21st)	Chemical Pathology	Blood	Plain Gel Tube	Adult - 3.5 ml	7 working days	Office hours (Weekly)	
198	Prolactin	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
199	Protein / Creatinine Index	Chemical Pathology	Random Urine	Universal Sterile Container	10 ml	1 working day	Office hours	
200	Protein urine, 24 hr	Chemical Pathology	24hr Urine	24hr Urine Bottle	24hr collection	7 working days	Office hours (Weekly)	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
201	Protein, Total	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
202	Protein, urine	Chemical Pathology	Random Urine	Universal Sterile Container	10 ml	7 working days	Office hours (Weekly)	
203	Prothrombin time (PT)	Haematology	Blood	Trisodium citrate tube (1 tube)	1.8 ml	60 minutes	24 hours	Fresh sample needed
204	PSA, Total	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	7 working days	Office hours (Weekly)	
205	Red Cell Phenotyping	Blood Transfusion Service	Blood	EDTA Tube	Paeds - 1.5 ml Adult - 3.5 ml	1 week	Office hours	Need to consult Blood Bank's doctor first
206	Renal biopsy	Histopathology	Tissue	Specimen in 2 containers: 1) Fresh tissue wet with Phosphate Buffer Saline 2) Tissue with 10% Buffered Formalin	Whole amount	21 working days	Office hours	
207	Respiratory Viral Screening	Microbiology	Nasopharyngeal Aspirata (NPA)	Sterile Container	3.5 ml	7 working days	Office hours	Fresh sample needed
208	Rh Phenotyping	Blood Transfusion Service	Blood	EDTA Tube	Paeds - 1.5 ml Adult - 3.5 ml	1 week	Office hours	
209	Rheumatoid Factors (RF)	Chemical Pathology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
210	Salicylate	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	1 hour	24 hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
211	SBCapillary, (Bilirubin Capillary Method)	Chemical Pathology	Blood	Heparinized Capillary Tube	≥ 3/4 Capillary Penuh	4 hours	24 hours	
212	SBV (Bilirubin Venous) - Total Bilirubin - Bilirubin Direct	Chemical Pathology	Blood	Paediatric Gel Tube / Lithium Heparin	1.5 ml	1 working day	24 hours	Paediatric Cases
213	Serology - Cytomegalovirus IgM	Microbiology	Blood	Plain Gel Tube	3.5 ml	14 working days	Office hours	
214	Serology - Dengue	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
215	Serology - Hepatitis B s Antibody	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
216	Serology - Hepatitis B s Antigen	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
217	Serology - Hepatitis Bc Antibody Total	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
218	Serology - Hepatitis Be Antibody	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
219	Serology - Hepatitis Be Antigen	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
220	Serology - Hepatitis C Screening	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
221	Serology - Herpes Simplex Virus 1/2	Microbiology	Blood	Plain Gel Tube	3.5 ml	14 working days	Office hours	
222	Serology - HIV Screening	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
223	Serology - Mycoplasma pneumoniae	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
224	Serology - Rapid Leptospira Test	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
225	Serology - Rubella IgM	Microbiology	Blood	Plain Gel Tube	3.5 ml	14 working days	Office hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
226	Serology - Syphilis Confirmation	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
227	Serology - Syphilis Screening	Microbiology	Blood	Plain Gel Tube	3.5 ml	7 working days	Office hours	
228	Serology - Toxoplasmosis Gondii IgG	Microbiology	Blood	Plain Gel Tube	3.5 ml	14 working days	Office hours	
229	Serology - Toxoplasmosis Gondii IgM	Microbiology	Blood	Plain Gel Tube	3.5 ml	14 working days	Office hours	
230	Serology - Typhus	Microbiology	Blood	Plain Gel Tube	3.5 ml	14 working days	Office hours	
231	Serum Albumin Ascites Gradients	Chemical Pathology	Blood & Ascite fluid	Plain Gel Tube / Plain Gel Tube	3 ml	1 working day	24 hours	
232	Sickling Test	Haematology	Blood	EDTA tube (1 tube)	2.0 ml	7 working days	Office hours	
233	Sodium	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
234	Sodium urine	Chemical Pathology	Random Urine	Universal Sterile Container	10 ml	7 working days	Office hours (Weekly)	
235	Sodium, urine 24hr	Chemical Pathology	24hr Urine	24hr Urine Bottle	24hr collection	7 working days	Office hours (Weekly)	
236	Stool Occult blood	Chemical Pathology	Stool	Sterile container	15 - 30 ml	On the same day	24 hours	Refer to Chemical Pathology Section 5.7 Special Tests Procedure
237	Synovial Fluid FEME	Chemical Pathology	Synovial Fluid	Universal Sterile Container	10 ml	7 working days	Office hours (Weekly)	
238	TB C&S - Non Sputum	Microbiology	Non Sputum	Sterile Container	Whole amount	6 - 8 weeks	Office hours	
239	TB C&S - Sputum	Microbiology	Sputum	Sterile Container	Whole amount	6 - 8 weeks	Office hours	
240	TB Smear - Non Sputum	Microbiology	Non Sputum	Sterile Container	Whole amount	24 hours	24 hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
241	TB Smear - Sputum	Microbiology	Sputum	Sterile Container	Whole amount	24 hours	24 hours	
242	Testosterone	Chemical Pathology	Blood	Plain Gel Tube	Paeds-1.5 ml Adult- 3.5 ml	7 working days	Office hours (Weekly)	
243	TFT (Thyroid Function Test) - Free T4 - TSH	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	3 working days	Office hours	For URGENT request (thyroid storm), please contact Chemical Pathologist On-Call
244	Theophylline	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	6 hours	Office hours	
245	Triglycerides	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
246	TSH (Thyroid Stimulating Hormone)	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
247	TSH Cord Blood (CTSH)	Chemical Pathology	Cord Blood	Plain Gel Tube	3.5 ml	1 working day	Office hours	
248	UIBC	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
249	UPT Morning Urine (Pregnancy Test)	Chemical Pathology	Morning Urine	Universal Sterile Container	10 ml	1 working day	24 hours	
250	UPT Random Urine (Pregnancy Test)	Chemical Pathology	Random Urine	Universal Sterile Container	10 ml	1 working day	24 hours	

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	LTAT (Min/Hr/Day)	AVAILABILITY	NOTES
251	Urea	Chemical Pathology	Blood	Plain Gel Tube / Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	24 hours	
252	Urea urine	Chemical Pathology	Random Urine	Universal Sterile Container	10 ml	7 working days	Office hours (Weekly)	
253	Urea, urine 24hr	Chemical Pathology	24hr Urine	24hr Urine Bottle	24hr collection	7 working days	Office hours (Weekly)	
254	Uric Acid	Chemical Pathology	Blood	Plain Gel Tube/Lithium Heparin	Paeds - 1.5 ml Adult - 3.5 ml	1 working day	Office hours	
255	Uric acid urine	Chemical Pathology	Random Urine	Universal Sterile Container	10 ml	7 working days	Office hours (Weekly)	
256	Uric Acid, 24hr	Chemical Pathology	24hr Urine	24hr Urine Bottle	24hr collection	7 working days	Office hours (Weekly)	
257	Urine Hemosiderin	Haematology	Urine	Sterile container	25.0 ml	48 hours	Office hours	By appointment (ext : 2877)
258	Valproic Acid	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	6 hours	Office hours	
259	Vancomycin	Chemical Pathology	Blood	Plain Gel Tube	Paeds - 1.5 ml Adult - 3.5 ml	6 hours	Office hours	



NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
1	17 Hydroxy Progesterone (17-OHP)	Chemical Pathology	Serum	Plain tube (serum), Paediatric patient: Paediatric tube	2-3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301	IMR
2	5-Hydroxyindoleacetic Acid (5-HIAA), Urine	Chemical Pathology	24-Hour urine specimen	24-Hour urine container with 10 ml of 25% HCL	5 ml of 24 hour urine specimen	IEM FORM	IMR
3	Acid Alpha Glucosidase	Chemical Pathology	Dried Blood Spot	Special filter paper. eg: Whatman 903	3 circles of dried blood spot	IEM FORM (Properly dried at room temperature for 4 hours before putting in sealed plastic bag. Transport at room temperature)	IMR
4	Acid Amino	Chemical Pathology	Plasma	Lithium heparin tube (plasma)	2 ml	IEM FORM	IMR
5	Acid Amino, CSF	Chemical Pathology	CSF	Sterile container	1 ml	IEM FORM (MUST send together with plasma. Indication: Epileptic encephalopathy)	IMR
6	Acid Amino, Urine	Chemical Pathology	Early morning urine	Sterile container	2 ml	IEM FORM (Early morning urine. Indication: Renal transport disorder. Hyperammonemia)	IMR
7	Acid Organic, Urine	Chemical Pathology	Urine	Sterile container	2 ml	IEM FORM	IMR
8	Acid Orotic, Urine	Chemical Pathology	Random urine	Sterile container	2 ml	IEM FORM	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
9	Acute Flaccid Paralysis (AFP)	Microbiology	Stool	Sterile container	5-10 ml	AFP FORM	IMR (Virology)
10	Acute Intermittent Porphyria (HMBS) Sequencing	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube.	IMR / UMDP/02 form and accompanied by consent form	IMR
11	Acute Intermittent Porphyria (HMBS) MLPA	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	(Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only).	IMR
12	Acylcarnitines	Chemical Pathology	Dried Blood Spot	Special filter paper. eg: Whatman 903	3 circles of dried blood spot	IEM FORM (Properly dried at room temperature for 4 hours before putting in sealed plastic bag. Transport at room temperature.)	IMR
13	ADAMTS13	Haematology	Blood	Trisodium citrate tube (1 tube)	1.8 ml	HOSPITAL AMPANG SPECIAL HEMATOLOGY LAB REQUISITION	Hospital Ampang (to consult HSNZ Haematologist)
14	Adrenocorticotrophic Hormone (ACTH)	Chemical Pathology	Plasma	K2 EDTA tube in ice, Paediatric patient: K2 EDTA Paediatric tube in ice	2-3 ml (adult),0.5-1 ml (paediatric)	PER-PAT 301 (Cortisol level should be provided with the request)	HKL
15	Alagille Syndrome	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
16	Alcohol (Ethanol)	Chemical Pathology	Serum or Plasma	Plain Tube without gel (serum) or Sodium Fluoride tube (plasma)	3 ml	PER-PAT 301	HKL
17	Aldosterone	Chemical Pathology	Plasma	K2 EDTA tube, Paediatric patient : K2 EDTA Paediatric tube	3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301 (Hypokalemia and certain drugs need to be avoided. Clinical history and drug history are MANDATORY. Refer Chemical Pathology Section 6.3 Special Tests Procedure for details.  Test should be requested by Specialist or Endocrine Specialist only).	Hospital Putrajaya
18	Alexander Disease (GFAP)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
19	Alpha 1-Antitrypsin Deficiency (SERPINA1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube or dried blood spot	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
20	Alpha 2 Macroglobulin	Chemical Pathology	Serum	Plain Tube	3ml	PER-PAT 301	Hospital Ampang

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
21	Alpha-1-Acid Glycoprotein (Orosomucoids)	Chemical Pathology	Serum	Plain Tube	3ml	PER-PAT 301	Hospital Ampang
22	Alpha-1-Antitrypsin (Quantitation)	Chemical Pathology	Serum	Plain tube. Paediatric patient: Paediatric plain tube	3 ml (adult), 0.5- 1 ml (paediatric)	SPECIFIC PROTEIN FORM	IMR
23	Alpha-1-Antitrypsin- (Phenotyping)	Chemical Pathology	Serum	Plain tube. Paediatric patient: Paediatric plain tube	3 ml (adult), 0.5- 1 ml (paediatric)	SPECIFIC PROTEIN FORM	IMR
24	Amobiasis Diagnosis - PCR	Microbiology	Whole blood in EDTA, pus/aspirate/ biopsy/ scrapings	EDTA tube or sterile air tight container	2.5ml	PER-PAT 301	IMR (Parasitology lab)
25	Amoebiasis Serology	Microbiology	Blood	Plain Gel Tube	5ml	PER-PAT 301	IMR (Parasitology lab)
26	Angelman Syndrome	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
27	Anti Aquaporin 4 (Anti Aq4)/Anti-Neuromyelitis Optica (Anti-NMO)	Microbiology	Blood	Plain Gel Tube	5ml	PER-PAT 301	IMR (AIRC Lab)
28	Anti Glutamic Acid Decarboxylase	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR
29	Anti Insulin	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR
30	Anti Insulinoma Associated Antigen-2	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
31	Anti Islet Cell	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR
32	Anti Mitochondrial Antibody	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR
33	Anti Parietal Cells Antibody	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR
34	Anti Smooth Muscle Antibody	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR
35	Anti Thyroglobulin Antibody	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	HKL
36	Anti Thyroid Microsomal Antibodies	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	HKL
37	Anti Voltage Gate Potassium Channel (VKGC): Anti -LCI 1, Anti-CASPR	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR
38	Anti-AcetylcholineReceptor	Chemical Pathology	Blood or Serum	Plain Gel Tube	5 ml	PER-PAT 301	IMR
39	Anti-Beta-2-Glycoprotein 1 (ABG)	Microbiology	Blood	Plain Gel Tube	5ml	PER-PAT 301	IMR (AIRC Lab)
40	Antibody Myeloperoxidase (Anti-MPO)	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (AIRC Lab)

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
41	Antibody Proteinase 3 (Anti-PR3)	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (AIRC Lab)
42	Anti-Cyclic Citrullinated Peptides (CCP)	Chemical Pathology	Blood or Serum	Plain Gel Tube	5 ml	PER-PAT 301	IMR
43	Anti-Glomerular Basement Membrane	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR
44	Anti-HBc IgM EIA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
45	Anti-Liver-Kidney Microsomer (LKM)	Chemical Pathology	Blood or Serum	Plain Gel Tube	5 ml	PER-PAT 301	IMR
46	Anti-N-Methyl-D-Aspartate Receptor (NMDAR)	Chemical Pathology	Blood/ CSF	Plain Gel Tube/ Bijou bottle	5 ml	PER-PAT 301	IMR
47	Anti-Thyroid receptor antibody	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
48	Argininosuccinate Lyase Deficiency (ASL)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
49	Argininosuccinate Synthase Deficiency (ASS1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
50	Aromatic Amino Acid Decarboxylase Deficiency (DDC)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
51	Aspergillus galactomanan antigen detection	Microbiology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR (Bacteriology lab)
52	Benzodiazepines	Chemical Pathology	Serum	Plain Tube without gel	3 ml	TDM FORM	HKL
53	Berardinelli Congenital Lipodystrophy	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
54	Beta-2 Microglobulin	Chemical Pathology	Serum	Plain Tube	3ml	PER-PAT 301	Hospital Ampang
55	Beta-2 Microglobulin, Urine	Chemical Pathology	Random Urine	Sterile Container	10ml	PER-PAT 301	Hospital Ampang
56	Bile acid	Chemical Pathology	Serum	Plain tube	5 ml (adult), 0.5 ml (paediatric)	PER-PAT 301	Hospital Selayang
57	Biogenic Amines, CSF	Chemical Pathology	CSF	Sterile container	0.5 ml	IEM FORM (Protect from light)	IMR
58	Biogenic Amines, Urine	Chemical Pathology	Random urine	Sterile container	2 ml	IEM FORM (Protect from light. Indication: Suspected neurotransmitter disorder)	IMR
59	Biotinidase Deficiency (BTD)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
60	Biotinidase Enzyme Activity	Chemical Pathology	Dried Blood Spot	Special filter paper. eg: Whatman 903	3 circles of dried blood spot	IEM FORM (Properly dried at room temperature for 4 hours before putting in sealed plastic bag. Transport at room temperature)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
61	BK virus (BKV) DNA Quantitation	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
62	Blood Cytogenetic Study	Haematology	Blood	Lithium heparin tube (1 tube) and EDTA tube (1 tube)	4.0 ml (Lithium heparin) & 2.0 ml (EDTA)	CYTOGENETICS REQUEST FORM FOR PERIPHERAL BLOOD SAMPLES HKL/GE/TPM/N-1-(1) OR CHROMOSOMAL STUDIES FOR PERIPHERAL BLOOD 01/Sept/2005	i) HKL (by appointment) or ii) HUSM, HUMAN GENOME CENTRE
63	Bone marrow Cytogenetic Study	Haematology	Bone Marrow Aspirate	Sodium Heparin tube (1 tube)	4 ml	BONE MARROW CYTOGENETICS REQUEST FORM OR CHROMOSOMAL STUDIES FOR BONE MARROW ASPIRATES	i) IMR OR ii) HUSM, HUMAN GENOME CENTRE
64	Bordetella pertussis (PCR)	Microbiology	1. Nasopharyngal aspirate (preferably) 2. Nasopharyngal swab (Dacron swab)	1. Sterile container 2. Stuarts transport media (do not use calcium alginate swabs/cotton swabs)	1-2 mls of nasopharyngeal aspirate	PER-PAT 301	IMR (Bacteriology lab)
65	Borellia burgdorferi (Lyme's disease) antibody detection	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (Bacteriology lab)
66	Brucella PCR	Microbiology	Blood	EDTA Tube	5ml	PER-PAT 301	IMR (Bacteriology lab)
67	Brucella Serology	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (Bacteriology lab)
68	CADASIL (NOTCH3) - hotspots	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
69	Caeruloplasmin	Chemical Pathology	Serum	Plain tube. Paediatric patient: Paediatric plain tube	3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301	HKL
70	Calcitonin	Chemical Pathology	Serum	Plain tube (serum), Paediatric patient: Paediatric tube	2-3 ml (adult), 1 ml (paediatric)	PER-PAT 301 (Fasting sample is preferable)	Institut Kanser Negara
71	Canavan Disease (ASPA)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
72	Cancer Antigen 15-3 (CA 15-3)	Chemical Pathology	Serum or Plasma	Plain Tube (serum) or Lithium Heparin Tube (plasma)	3 ml	PER-PAT 301	HKL
73	Cancer Antigen 19-9 (CA 19-9)	Chemical Pathology	Serum or Plasma	Plain Tube (serum) or Lithium Heparin Tube (plasma)	3 ml	PER-PAT 301	HKL
74	Carbamoylphosphate Synthetase 1 Deficiency (CPS1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
75	Carnitine (Total & Free plasma)	Chemical Pathology	Plasma	Lithium heparin tube	2 ml	IEM FORM (Indication: Carnitine deficiency(Primary or secondary), Fatty acid oxidation defect, organic aciduria)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
76	Carnitine Palmitoyltransferase 1A (CPT1) Deficiency (CPT1A)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
77	Carnitine Palmitoyltransferase II (CPT 2) Deficiency (CPT2)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
78	Carnitine Update Deficiency (OCTN2)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
79	Carnitine-Acylcarnitine Translocase Deficiency (SLC25A20)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
80	Cat scratch disease (Bartonella henselae) antibody detction	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (Bacteriology lab)

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
81	Cathecholamines, Urine	Chemical Pathology	24-hour urine specimen	24-hour urine container with 10 mls of 25% HCL	Minimum urine volume: 500 mls (adult)	PER-PAT 301 i) Urine Volume :Adult > 500 ml) ii) Urine pH <5. iii) Only request by Specialist . Refer Chemical Pathology Section 6.1 Special Tests Procedure for details.	HKL
82	Chikugunya IgG/IgM	Microbiology	Blood	Plain Gel Tube	5ml	PER-PAT 301	MKAK
83	Chikugunya RT-PCR	Microbiology	Blood	Plain Gel Tube	3.5 mls	PER-PAT 301	MKAK
84	Chikugunya virus isolation	Microbiology	Blood	Plain Gel Tube	3.5 mls	PER-PAT 301	MKAK
85	Chlamydia pneumoniae antibody	Microbiology	Blood	Plain Gel Tube	3ml	PER-PAT 301	Hospital Sg. Buloh
86	Chlamydia pneumoniae antibody	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	Hospital Sg. Buloh
87	Chlamydia trachomatis antibody	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	Hospital Sg. Buloh
88	Chlamydia trachomatis Immunofluorescence	Microbiology	Genital discharge/ Eye discharge	Smear (on slide)	Not Applicable	PER-PAT 301	Hospital Sg. Buloh
89	Cholinesterase	Chemical Pathology	Serum	Plain Tube	3 ml	PER-PAT 301	HKL
90	Citrin Deficiency (SLC25A13)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
91	Classical Homocystinuria (CBS)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
92	CMV - DNA PCR Viral Load (Quantitative)	Microbiology	Blood	EDTA Tube	3 ml	PER-PAT 301	HKL
93	CMV - IgG ELISA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
94	Coagulation factor assay (other than factor VIII and IX)	Haematology	Blood	Trisodium citrate tube (3 tubes)	5.4 ml	SEROLOGY REQUEST FORM PDN/HA/QP-01/01	PDN
95	Coeliac Antibodies; Anti Endomysium Anti Glladin Anti Tissue Transglutaminase	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR
96	Copper	Chemical Pathology	Serum	Plain Tube without gel	3 ml	PER-PAT 301	IMR
97	Copper, urine	Chemical Pathology	24 hr urine	Sterile Container	20 ml	PER-PAT 301	IMR
98	Cortisol, Free, Urine	Chemical Pathology	24-hour urine specimen	24-hour urine container without preservative	Minimum urine volume: 500 mls (adult)	PER-PAT 301 (1. Incomplete 24 hours urine collection may affect validity of the results 2. Patients' hydration status and renal disease also influence urine cortisol excretion)	HKL

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
99	Coxiella Serology	Microbiology	Blood	Plain Gel Tube	1ml	PER-PAT 301	IMR (Bacteriology lab)
100	C-Peptide	Chemical Pathology	Serum	Plain tube (serum), Paediatric patient: Paediatric tube	2-3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301 (Glucose result should be provided with the request)	HKL
101	Creatine and Guanidinoacetate, Urine	Chemical Pathology	Random urine	Sterile container	2 ml	IEM FORM	IMR
102	Cryoglobulin	Chemical Pathology	Refer to performing laboratory	Refer to performing laboratory	Refer to performing laboratory	Test offered by appointment (03 4279 6000 Ext 6216) Only patient referred to H. Ampang, HKL & IJN	Hospital Ampang
103	Cryptococcal antigen	Microbiology	Serum	Plain Gel Tube	3ml	PER-PAT 301	HRPZ II
104	CSF Oligoclonal band	Chemical Pathology	CSF and Serum	Sterile Bijou bottle (CSF) and Plain tube (Serum)	3ml (CSF) and 5ml (Serum)	SPECIFIC PROTEIN FORM (CSF sample must paired with serum sample within 4hours of collection)	IMR
105	Cystine, Urine	Chemical Pathology	Random urine	Sterile container	2 ml	IEM FORM	HKL
106	Cytomegalovirus (PCR)	Microbiology	Blood/ CSF	Plain Gel Tube/ Bijoux bottle	2-3ml/ 300uL	PER-PAT 301	HRPZ II
107	Dehydroepiandrosterone Sulphate (DHEAS)	Chemical Pathology	Serum	Plain tube (serum), Paediatric patient: Paediatric tube	2-3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301	HKL

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
108	Delta-aminolevulinic acid (ALA), Urine	Chemical Pathology	Random urine or 24-Hour urine specimen	Sterile container (Random urine) or 24-Hour urine container without preservative.	5 ml	IEM FORM (Protect from light)	IMR
109	Dihydropyrimidinase (DHP) Deficiency (DPYS)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
110	DNA analysis for alpha thalassaemia	Haematology	Blood	EDTA tube (1 tube)	3 ml	DNA ANALYSIS THALASEMIA REQUEST FORM	HKL
111	DNA analysis for beta thalassaemia	Haematology	Blood	EDTA tube (1 tube)	3 ml	DNA ANALYSIS THALASEMIA REQUEST FORM	IMR
112	DNA Extraction & Storage	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
113	EBV - IgG ELISA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
114	EBV - IgM ELISA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
115	Echinococcosis Serology	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (Serology lab)
116	Enterovirus PCR	Microbiology	Blood/ Stool/ Swab	Plain Gel Tube Universal container VTM	2-3ml Size of 1 pea Swab from blister	PER-PAT 301	HRPZ II

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
117	Enterovirus-molecular detection and enterovirus 71	Microbiology	Stool Rectal swab Throat swab Vesicle swab Ulcer swab Pleural fluid CSF Serum	Sterile container VTM VTM VTM VTM VTM Plain Gel Tube	5g or 'pea size' - - - - 1ml 5ml	PER-PAT 301	МКАК
118	Enterovirus-virus isolation (coxsackie B, A16 & A24, enterovirus 70&71, echovirus and poliovirus	Microbiology	Stool Rectal swab Throat swab Vesicle swab Ulcer swab Pleural fluid CSF Serum	Sterile container VTM VTM VTM VTM VTM Plain Gel Tube	5g or 'pea size' - - - - 1ml 5ml	PER-PAT 301	МКАК
119	Epstein Barr Virus PCR	Microbiology	Blood/ CSF	Plain Gel Tube/ Bijoux bottle	2-3ml/ 300uL	PER-PAT 301	HRPZ II
120	Ethylmalonic Encephalopathy (ETHE1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
121	Filariasis Diagnosis - PCR	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (Parasitology lab)
122	Filariasis Serology	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (Parasitology lab)
123	Floating-Harbor Syndrome (FHS) (SRCAP)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
124	Fluconazole	Chemical Pathology	Plasma	K2 EDTA Tubes	3 ml	PER-PAT 301 (Sample must arrived immediately (2-8°C) after collection date. Moderately and grossly hemolysed sample not suitable for analysis)	Hospital Ampang
125	Fragile X Syndrome (FRAXA)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
126	Free Kappa Light Chain	Chemical Pathology	Serum	Plain Tube	5ml	PER-PAT 301	Hospital Ampang
127	Free Kappa Light Chain, Urine	Chemical Pathology	Random Urine	Sterile Container	20ml	PER-PAT 301	Hospital Ampang
128	Free Lambda Light Chain	Chemical Pathology	Serum	Plain Tube	5ml	PER-PAT 301	Hospital Ampang
129	Free Lambda Light Chain, Urine	Chemical Pathology	Random Urine	Sterile Container	20ml	PER-PAT 301	Hospital Ampang
130	Free light chain Quantitation	Chemical Pathology	Serum	Plain Tube	5ml	PER-PAT 301	Hospital Ampang

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
131	Free light chain Quantitation, Urine	Chemical Pathology	Random Urine	Sterile Container	20ml	PER-PAT 301	Hospital Ampang
132	Fructosamine	Chemical Pathology	Serum or Plasma	Plain tube (serum) or Lithium heparin tube (plasma), Paediatric patient: Paediatric tube	2-3 ml (adult)	PER-PAT 301	Hospital Ampang
133	Fructose-1,6- Bisphosphatase Deficiency (FBP1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/Neurologist/ Physician/Paediatrician only)	IMR
134	Fucosidosis (FUCA1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
135	G6PD quantitation	Chemical Pathology	Whole Blood	K2 EDTA Tube, Paediatric patient: K2 EDTA Paediatric tube	3ml	PER-PAT 301	Hospital Ampang
136	Galactokinase Deficiency (GALK1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
137	Galactose Epimerase Deficiency (GALE)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
138	Galactose Total	Chemical Pathology	Dried Blood Spot	Special filter paper. eg: Whatman 903	3 circles of dried blood spot	IEM FORM (Properly dried at room temperature for 4 hours before putting in sealed plastic bag. Transport at room temperature)	IMR
139	Galactose-1-Uridyl Transferase (GALT)	Chemical Pathology	Dried Blood Spot	Special filter paper. eg: Whatman 904	4 circles of dried blood spot	IEM FORM (Properly dried at room temperature for 4 hours before putting in sealed plastic bag. Transport at room temperature)	IMR
140	Gangliosides Antibodies: Anti-GM1 Anti-GM2 Anti-GM3 Anti-GD1a Anti-GD1b Anti-GT1b Anti-GQ1b	Chemical Pathology	Blood/ CSF	Plain Gel Tube/ Bijou bottle	5 ml	PER-PAT 301	IMR (AIRC Lab)
141	Gaucher Disease (GBA)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
142	Glutaric Aciduria Type 1 (GCDH)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
143	Glycogen Storage Disease Type Ia (GSDI) (G6P6)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
144	Glycogen Storage Disease Type Ib (GSDI) (SLC37A4)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
145	Glycogen Storage Disease Type III (GSDIII) (AGL)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
146	Growth Hormone (Somatotrophin)	Chemical Pathology	Serum	Plain tube (serum), Paediatric patient: Paediatric tube	2-3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301	
147	Hantavirus HFRS Antibody, IgG	Microbiology	Blood	Plain Gel Tube	1-3 ml	PER-PAT 301	IMR (Virology Lab)
148	Hantavirus HFRS Antibody, IgM	Microbiology	Blood	Plain Gel Tube	1-3 ml	PER-PAT 301	IMR (Virology Lab)
149	Haptoglobin	Chemical Pathology	Serum	Plain tube. Paediatric patient: Paediatric plain tube	3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301	HKL
150	HAV IgG/IgM ELISA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
151	HBsAg - (Confirmatory by CMIA)	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
152	HBV - DNA PCR Viral Load (Quantitative)	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	Hospital Sg. Buloh
153	HCV - RNA Genotyping	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
154	HCV - RNA PCR Viral Load (Quantitative)	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	Hospital Sg. Buloh
155	Hemoglobin, Urine	Chemical Pathology	Random Urine	Universal container	10 ml	IEM FORM	IMR
156	Hemophilia carrier study	Haematology	Blood	Trisodium citrate tube (6 tubes)	10.8 ml	SEROLOGY REQUEST FORM PDN/HA/QP-01/01	PDN
157	Hepatitis A Virus (HAV) - IgG EIA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
158	Hepatitis A Virus (HAV) - IgM EIA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
159	Hereditary Orotic Aciduria (UMPS)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
160	Herpes Simplex Virus (HSV) PCR	Microbiology	Blood/ CSF	Plain Gel Tube/ Bijoux bottle	2-3ml/ 300uL	PER-PAT 301	HRPZ II

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
161	Herpes Simplex Virus Antigen, Acute Neurological Syndrome	Microbiology	Vesicular Swab/Scraping	Sterile plastic vial	Swabs to be put into 2-3mls of VTM	PER-PAT 301	IMR (Virology Lab)
162	Herpes Simplex Virus Antigen, Conjunctivitis	Microbiology	Eye swab, lacrimal tears	i) Eye swab: Sterile plastic vial contain 2-3ml of VTM ii) Lacrimal tears: In capillary tube	i) Eye swab: Sterile swab moistened with distilled water ii) Lacrimal tears: 10-20 ul tears	PER-PAT 301	IMR (Virology Lab)
163	Herpes Simplex Virus Isolation, Acute Neurological Syndrome	Microbiology	Throat swab, Stool, Rectal swab, CSF, Vesicular Swab/Scraping, Organ biopsies	i) TS: Sterile plastic vial contain 2-3ml of VTM ii) Stool: Sterile bottle iii) Rectal swab: Sterile plastic vial contain 2-3ml of VTM vi) CSF: sterile container v) Vesicular swab/scraping: Sterile plastic vial vi)organ biopsy: Sterile containers containing VTM to keep tissue moist	i) TS: Sterile swab ii) Stool: >5gm (thumb size) iii) Rectal swab: Stool on sterile swab moistened with distilled water iv) CSF: 1-3mls v) Vesicular swab/scrapings: Swabs to be put into 2-3mls of VTM vi) Organ biopsy: remove portions, about 1.5cm cube of various parts of affected organs	PER-PAT 301	IMR (Virology Lab)

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
164	Herpes Simplex Virus Isolation, Conjunctivitis	Microbiology	Eye swab, lacrimal tears	i) Eye swab: Sterile plastic vial contain 2-3ml of VTM ii) Lacrimal tears: In capillary tube	i) Eye swab: Sterile swab moistened with distilled water ii) Lacrimal tears: 10-20 ul tears	PER-PAT 301	IMR (Virology Lab)
165	Herpes virus Isolation	Microbiology	Vesicular swab/scraping	Sterile plastic vial	Swabs to be put into 2-3mls of VTM	PER-PAT 301	IMR (Virology Lab)
166	Herpes viruses Isolation	Microbiology	i)Nasopharynge al swab, ii)Throat swab, iii) Cardiac biopsy, iv) Rectal swab, v) Stool, vi) Pericardial aspirate	i) NPS: Sterile plastic vial contain 2-3ml of VTM ii) TS: Sterile plastic vial contain 2-3ml of VTM iii) organ biopsy: Sterile containers containing VTM to keep tissue moist iv) Rectal swab: Sterile plastic vial contain 2-3ml of VTM v) Stool: Sterile bottle vi) Pericardial aspirate: sterile plastic vial contain 2-3ml VTM	i) NPS: A flexible, fine shafter polyester swab. Use different swab for each nostrils ii) TS: Sterile swab iii) biopsy: remove portions, about 1.5cm cube of various parts of affected organs iv) Rectal swab: Stool on sterile swab moistened with distilled water v) Stool: >5gm (thumb size)	PER-PAT 301	IMR (Virology Lab)

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
167	HIV DR Genotyping (Human immunodeficiency virus (HIV) Drug Resistance Test)	Microbiology	Blood	EDTA Tube	5-10ml	IMR/Viro/HIV/24 form	IMR (Virology Lab)
168	HIV PCR (Human immunodeficiency virus (HIV) Nucleic Acid)	Microbiology	Blood	EDTA Tube	2.5ml	IMR/VIRUS/NARL2	IMR (Virology Lab)
169	HIV Viral load	Microbiology	Blood	EDTA Tube	3ml x 4 Tube (Adult) 3ml x 2 Tube(Peads)	PER-PAT 301	HRPZ II
170	HLA Typing (Class I and II)	Microbiology	Blood	EDTA Tube	6 ml	●HLA TYPING TEST REQUEST FORM - IMR/AIRC/TI/RF-2 ●HLA TYPING TEST REQUEST FORM (Disease Association) - IMR/AIRC/TI/RF-3	IMR (appointment to be taken by clinician)
171	HLA typing for bone marrow transplant	Haematology	Blood	EDTA tube (3 tubes)	6.0 ml	HLA TYPING TEST REQUEST FORM: IMR/AIRC/TI/RF-2 IMR/AIRC/TI/RF-3	IMR
172	Homocysteine	Chemical Pathology	Plasma	EDTA tube	2 ml	IEM FORM (Indication: Suspected Homocystinuria, Marfan like syndrome, Cobalamine disorder, sulphur amino acid disorder)	IMR
173	Homocysteine, Urine	Chemical Pathology	Random urine	Sterile container	2 ml	IEM FORM	HKL
174	HTLV I & II - Ab (Screening by ELISA)	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
175	Hydatid Disease/Echinococcosis Diagnosis - Serology	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (Parasitology lab)

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
176	Hypophosphatasia (ALPL)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
177	IgE, Specific	Microbiology	Blood	Plain Gel Tube	5ml	PER-PAT 301	IMR (AIRC Lab)
178	IgE, Total	Microbiology	Blood	Plain Gel Tube	5ml	PER-PAT 301	IMR (AIRC Lab)
179	Immunoglobulin A (IgA)	Chemical Pathology	Blood	Plain Gel Tube	3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301	HKL
180	Immunoglobulin E (IgE) specific	Chemical Pathology	Blood	Plain Gel Tube	3ml	PER-PAT 301	IMR
181	Immunoglobulin E (IgE) Total	Chemical Pathology	Blood	Plain Gel Tube	3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301	IMR
182	Immunoglobulin G (IgG)	Chemical Pathology	Blood	Plain Gel Tube	3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301	HKL
183	Immunoglobulin M (IgM)	Chemical Pathology	Blood	Plain Gel Tube	5ml	PER-PAT 301	HKL
184	Immunophenotyping for leukemia/lymphoma (bone marrow/peripheral blood)	Haematology	Blood/ Bone Marrow Aspirate	EDTA tube (2 tubes)	4.0 ml	PER-PAT 301	HKL
185	Insulin	Chemical Pathology	Serum	Plain tube (serum), Paediatric patient: Paediatric tube	2-3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301 (Glucose level should be provided with the request)	HKL

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
186	Insulin-like Growth Factor 1 (IGF-1)	Chemical Pathology	Serum	Plain tube (serum), Paediatric patient: Paediatric tube	2-3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301 (Fasting sample is preferable)	IMR
187	Isolated Methyl Malonic Aciduria (MMA) (MUT)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
188	Japanese encephalitis IgM	Microbiology	Blood	Plain Gel Tube	5ml	PER-PAT 301	MKAK
189	Japanese encephalitis- RTPCR	Microbiology	Blood	Plain Gel Tube	5ml	PER-PAT 301	MKAK
190	Japanese encephalitis virus isolation	Microbiology	Blood	Plain Gel Tube	5ml	PER-PAT 301	MKAK
191	Ketone	Chemical Pathology	Serum	Plain tube	5 ml (adult), 0.5 ml (paediatric)	PER-PAT 301	HKL
192	Lassa Nuclei Acid	Microbiology	Serum, Tissue Biopsy	After consultation only	After consultation only	PER-PAT 301	IMR (Virology Lab)
193	Lead	Chemical Pathology	Plasma or Whole Blood	Lithium heparin tube (Plasma) or K2 EDTA tube (Whole Blood)	3 ml	PER-PAT 301	
194	Leber's hereditary optic neuropathy (LHON)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
195	Legionella pneumophilia	Microbiology	Urine	Sterile container	5ml	PER-PAT 301	Hospital Sg. Buloh
196	Legionella Serology	Microbiology	Blood	Plain Gel Tube	5ml	PER-PAT 301	MKAK
197	Leigh Syndrome (SURF1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
198	Leishmaniasis PCR	Microbiology	Lymph node/tissue aspirate, blood in EDTA, buffy coats, dried blood on filter paper	EDTA Tube, filter paper	2.5 ml	PER-PAT 301	IMR (Parasitology lab)
199	Leishmaniasis Serology	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (Parasitology lab)
200	Leopard Syndrome (PTPN11)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
201	Lesch-Nyhan Syndrome (HPRT)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
202	Lipoprotein (a) Electrophoresis	Chemical Pathology	Serum	Plain Tube	3ml	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
203	Lissencephaly (LIS1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
204	Long-Chain 3-Hydroxyacyl- CoA Dehydrogenase (HADHA)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
205	Lupus Anticoagulant	Haematology	Blood	Trisodium citrate tube (6 tubes)	10.8 ml	SEROLOGY REQUEST FORM PDN/HA/QP-01/01	PDN
206	Lysinuric Protein Intolerance (SLC7A7)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
207	Lysosomal Storage Disease (LSD) Confirmation- Enzyme assay	Chemical Pathology	Whole Blood	EDTA tube	6 ml	IEM FORM	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
208	Lysosomal Storage Disease (LSD) Screening	Chemical Pathology	Dried Blood Spot	Special filter paper. eg: Whatman 903	3 circles of dried blood spot	IEM FORM (Properly dried at room temperature for 4 hours before putting in sealed plastic bag. Transport at room temperature)	IMR
209	Malaria PCR	Microbiology	Blood, Dried blood (filter paper), Thick/thin blood film (Giemsa stained)	Slide mailer or EDTA tube or seal plastic bag	2.5ml	PER-PAT 301	IMR (Parasitology lab)
210	Malaria Serology	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (Parasitology lab)
211	Maple Syrup Urine Disease (BCKDHA)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
212	Marburg Nucleic Acid	Microbiology	Serum, Tissue Biopsy	After consultation only	After consultation only	PER-PAT 301	IMR (Virology Lab)
213	Maroteaux-Lamy Syndrome, MPS VI (ARSB)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
214	MCT8-Specific Thyroid Hormone Cell Transporter Deficiency (SLC16A2)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
215	Measles IgM	Microbiology	Serum /blood	Plain Gel Tube	1ml for serum 5ml for blood	Measles form	MKAK
216	Measles Virus Isolation/RT PCR	Microbiology	Urine Nasopharyngeal secretion Throat swab	Sterile screw capped container sediment 2.5ml sterile VTM	10ml/urine 1ml	Measles form	MKAK
217	Medium Chain Acyl-CoA Dehydrogenase (MCAD) Deficiency (ACADM)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
218	Mercury, urine	Chemical Pathology	Random urine	Sterile Container	20 ml	PER-PAT 301	IMR
219	Metabolic Screening, Urine	Chemical Pathology	Random urine	Sterile container	2 ml	IEM FORM (Indication: Screening for organic acid disorder and amino acid disorder)	IMR
220	Metachromatic Leukodystrophy (MLD) (ARSA)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
221	Methylenetetrahydrofolate Reductase Deficiency (MTHFR)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
222	Methylmalonic Aciduria and Homocystinuria Type D (MMADHC)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
223	Methylmalonic Aciduria and Homocystinuria, cbIC Type (MMACHC)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
224	Methylmalonyl-CoA Epimerase Deficiency (MCEE)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
225	Micro-agglutination test for leptospirosis antibody (MAT)	Microbiology	Blood	Plain Gel Tube	3-5ml	Leptospira form	MKA,KB
226	Mitochondrial Encephalomyopathy, Lactic Acidosis, and Stroke-Like Episodes (MELAS) Syndrome (3243 hotspot)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
227	Mitochondrial Encephalomyopathy, Lactic Acidosis, and Stroke-Like Episodes (MELAS) Syndrome (full panel)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
228	Mitochondrial Short-Chain Enoyl-CoA Hydratase 1 Deficiency (ECHS1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
229	Molecular - TB Genome Detection	Microbiology	Sputum, Tissue, Eye, Body Fluids, BAL, Trephine Biopsy	Sterile container	Whole Amount	PER-PAT 301	MKA,KB
230	Molecular - TB LPA	Microbiology	Sputum	Sterile container	Whole Amount	PER-PAT 301	MKA,KB
231	Molecular study for Acute Leukemia	Haematology	Bone marrow/blood	EDTA tube (3 tubes)	6.0 ml	MOLECULAR ANALYSIS FOR LEUKEMIA	IMR
232	Molecular study for BCR- ABL	Haematology	Blood/ Bone Marrow Aspirate	EDTA tube (6 tubes)	15 ml	HOSPITAL AMPANG SPECIAL HEMATOLOGY LAB REQUISITION	Hospital Ampang
233	Molecular study for JAK2	Haematology	Blood/ Bone Marrow Aspirate	EDTA tube (2 tubes)	3 ml	HOSPITAL AMPANG SPECIAL HEMATOLOGY LAB REQUISITION	Hospital Ampang
234	Molecular study for PML- RARA	Haematology	Blood/ Bone Marrow Aspirate	EDTA tube (2 tubes)	3 ml	HOSPITAL AMPANG SPECIAL HEMATOLOGY LAB REQUISITION	Hospital Ampang
235	Morquio A Disease (MPS IVA) - GALNS	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
236	mtDNA Deletion Syndromes Chronic Progressive External Ophthalmoplegia (CPEO) MLPA	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
237	mtDNA Deletion Syndromes - Kearns-Sayre Syndrome (KSS) MLPA	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
238	mtDNA Deletion Syndromes - Pearson Syndrome MLPA	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
239	mtDNA Depletion Syndrome (MDS) Panel - ANT1	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
240	mtDNA Depletion Syndrome (MDS) Panel - DGUOK	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
241	mtDNA Depletion Syndrome (MDS) Panel - MPV17	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
242	mtDNA Depletion Syndrome (MDS) Panel - POLG	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
243	mtDNA Depletion Syndrome (MDS) Panel - RRM2B	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
244	mtDNA Depletion Syndrome (MDS) Panel SUCLA2	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
245	mtDNA Depletion Syndrome (MDS) Panel SUCLG1	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
246	mtDNA Depletion Syndrome (MDS) Panel TWINKLE	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
247	mtDNA Depletion Syndrome (MDS) Panel TYMP	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
248	Mucopolysaccarides(MPS)- Confirmation( Enzyme assay)	Chemical Pathology	Whole Blood	EDTA tube	6 ml	IEM FORM	IMR
249	Mucopolysaccarides(MPS)- Screening	Chemical Pathology	First morning urine	Sterile container	5 ml	IEM FORM (First morning urine)	IMR
250	Multiple Respiratory Chain Deficiencies (Mitochondrial Translation Defect) (GFM1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
251	Mumps - IgG ELISA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
252	Mumps - IgM ELISA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
253	Mumps RT-PCR	Microbiology	Throat swab Saliva Urine	2.5ml sterile VTM Sterile screw cappe container	1ml 10ml of urine or sediment	PER-PAT 301	MKAK
254	Mumps Virus isolation	Microbiology	Throat swab Saliva Urine	2.5ml sterile VTM Sterile screw cappe container	1ml 10ml of urine or sediment	PER-PAT 301	МКАК

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
255	Myoclonic Epilepsy with Ragged-Red Fibers (MERRF) Syndrome	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
256	Myoglobin	Chemical Pathology	Serum or Plasma	Plain Tube (serum) or Lithium Heparin Tube (plasma)	5ml	PER-PAT 301	Hospital Ampang
257	Myoglobin Urine (Qualitatif)	Chemical Pathology	Random Urine	Sterile Container	10ml	IMR / UMDP/02 form and accompanied by consent form	IMR
258	Myoglobin urine (Quantitatif)	Chemical Pathology	Random Urine	Sterile Container (add with 200mg sodium bicarbonate for each 10ml)	10ml	PER-PAT 301	Hospital Ampang
259	N-Acetylglutamate Synthase (NAGS) Deficiency (NAGS)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
260	Neuropathy, Ataxia and Retinitis Pigmentosa (NARP) Syndrome	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
261	Nipah Virus Antibody	Microbiology	Serum, CSF	i) CSF: sterile container ii) Serum:plain tube	i) CSF: 1-3mls ii) Serum: 1-3mls	PER-PAT 301	IMR (Virology Lab)
262	Nipah Virus Nucleic Acid	Microbiology	Serum, CSF, Organ biopsies	After consultation only	After consultation only	PER-PAT 301	IMR (Virology Lab)
263	Non Ketotic Hyperglycinemia (NKH)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
264	Noonan Syndrome (PTPN11)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
265	Oligosaccharide / tetrasaccharide, Urine	Chemical Pathology	First morning urine	Sterile container	5 ml	IEM FORM (First morning urine. Transport frozen in ice)	IMR
266	Ornithine Transcarbamylase (OTC) Deficiency (OTC)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
267	Paraneoplastic Neurologycal Syndrome (PNS) Antibodies: Anti-Ma Anti-Yo Anti-RI Anti-Hu Anti-Amphiysin Anti-CV2	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR
268	Paraquat, urine	Chemical Pathology	Random urine	Sterile Container	10 ml	PER-PAT 301	Jabatan Kimia
269	Parathyroid Hormone, Intact (iPTH)	Chemical Pathology	Plasma	K2 EDTA tube in ice, Paediatric sample: K2 EDTA Paediatric tube in ice	2-3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301 (Send sample immediately to the lab. Fasting sample is preferable)	HDU -IMR Other patient - HKL
270	Parvovirus B19 - IgG ELISA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
271	Parvovirus B19 - IgM ELISA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
272	Parvovirus B19 PCR	Microbiology	Serum Amniotic fluid	Plain Gel Tube Sterile screw capped container	1ml for serum	PER-PAT 301	MKAK
273	Phosphomannomutase 2 Deficiency (PMM2-CDG) (PMM2)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
274	Pipecolic Acid	Chemical Pathology	Plasma	Lithium heparin tube	2 ml	IEM FORM (Collect 4 hours after meals)	IMR
275	Platelet Antibody	Blood Transfusion Service	Blood	EDTA & Plain tube	Refer Borang PDN/IH/QP- 03/03	Borang Permohonan Rujukan Ujian Platelet Immunologi (PDN/IH/QP- 03/03)	PDN
276	Pneumocystis carinii Immunofluorescence	Microbiology	Induced sputum	Sterile Container		PER-PAT 301	HKL
277	POLG-Related Disorders	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
278	Pompe Disease (GAA)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
279	Porphyrin/ Porphobilinogen, Urine	Chemical Pathology	Random urine	Sterile container	5 ml	IEM FORM (Protect from light. Indication: Suspected porphyrias)	IMR
280	Prader-Willi Syndrome (SNRPN) MS-PCR	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
281	Pre Albumin	Chemical Pathology	Serum	Plain Tube	3ml	PER-PAT 301	Hospital Ampang
282	Primary Dystonia	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
283	Primary immunodeficiency (PID) scrrening test i) T & B cell Subset Enumeration ii)Immunoglobulin & Complement Quantitation iii)Phagocytic Function Test	Microbiology	Blood Blood Blood	EDTA tube EDTA tube Plain Gel Tube	2ml 5ml 2ml	PID Form	IMR (appointment to be taken by clinician)
284	Procalcitonin	Chemical Pathology	Serum	Plain tube (serum), Paediatric patient: Paediatric tube	2-3 ml (adult), 1 ml (paediatric)	PER-PAT 301	IKN
285	Prostate Spesific Antigen (PSA), Free	Chemical Pathology	Serum or Plasma	Plain Tube (serum) or Lithium Heparin Tube (plasma)	3 ml	PER-PAT 301	HKL
286	Protein Electrophoresis	Chemical Pathology	Serum	Plain Tube	5ml	MULTIPLE MYELOMA FORM	Hospital Ampang
287	Protein Electrophoresis, Urine	Chemical Pathology	Random Urine (preferred early morning)	Sterile Container	20ml	MULTIPLE MYELOMA FORM (Sample urine must paired with serum)	Hospital Ampang

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
288	Pseudorheumatoid Dysplasia (WISP3)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
289	PTEN-associated Diseases (PTEN) Sequencing	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
290	Pterins, CSF	Chemical Pathology	CSF	Special microtube with preservative (K2 EDTA and DTE) provided by IMR	0.5 ml	IEM FORM (Protect from light)	IMR
291	Pterins, Urine	Chemical Pathology	Random urine	Sterile container	2 ml	IEM FORM (Protect from light)	IMR
292	Purine & Pyrimidine, Urine	Chemical Pathology	Random urine	Sterile container	2 ml	PER-PAT 301	HKL
293	Purine Nucleoside Phosphorylase Deficiency (PNP)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
294	Pyruvate	Chemical Pathology	Plasma	Conical tube added with 4ml 8% of perchloric acid	2 ml	PER-PAT 301 (Draw 2 ml of blood and dispense into conical tube containing cold 4ml 8% of perchloric acid solution as preservative. Cap the tube and mix gently until entire solution turns brown. Immediately place in ice pack and send to the lab)	HKL
295	Pyruvate Dehydrogenase Deficiency (PDHA1)	Chemical Pathology	Whole Blood	K2 EDTA tubes( 1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
296	Pyruvate, CSF	Chemical Pathology	CSF	Conical tube added with 4ml 8% of perchloric acid	2 ml	PER-PAT 301 (Draw 2 ml of blood and dispense into conical tube containing cold 4ml 8% of perchloric acid solution as preservative. Cap the tube and mix gently until entire solution turns brown. Immediately place in ice pack and send to the lab)	HKL
297	Rabies Virus Antigen	Microbiology	Neck biopsy, Brain biopsy	After consultation only	After consultation only	PER-PAT 301	IMR (Virology Lab)
298	Rabies Virus Isolation	Microbiology	Neck biopsy, Saliva, CSF, Brain biopsy	After consultation only	After consultation only	PER-PAT 301	IMR (Virology Lab)

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
299	Rabies Virus Nucleic Acid	Microbiology	Neck biopsy, Saliva, CSF, Brain biopsy	After consultation only	After consultation only	PER-PAT 301	IMR (Virology Lab)
300	Reducing Sugar (Qualitative), Stool	Chemical Pathology	Stool	Stool Container	1 g	PER-PAT 301	HKL
301	Reducing Sugar (Qualitative), Urine	Chemical Pathology	Urine	Universal container	10 ml	PER-PAT 301	HKL
302	Renin	Chemical Pathology	Plasma	K2 EDTA tube, Paediatric patient:K2 EDTA Paediatric tube	2-3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301 Refer Chemical Pathology Section 6.3 Special Tests Procedure for details. (Test should be requested by Specialist or Endocrine Specialist only).	Hospital Putrajaya
303	Retinoblastoma (RB1) MLPA	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
304	Retinoblastoma (RB1) Sequencing	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
305	Rift Valley Nucleic Acid	Microbiology	Serum, CSF, Organ biopsies	After consultation only	After consultation only	PER-PAT 301	IMR (Virology Lab)

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NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
306	Rubella - IgG ELISA	Microbiology	Blood	Plain Gel Tube	3-5ml	PER-PAT 301	HKL
307	Rubella virus isolation/RT-PCR	Microbiology	Nasopharyngeal secretion Throat swab	Sterile screw capped container 2.5ml sterile VTM	1ml	PER-PAT 301	MKAK
308	SARS Coronavirus Nucleic Acid	Microbiology	Nasopharyngeal aspiration, Nasopharyngeal swab, Throat swab, Throat gargle, BAL, Sputum, Nasal swab, Organ biopsies, Stool	After consultation only	After consultation only	PER-PAT 301	IMR (Virology Lab)
309	Schinzel Giedion Syndrome (SETBP1)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
310	Schistosomiasis Serology	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (Parasitology lab)
311	SCN1A-Related Seizure Disorders (SCN1A)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

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NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
312	Severe Congenital Neutropenia (ELANE)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
313	Sex Hormone Binding Globulins (SHBG)	Chemical Pathology	Serum	Plain tube (serum), Paediatric patient: Paediatric tube	2-3 ml (adult), 0.5-1 ml (paediatric)	PER-PAT 301 (Testosterone result needs to be provided if Free Androgen Index (FAI) report is required)	Hospital Putrajaya
314	Short-Chain 3-Hydroxyacyl- CoA Dehydrogenase (SCHAD) Deficiency (HADH)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
315	Sialic Acid (Total & Free), Urine	Chemical Pathology	Random urine	Sterile container	2 ml	IEM FORM (Indication: Sialic acid storage disease)	IMR
316	Sirolimus	Chemical Pathology	Whole Blood	K2 EDTA tube	2 ml	Use TDM form. Send in 2-8°C within 7 days. Please refer to TDM Sampling Guide	HKL
317	Skin Antibodies for Pemphlgoid Disease: Anti-BP 180 Anti-BP 230 Anti-Desmoglein 1 & 3	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR

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NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
318	Specific Liver Antibodies: Anti-AMA-M2 Anti-M2-3B/BPO Anti-Sp100 Anti-PML Anti-gp120 Anti-LKM1 Anti-LC1 Anti SLA/LP Anti-Ro 52	Chemical Pathology	Blood	Plain Gel Tube	5 ml	PER-PAT 301	IMR
319	Spinal Muscular Atrophy (SMA) Sequencing	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
320	Succinylacetone, Urine	Chemical Pathology	Random urine	Sterile container	1 ml	IEM FORM (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR
321	Sugar and Polyol, Urine	Chemical Pathology	Random urine	Sterile container	2 ml	IEM FORM (Indication: Suspected for sugar and carbohydrate disorder)	IMR
322	Sulfite Oxidase (SUOX) Deficiency (SUOX)	Chemical Pathology	Whole Blood	K2 EDTA tubes (1-2 tubes)	2.5 ml blood for each tube	IMR / UMDP/02 form and accompanied by consent form (Requested by Clinical geneticist/ Neurologist/ Physician/ Paediatrician only)	IMR

NO.	TEST	UNIT	SPECIMEN TYPE	CONTAINER	VOLUME	REMARK	REFERRAL LAB
323	Sulfocysteine, Urine	Chemical Pathology	Random urine	Sterile container	1 ml	IEM FORM	IMR
324	Sulphite, Urine	Chemical Pathology	Random urine	Sterile container	2 ml	IEM FORM	HKL
325	Sweat Test	Chemical Pathology	Sweat	Sweat collector	15ul	PER-PAT 301 (Can only be requested by Respiratory Paeditrician. By appointment only. Sample collection and analysis done by laboratory staff)	HKL
326	Tacrolimus	Chemical Pathology	Whole Blood	K2 EDTA tube	2 ml	Use TDM form. Send in 2-8°C within 7 days.  Please refer to TDM Sampling  Guide	HKL
327	Taeniasis Serology	Microbiology	Blood	Plain Gel Tube	2ml	PER-PAT 301	IMR (Parasitology lab)



## AFFENDICS







Order of Draw								
Tube Closure Color	Collection Tube	Mix by Inverting	Min. Clot Time					
	Blood Cultures – SPS	8 to 10 times	N/A					
<b>信7777777</b> 期量	Citrate Tube (Light Blue)	3 to 4 times	N/A					
	Serum Separator Tubes (Gold and Tiger)	5 times	30 minutes					
11 - 12 - 12 - 12 - 12 - 12 - 12 - 12 -	Serum Tube (Red)	5 times (plastic) None (glass)	60 minutes					
	Rapid Serum Tube (Orange)	5 to 6 times	5 minutes					
	Plasma Separator Tube	8 to 10 times	N/A					
	Heparin Tube (Green)	8 to 10 times	N/A					
	EDTA Tube (Lavender)	8 to 10 times	N/A					
1 C € 11 C €	PPT Separator Tube	8 to 10 times	N/A					

8 to 10 times

N/A

(Pearl)

Fluoride Tube (Gray)

# THE END OF PATHOLOGY HANDBOOK 5TH EDITION 2018