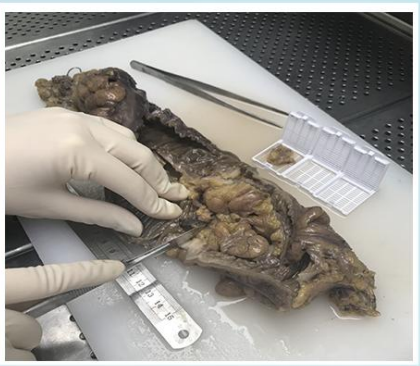
LABORATORY HANDBOOK 2025

Version 1 2025 (Updated 13 Jan 2025)



BERSEKUTU BERTAMBAH MUTU

DEPARTMENT OF PATHOLOGY
HOSPITAL TAIPING

RECORD OF AMENDMENT FOR HANDBOOK 2025 (Handbook will be updated once a year)

DATE	AMENDMENT NO.	DETAILS OF AMENDMENT
15/1/2024	1	General Information 9. Critical value notification 13. Amendment of patient`s information Chemical Pathology: 4. Tests offered Added few tests & edited LTAT of tests offered. Hematology: 2.List of services 3. Specimen collection & handling 4. Tests offered Microbiology: Removed Stool Occult Blood & edited Bordetella pertussis. Histopathology: 2.List of services 3. Request for histopathology services, page 56 3.2 Frozen section 4. Specimen collection and handling 6. HPE TTAT 7. Reporting & dispatching of results Outsource: 4. Test Offered In Outsource Laboratory Taiping Hospital & LTAT Cytology: No changes
13/8/2024	2 (Updated as per MS ISO 15189 2022 Gap Analysis & Internal Audit)	General Information: 2.0 Services and functions 6.0 Pre-analytical requirements 8.0 Results/Reports 14. Contingency plan in case of emergency/fire Histopathology: 6.Test Offered In Histopatology Laboratory, Hospital Taiping & LTAT Cytology: 3.1 Test Offered In Cytology Laboratory, Hospital Taiping Outsource: 4. Test Offered In Outsource Laboratory Taiping Hospital & LTAT
13/1/2025	2 (Updated as per MS ISO 15189 2022	General Information: 5. Contact Numbers For Department Of Pathology, Hospital Taiping 7. Rejection

	Surveillance Audit)	10. Types Of Containers And Order Of Draw Chemical Pathology: 5. Factors Known To Significantly Affect Performance Of Tests / Interpretation Of Results 6. Stability Time Of Test Hematology: 3. Specimen collection & handling 4. Tests Offered In Hematology Laboratory, Hospital Taiping & LTAT Microbiology: 3. Specimen collection & handling 4. Tests Offered In Hematology Laboratory, Hospital Taiping & LTAT Histopathology: 6.Test Offered In Histopatology Laboratory, Hospital Taiping & LTAT Outsource: 2. List Of Services 3. Specimen collection & handling Specimen collection & handling 4. Test Offered In Outsource Laboratory Taiping Hospital & LTAT

Content

MESSAGE FROM THE HOSPITAL DIRECTOR

The medical laboratory is a laboratory where tests are conducted out on clinical specimens to obtain information about the health of a patient to aid in diagnosis, treatment, and prevention of disease. Thus, laboratory service is one of the important parts in healthcare system and need to offer a high-quality laboratory service.

Along with the Ministry of Health's Vision, the Department of Pathology had invested great efforts in ensuring good laboratory services are provided to not only the patients seeking medical treatments in Hospital Taiping but also in hospitals and health clinics in the northern zone of Perak state.

The Department of Pathology's continuous efforts of reviewing, and updating the contents of the laboratory handbook is to ensure accurate and precise information are communicated efficiently. The ultimate purpose of the laboratory handbook is to provide user-friendly guideline for all healthcare providers.

I hope that this updated and revised version will be fully utilized by all healthcare facilities which either uses the Department of Pathology, Hospital Taiping as a primary or secondary center for lab testing.

I would also like to applaud all editorial board members for their contributions in revising and updating the handbook and hope that the Department of Pathology will continue to provide high quality services.

Dr. Khuzaini Bin Ab Karim
Director
Hospital Taiping
Perak, Malaysia.

JANUARY 2025

MESSAGE FROM THE HEAD OF DEPARTMENT

Clinical laboratories are considered an indispensable and fundamental component of the health system and contribute directly to the improvement of health services delivery. Accurate, reliable and timely results from laboratory investigations are critical elements in decision-making in clinical settings.

This handbook is a guide to the all our users not only in Taiping Hospital but also in all hospitals and health clinics in northern zone of Perak state. It is hoped that it will provide the laboratory user with a quick and easy reference to the services available in our laboratory. Information is provided mainly on pre-analytical requirements which involved types of specimen, container & request form required and also specimen handling. If you wish further advice please contact the appropriate laboratory unit personnel.

As for laboratory result/report, we encourage the use of laboratory information system which is available in almost all wards and clinics in Taiping Hospital as well as in all hospitals and health clinics in northern zone of Perak state.

We welcome comments from our users about the services currently available, which may lead to future improvements of the service.

Lastly, I would like to express appreciation and gratitude towards all committee members involved in this Laboratory Handbook. Congratulations for all the effort taken.

Dr. Sanada binti Abu Bakar
Hematopathologist and
Head of Department
Department of Pathology
Hospital Taiping
Perak, Malaysia.

JANUARY 2025

EDITORIAL COMMITTEE MEMBERS

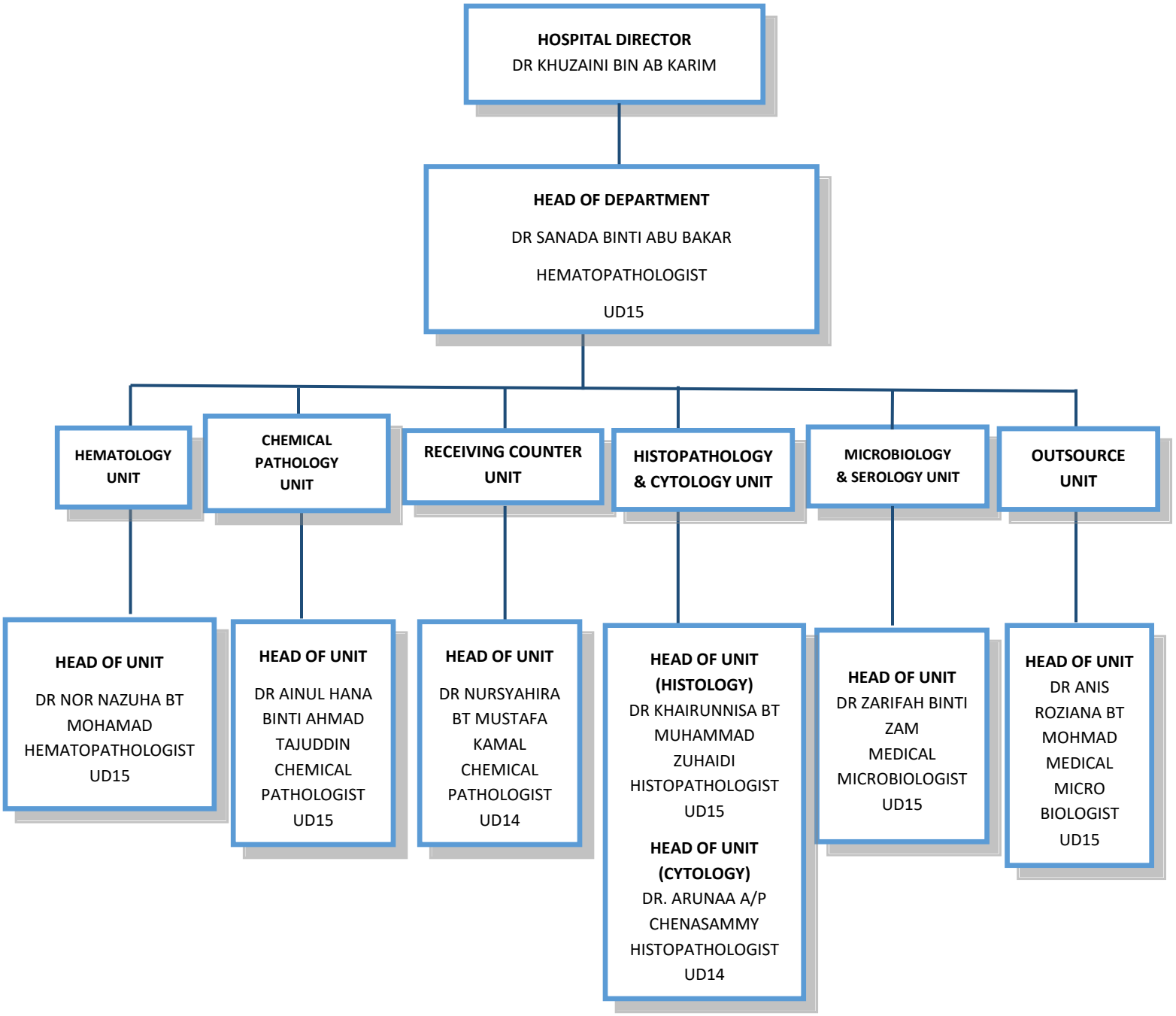
Advisor : Dr. Sanada Binti Abu Bakar

Coordinator : Dr. Ainul Hana Bt Ahmad Tajuddin

Editor : Cik Louise Santana Malar

Contributors :
Dr. Zarifah Binti Zam
Dr. Ainul Hana Binti Ahmad Tajuddin
Dr. Nor Nazuha Binti Mohamad@Manas
Dr. Anis Roziana Binti Mohmad
Dr Faridah Hanim Binti Zan
Dr Khairunnisa Binti Muhammad Zuhaidi
Dr. Arunaa A/P Chenasammy
Dr. Nursyahira Binti Mustafa Kamal
Dr. Abdul Kadir Bin Mat
Pn. Yogeswary A/P Sivaraja
Pn. Nor Baiti Binti Ahmad Kamarudin
Pn. Norhayati Binti Hamzah
En. Mohd Rohaizad Bin Mohd Rodzi
Pn. Nor Ruzanna Binti Zainuddin
Pn. How Lian Tee
En. Jaslin Bin Jasmin

ORGANIZATION CHART, DEPARTMENT OF PATHOLOGY, HOSPITAL TAIPING



MINISTRY OF HEALTH (MOH)

VISION

A nation working together for better health.

MISSION

The mission of the Ministry of Health is to lead and work in partnership:

i. to facilitate and support the people to:

- attain fully their potential in health.
- appreciate health as a valuable asset.
- take individual responsibility and positive action for their health.

ii. to ensure a high-quality health system that is:

- customer centered.
- equitable.
- affordable.
- efficient.
- technologically appropriate.
- environmentally adaptable.
- innovative.

iii. with emphasis on:

- professionalism, caring and teamwork value.
- respect for human dignity.
- community participation.

DEPARTMENT OF PATHOLOGY, HOSPITAL TAIPING

VISION

To be a medical laboratory that can provide pathology and transfusion service that are dynamic, efficient and effective consistent with environmental change, current technology and customer demand.

MISSION

To provide high quality pathology services to improve and achieve customer satisfaction in medical treatment and patient care through:

- Trained, knowledgeable and professional staffs.
- Teamwork.
- A safe, harmonious and conducive working environment.
- Appropriate equipment that meets its function.

CLIENT CHARTER

- Every patient will be given appropriate treatment of quality in this hospital.
- Every client will be treated well in a friendly, considerate, respectful, polite, honest and sincere manner.
- Every patient will be given clear explanation pertaining to the suggested procedure and treatment, including risks and other options.
- Every patient who requires specialized treatment that is not available at this hospital will be referred to another appropriate center.
- Every patient is guaranteed that their honor and dignity will be protected while receiving treatment.
- All information pertaining to disease and treatment will be kept confidential and only will be revealed to certain party with his/her consent and subject to law.

TERMINOLOGY

Definition of terminologies used in this manual:

- **Critical value (CV)** – Test results or value that falls outside the critical limits or the presence of any unexpected abnormal findings, cells or organisms which may cause imminent danger to the patient, and/or require immediate medical attention.
- **Critical limits** – Boundaries of low and high lab test values beyond which may cause imminent danger to the patient and/or require immediate medical attention.
- **TAT** - A total turnaround time is defined as the cumulative time taken for a sample to be processed. It includes the start time at which the sample is taken from a patient, time spent in transportation, its arrival at reception, pre-analysis and post analytical phases until validation by laboratory staff, the result being issued and its subsequent receipt by the requesting physician.
- **LTAT** - A laboratory turnaround time is defined as the total time taken for a sample to be processed within the laboratory, from its arrival at the reception until a validated result has been released.
- **1 working day LTAT** - 1 working day LTAT is defined as 24 hours LTAT excluding Saturday, Sunday and public holiday.
- **STAT/ Urgent** – A short turnaround time is defined as a minimum time period for known routine LTAT for a test.

GENERAL INFORMATION

1.0 INTRODUCTION

The Department of Pathology, Hospital Taiping aims to provide quality services to ensure accurate and timely lab results. This handbook is intended to provide all users of our pathology lab with (i) concise guide to the range of services provided as well as (ii) on the steps to be taken for proper collection and submission for testing.

2.0 SERVICES AND FUNCTIONS

The Department of Pathology is located at Level 3, Clinical Service Bock (CSB), Hospital Taiping.
The department provides diagnostic and consultative services in the following disciplines:

- Chemical Pathology
- Hematology
- Histopathology (including clinical autopsies and frozen sections)
- Cytopathology
- Microbiology & Serology

These services are carried out by respective units/laboratories, each of which is headed by one or more pathologists specialized in that particular field of testing. The department also provides outsource services to various referral labs.

Apart from these services, the department also acts as a training center for medical students, medical laboratory technologists and biomedical science students.

For any enquiries on our services, please refer to the handbook for the telephone or extension numbers of the laboratory units in the Pathology Department. *Borang Aduan Pelanggan Dan Maklumbalas Jabatan Patologi Hospital Taiping* (as shown below) can be used to convey any written suggestions or complaints. There is also a suggestion box located near Counter Receiving Area of Pathology Department. All suggestions and complaints will be investigated by the *Jawatankuasa Insiden & Aduan Pelanggan Jabatan Patologi.* Users are welcome to give any feedback or complaints to help improve the quality of our service. Please scan the QR Code as below:

HTPG/JP/22/02
Ver.2 (2023_0208)

BORANG ADUAN PELANGGAN DAN MAKLUMBALAS

JABATAN PATOLOGI HOSPITAL TAIPING

Nombor Rujukan (Kegunaan Pejabat):
No Aduan:

Bahagian A – Untuk diisi oleh pengadu/penerima aduan

1.MAKLUMAT PENGADU:	
Nama: No KP: Wad/Klinik/Hospital: To Tel:	Alamat email: Tarikh: Tandatangan:
2. MAKLUMAT ADUAN: Saluran Aduan: ☐ Surat ☐ Telefon ☐ Datang sendiri ☐ Email ☐ Lain-lain	
3. ADUAN YANG DIBUAT:	
Nama penerima aduan: Tandatangan: Tarikh:	
Nama anggota/Unit yang berkaitan dengan aduan:	
Tarikh serahan:	

**Sila serahkan borang yang lengkap diisi kepada Koordinator Insiden dan Aduan Jabatan Patologi*

Mukasurat 1 daripada 2

HTPG/JP/22/02
Ver.2 (2023_0208)

Bahagian B-Untuk diisi oleh Unit yang terlibat membuat siasatan (1-5)

1. Tarikh terima borang aduan:
2. HASIL SIASATAN
3. PUNCA MASALAH YANG DIKENALPASTI
4. TINDAKAN PEMBETULAN

Tindakan oleh:	Tarikh:

5. STATUS ADUAN

- ☐ Telah diselesaikan secara terus
- ☐ Untuk dipanjangkan kepada unit /jabatan yang terlibat
- ☐ Untuk dibincangkan didalam mesyuarat
- ☐ Lain-lain (Nyatakan):

Tarikh maklumbalas kepada pengadu:
Kaedah maklumbalas kepada pengadu:

6. PENGESAHAN OLEH KETUA JABATAN PATOLOGI

Tandatangan:	**Tarikh:**

**Sila serahkan borang yang lengkap diisi kepada Koordinator Insiden dan Aduan Jabatan Patologi*

Mukasurat 2 daripada 2

3.0 SERVICES QUALITY

Quality of lab results/reports is assured by:

- Internal quality control program.
- Participate in various External Quality Assurance (EQA) scheme or program.

4.0 SERVICE HOURS

1. 24-hour services:

- Chemical Pathology
- Hematology
- Microbiology

***** For list of the 24-hour tests, refer to related pages under each unit.

2. Office hour services:

- Histopathology and Cytology:
  Monday to Friday: 08.00 am – 01.00 pm
  02.00 pm – 05.00 pm
  (Saturdays, Sundays & Public Holidays: Closed)

3. On-call services are provided and the call roster is made available to the hospital operators.

5.0 CONTACT NUMBERS FOR DEPARTMENT OF PATHOLOGY, HOSPITAL TAIPING

Any queries or problems can be directed to the following personnel at the following extensions:

UNIT	DESTINATION	EXT
Pathology	Office	5316
Chemical Pathology	Head Of Unit & Chemical Pathologists MO / Scientific Officer Chemical Pathology Lab Drug Lab	 5315 5335 5367/5368 5337
Hematology	Head Of Unit & Hematopatologist Medical Officer Scientific Officer Hematology Lab (Routine) Hematology Lab (Specialised)	 5314 5328 5374 5367 5332
Microbiology	Head Of Unit & Microbiologist Scientific Officer Microbiology Lab Serology	 5312 5371 5303 5301

Histopathology	Head Of Unit Histopathologist Medical Officer Histopathology Lab	5317 5313/5318 5325/5327 5308
Cytopathology	Cytopathology Lab Cytoscreener	5366 5324
Outsource Services	Outsource Lab	5358

6 PRE-ANALYTICAL REQUIREMENTS

6.1 Request form

Each request accepted by the lab for examinations shall be considered as an agreement. A standard laboratory request form is used for all categories of test except Histopathology request and referral lab/ specialized test.

All request forms must be filled in legibly. The completed forms shall be signed and stamped by a doctor and accompanied by properly collected specimen(s).

The following information must be provided for every request:

I. Patient's detail : Full name, full identity card (IC) number, sex and age.
II. Source : Ward, clinic and name of hospital (if relevant)
III. Patient's clinical summary : Relevant clinical summary including provisional diagnosis and treatment.
IV. Test detail(s) : Request must specify the test required.
V. Specimen(s) : Date and time of specimen collection. Type of specimen and anatomic site (if relevant).
VI. Request detail(s) : Doctor's name, signature and official stamp.

All oral request or additional request will be allowed according to the specimen stability specified by respective unit.

Informed consent of the patient for all procedures carried out on the patient need to be detailed in the request form especially invasive procedures with increased risk of complications.

6.2 Samples/specimens

The samples/ specimens should be collected by the ward or clinic staff using appropriate technique to ensure quality and correct containers.

The specimen containers must be labeled with at least two identifiers (i.e., name of patient and patient's I.C number) and test requested.

The specimen containers should be placed in biohazard plastic bags with the respective request forms stapled outside the bag.

The patient identification on the specimen must match exactly the identifier on the test request form. Unlabeled or mislabeled specimens will be rejected.

Specimens and materials used in the collection process will be disposed after the specified retention period.

6.3 Type of containers

The specimen should be sent to laboratory in appropriate containers (please see list of tests under each unit for specification).

6.4 Transportation of specimen

The specimens should be transported to the laboratory as specified for the type of test requested within appropriate time frame and according to transport requirements for that test.
All specimens should be sent to the laboratory together with a request form and receive acknowledgement from the laboratory staff.

6.5 Information of tests & location to send for medico-legal samples

Test	**Location**
1.Smear posterior fornix for spermatozoa	Jabatan Kimia, Ipoh
2.Smear introitus for spermatozoa	
3.Rectal smear/swab for spermatozoa	
1.Blood ABO & Rh Grouping	Jabatan Perubatan Transfusi, Hospital Taiping
1.Ujian VDRL/TPHA	Jabatan Patologi, Hospital Taiping
2.Ujian Anti HIV	
3.Ujian Hepatitis B Antigen	
4.Ujian Gonococcal (Smear posterior fornix)	
5.Ujian Gonococcal (Smear introitus)	
6.Ujian High Virginia Swab C & S (Transport media amies charcoal)	
7.Urine Pregnancy Test	

7. REJECTION

7.1 Request which do not fulfill the laboratory requirements will be rejected as specimen or test requisition rejection criteria stated below:

Primary Rejection:	
1	Sample leakage
2	Wrong tube / container (for routine tests only except for Platelet count in citrate tube)
3	Unlabelled / mislabelled/ inadequate particulars on specimen tube
4	Test is not offered
5	No request form

6	Incomplete particulars on the request form • Patient's name/ identification number is not clearly written • No ward or clinic • No diagnosis • No clinical history • Type of request not clear/ not written • Date/ time of specimen collection is not stated • No requesting doctor's signature, name or chop • No specialist sign (for specialised tests)
7	Wrong request form
8	No specimen received
9	Test is not offered after office hour
10	Others eg; other test requirement
Secondary Rejection:	
1	Insufficient/ overfilled specimen
2	Hemolysed specimen
3	Contaminated specimen
4	Poor blood smear preparation
5	Redundant requests
6	Clotted specimens
7	Name or ID number of patient not tally in LIS
8	Test is not indicated
9	Incomplete clinical history
10	Test does not meet test requirement
11	Test is not specified/ Sharing of request form/ specimen (eg; different unit)
12	Different specimen type written in the form/ specimen label
13	Time of received exceed specimen stability time
14	Test is suspended temporarily
15	Others ie; other test requirements

7.2 The laboratory procedure for rejection is as follows:

I. For primary rejection: The rejection will be notified to the requester and the rejection form will be filled by the lab staff and dispatched into the respective pigeon hole. The rejected specimens and forms will not be returned to the requester except for histopathology/cytopathology specimen and rejection criteria no 6 and no 7. For outsource specimens, rejection will be done in LIS.

II. For secondary rejection: Rejection will be done in LIS except for rejection criteria no 7 will be done using rejection form. Only for precious specimens, the requesting ward/clinic will be notified.

7.3 Please refer to the respective units for specific rejection criteria.

8. RESULTS/REPORTS

3.1 All test results will be available in the Laboratory Information System (LIS).
3.2 All preliminary results, will be followed by final report.
3.3 For Biochemistry, Microbiology, Immunology, Serology (Non-infectious disease), printed test results will be placed in the designated pigeon hole for wards & clinics that still request hardcopy of results.
3.4 For serology (infectious disease), reports will be dispatched to ward/clinic by lab staff.
3.5 All critical result (CV) will be notified to the requestor immediately. (Please refer to tables 1-4; pages 13-14). The result informed and the name of person receiving the notification will be noted in the LIS system and laboratory report.
3.6 Special considerations for results: When agreed with the user, the results may be reported in a simplified way and any information that is not reported to the user will be readily available. Special counselling may be required for examination results with serious implications for the patient (e.g. for genetic or certain infectious diseases). Laboratory management will ensure that these results are not communicated to the patient without adequate counselling. Results of laboratory examinations that have been anonymized maybe used for epidemiology, demography, or other statistical analyses, as long as all risks to patient privacy and confidentiality are mitigated.

9. CRITICAL VALUE NOTIFICATION

a) Inpatient (all wards & Emergency Department)
• Critical results will be notified within 30 minutes. For Emergency Department, critical results are informed to other zones if calls to the relevant zone are not answered for 3 times, if still no answer, the MA incharge/Oncall Emergency Specialist will be notified.
b) Outpatients (all clinics & Hemodialysis Unit)
• Critical results will be notified within 1 hour. Results obtained after office hours will be notified to the test requestor or Oncall Medical Officer.
c) If the telephone line is engaged/not answered (tried 3x within 30 minutes, tried again after 5-10 minutes from the first call), or any other issues, note will be entered in LIS.
Apart from that, some additional procedures as follows need to be emphasized according to the Improving Notification of Critical Laboratory Results in MOH Hospitals, February 2010 guide:
• Recipients of critical decision notifications are only doctors, MA and nurses and the recipients need to read back the critical value.
• Critical results will be notified according to the location specified in the test application form. The one who receives the notification needs to inform the attending doctor if the patient has been transferred to another location.
• The one who receives the phone call needs to receive notification of critical results even if the patient is not under care.

Table 1: Critical Limit in Chemical Pathology

Notification method: Through telephone call to Ward/Clinic/Requesting doctor

TEST	UNIT	NEONATES (Less than 28 days)		PEDIATRIC (1 mth-12 year)		ADULT (13 year and above)	
		LOWER LIMIT	UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT	UPPER LIMIT
Sodium	mmol/L	-	-	125	155	125	155
Potassium	mmol/L	-	-	2.8	6.0	2.8	6.0
Creatinine	µmol/L				330		
Calcium	mmol/L	-	-	1.7	3.1		
Ammonia	µmol/L	-	-	-	100	-	-
T. Bilirubin	µmol/L	-	300	-	-	-	-
Magnesium	mmol/L	-	-	0.5	1.8	-	2.0
Phosphate	mmol/L	-	-	0.4	2.8	-	-
Glucose	mmol/L	-	-	-	-	2.8	20
Lactate	mmol/L	-	-	-	3.0	-	-
Serum Osmolality	mmol/kg	-	-	250	310	250	350
CSF-Glucose	mmol/L	-	-	1.6	-	-	-
CSF-Protein	g/L	-	-	-	1.87	-	-
Urea	mmol/L	-	-	-	19.0	-	-
Uric Acid	µmol/L	-	-	-	500	-	-
TSH Cord Blood	mIU/L	-	>20	-	-	-	-
Amikacin	mcg/mL	-	>10	-	>10	-	>10
Carbamazepine	mcg/mL	-	>12	-	>12	-	>12
Digoxin	ng/mL	-	>2	-	>2	-	>2
Gentamicin	mcg/mL	-	>2	-	>2	-	>2
Phenytoin	mcg/mL	-	>20	-	>20	-	>20
Theophylline	mcg/mL	-	>20	-	>20	-	>20
Valproic Acid	mcg/mL	-	>125	-	>125	-	>125
Vancomycin	mcg/mL	-	>20	-	>20	-	>20

Table 2: Critical Limits in Hematology

Notification method: Through telephone call to Ward/Clinic/Requesting doctor

TEST	*UNIT*	*NEONATES (Less than 28 days)*		*PEDIATRIC (1 mth-12 year)*		*ADULT (13 year and above)*	
		LOWER LIMIT	UPPER LIMIT	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT	UPPER LIMIT
Hemoglobin (Hb)	g/L	8.0	22.0	7.0	20.0	6.0	19.0
Hematocrit (HCT)	%	25	70	20	60	-	-
Platelet	/L	50 x 10^9/L	1000 x 10^9/L	50 x 10^9/L	1000 x 10^9/L	20 x 10^9/L	1000 x 10^9/L
TWBC	/L	2.0 x 10^9/L	50.0 x 10^9/L	2.0 x 10^9/L	50.0 x 10^9/L	-	-
INR	Ratio	-	>5	-	>5	-	>5
PT	Sec	-	-	-	-	-	36.0 sec or >2.5 upper limit
APTT	Sec	-	-	-	-	-	80 sec or > 2x upper limit
Fibrinogen	mg/dL	70	-	70	-	100	-

Table 3: Critical Findings in Anatomical Pathology

Notification method: Through telephone call to Ward/Clinic & *WhatsApp* Surgeons

TEST	CRITICAL FINDING
Unexpected or discrepant findings	Unexpected malignancy, wrong organ removed.
Reports of infection	Bacteria in heart valves or bone marrow. Organism in an immune-compromised patient such as AFB, fungi, viral, protozoa. Organisms in Cerebrospinal fluid (CSF) Unusual organism or organism in unusual sites e.g., amoeba in the eye.
Report in critically ill patients requiring immediate therapy	Crescents is greater than 50% of glomeruli in renal biopsy specimen Transplant rejection.
Cases than have immediate clinical consequences	Fat in endometrial curettage Mesothelial cells in a heart biopsy Fat in a snare colon biopsy specimen

Table 4: Critical Findings in Microbiology

Notification method: Through telephone call to Ward/Clinic & *WhatsApp* group Antimicrobial Stewardship (AMS)

TEST	CRITICAL FINDING
Cerebrospinal fluid Culture & Sensitivity	Microscopy result (normal or abnormal)
Cerebrospinal fluid Antigen detection	Positive 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, Shigella*
Any type culture	ESBLs producer organism, MRSA, Multi-Resistant Organism (MRO), VRE, VRSA
Antigen detection	*Legionella spp*
Pernasal swab	*Bordetella Pertussis, Corynebacterium diphtheria*

Reference:

Minute of meeting regarding critical value notification & rejection rate done with clinicians done 7 August 2023

A quick guide for improving notification of critical lab results in MOH hospitals – A project for improving patient safety 2010.

10. TYPES OF CONTAINERS AND ORDER OF DRAW

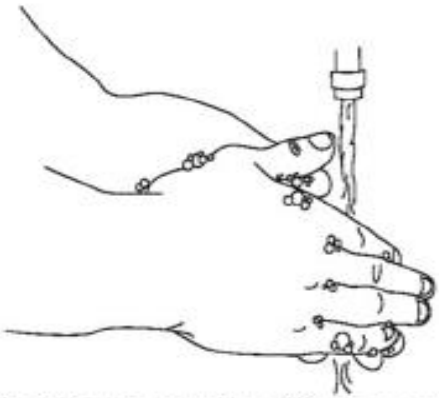
Order of draw in phlebotomy is a system of collecting more than one tube of blood at the same time from a patient while reducing instances of cross-contamination. **FILL THE TUBE UNTILL THE INDICATOR STATED ON THE TUBE**. Contamination may occur when the syringe contacts microorganisms, additives or blood mixed with additives in previous test tubes. [CLSI Procedures for the Collection of Diagnostic Blood Specimens by Venipuncture; Approved Standard – Sixth Edition is as followed:

ORDER OF DRAW	BOTTLE	LABORATORY USE	MIX BY INVERTING
1	 Blood Culture Bottle	For blood culture collection, remove flip-off caps from BACTEC culture vial(s). Wipe tops of vials with single alcohol swab and allow drying. Avoid contamination as entering the needle into the bottle. Mix specimen by inversion several times.	8-10 times
2	 Citrate Tube	PT/INR, APTT, Fibrinogen, D-Dimer, Platelet Function Test, Lupus Anticoagulant	3-4 times
3	 Serum Separator Tube	<u>Biochemistry Test</u> LFT, RP, FLP, Calcium, Cardiac enzymes, Phosphate, Magnesium, Amylase, Serum Bilirubin, TSH, FT4, βHCG, AFP, Prolactin, Salicylates, <u>Microbiology Test</u> ASOT, Rheumatoid Factor (RF), CRP, Infectious Mononucleosis, Leptospiral Rapid Test, Hep C, HIV, HBsAg, Anti HBS, VDRL, TPHA, Widal, Dengue Serology, ANA, anti dsDNA, Mycoplasma serology, Dengue Rapid Test	5 times
4	 EDTA Tube	Blood grouping, Cross Match, FBC, FBP, Retic count, LAP score, Hb electrophoresis, CD4/CD8, HbA1c	8-10 times
5	 Fluoride Tube	FBS,2HPP, RBS, Serum Lactate	8-10 times

11. BLOOD COLLECTION PROCEDURE (WHO GUIDELINES ON DRAWING BLOOD: BEST PRACTICES IN PHLEBOTOMY, 2010)

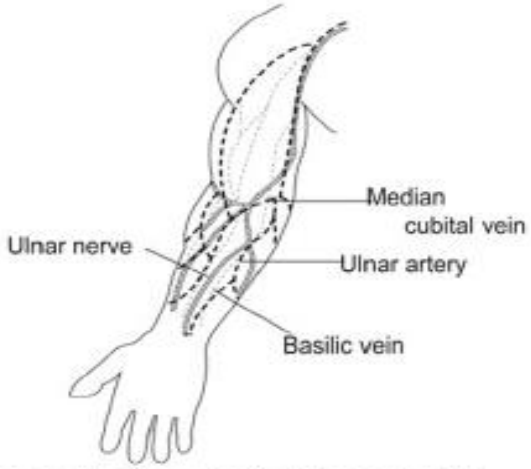
1. Assemble equipment
2. Perform hand hygiene
3. Identify and prepare the patient.
4. Select the site, preferable at the antecubital area (i.e the bend of the elbow).
5. Apply tourniquet (about 4-5 finger widths above the venipuncture site).
6. Ask the patient to form a fist so that the veins are more prominent.
7. Put on well-fitting gloves.
8. Disinfect the venipuncture site with 70% isopropyl alcohol for 30 seconds and allow to dry completely (around 30 SECONDS)
9. Anchor the vein by holding the patient`s arm and place a thumb below the venipuncture site.
10. Enter the vein swiftly at 30^{o}angle.
11. Once sufficient blood has been collected, release the tourniquet before drawing the needle.
12. Withdraw the needle gently and then give the patient a clean gauze or dry cotton-wool ball to apply to the site with gentle pressure.
13. Pierce the stopper on the tube with the needle directly above the tube using slow, steady pressure. Do not press the syringe plunger because additional pressure increases the risk of hemolysis. Allow the tubes to be filled directly by the vacuum inside the vacutainer tube.
14. If non-vacutainer tube being used, allow the blood to fill the collection tube by using a slow and steady pressure until the blood filled immediately after collection.
15. Discard the used needle and syringe or blood-sampling device into sharp bin.
16. Check the label and forms for accuracy.
17. Remove gloves and perform hand hygiene.

1. Assemble equipment and include needle and syringe or vacuum tube, depending on which is to be used.



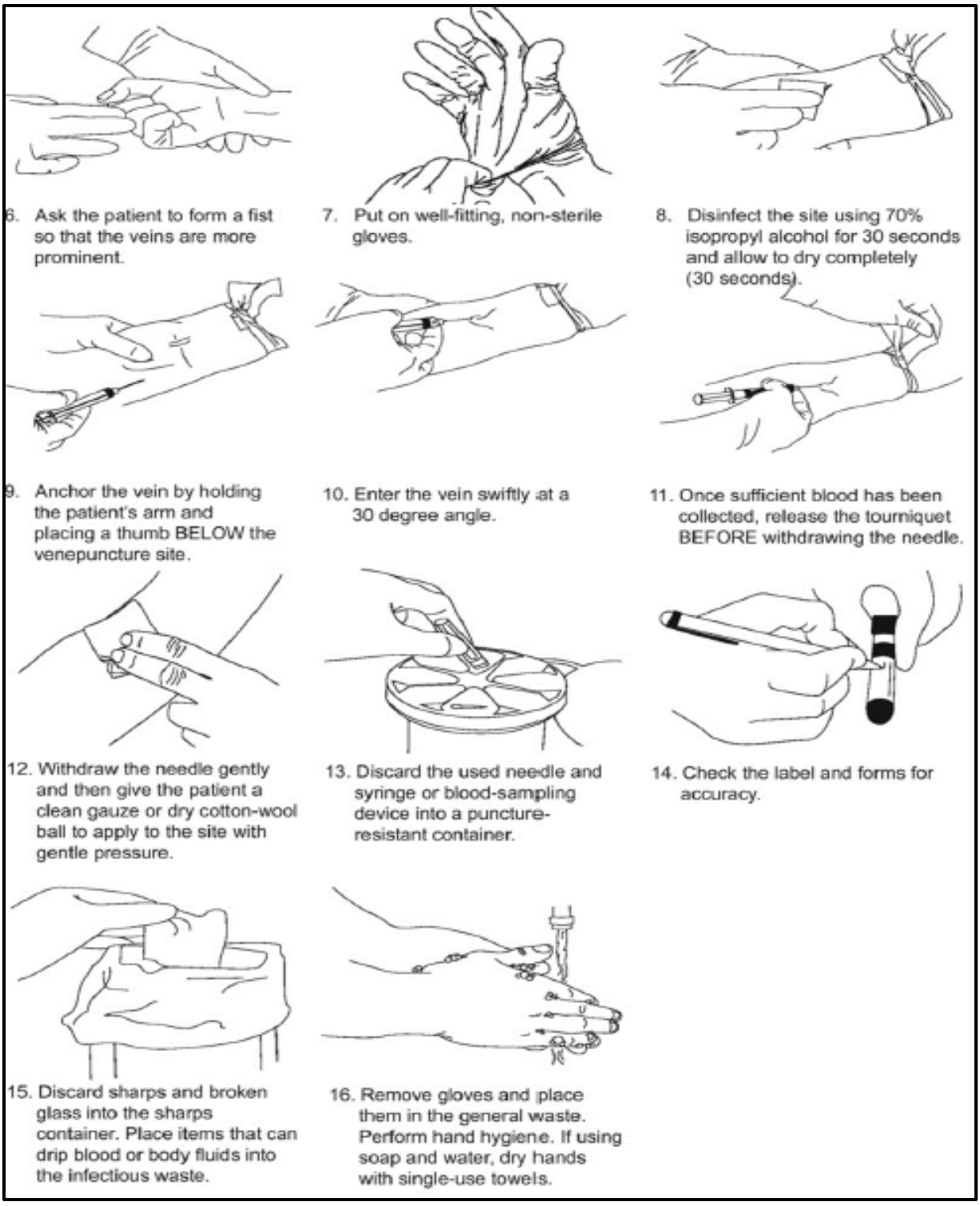
2. Perform hand hygiene (if using soap and water, dry hands with single-use towels).

3. Identify and prepare the patient.



4. Select the site, preferably at the antecubital area (i.e. the bend of the elbow). Warming the arm with a hot pack, or hanging the hand down may make it easier to see the veins. Palpate the area to locate the anatomic landmarks. DO NOT touch the site once alcohol or other antiseptic has been applied.

5. Apply a tourniquet, about 4–5 finger widths above the selected venepuncture site.



6. Ask the patient to form a fist so that the veins are more prominent.

7. Put on well-fitting, non-sterile gloves.

8. Disinfect the site using 70% isopropyl alcohol for 30 seconds and allow to dry completely (30 seconds).

9. Anchor the vein by holding the patient's arm and placing a thumb BELOW the venepuncture site.

10. Enter the vein swiftly at a 30 degree angle.

11. Once sufficient blood has been collected, release the tourniquet BEFORE withdrawing the needle.

12. Withdraw the needle gently and then give the patient a clean gauze or dry cotton-wool ball to apply to the site with gentle pressure.

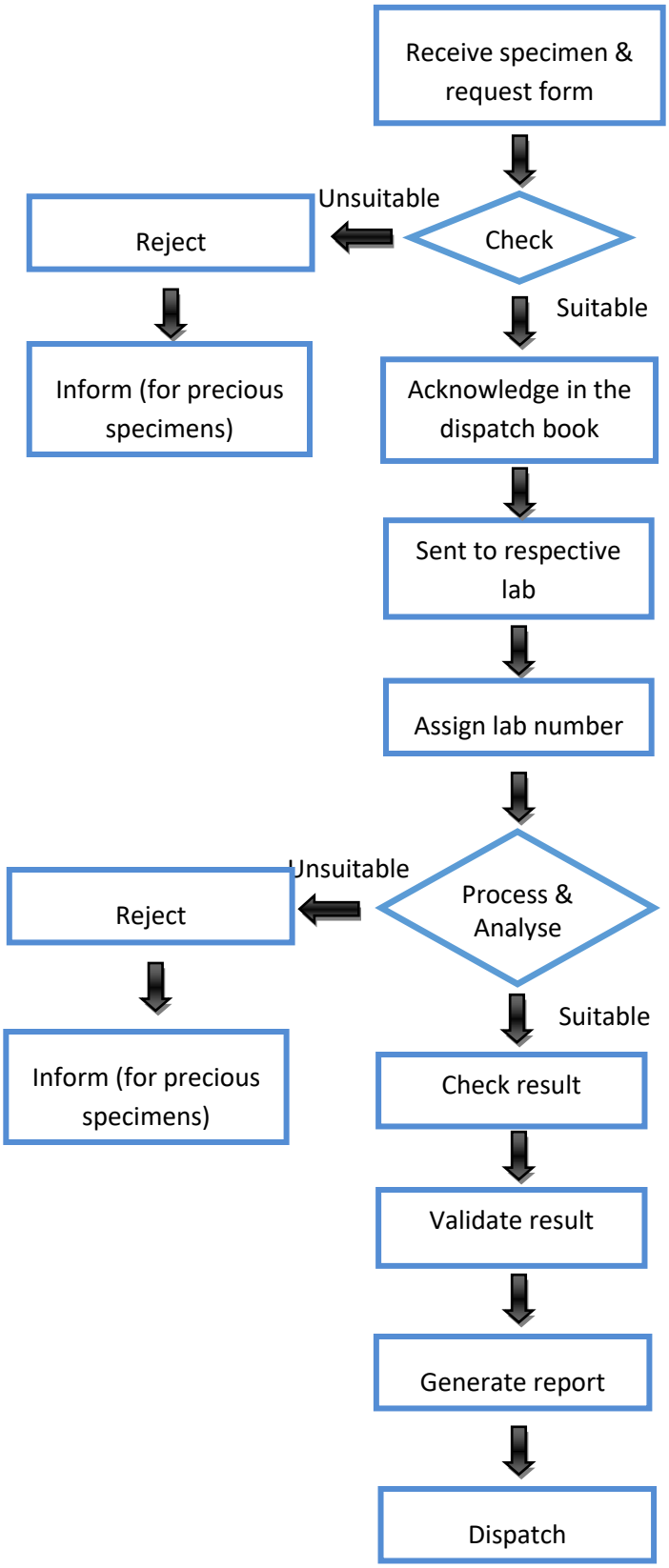
13. Discard the used needle and syringe or blood-sampling device into a puncture-resistant container.

14. Check the label and forms for accuracy.

15. Discard sharps and broken glass into the sharps container. Place items that can drip blood or body fluids into the infectious waste.

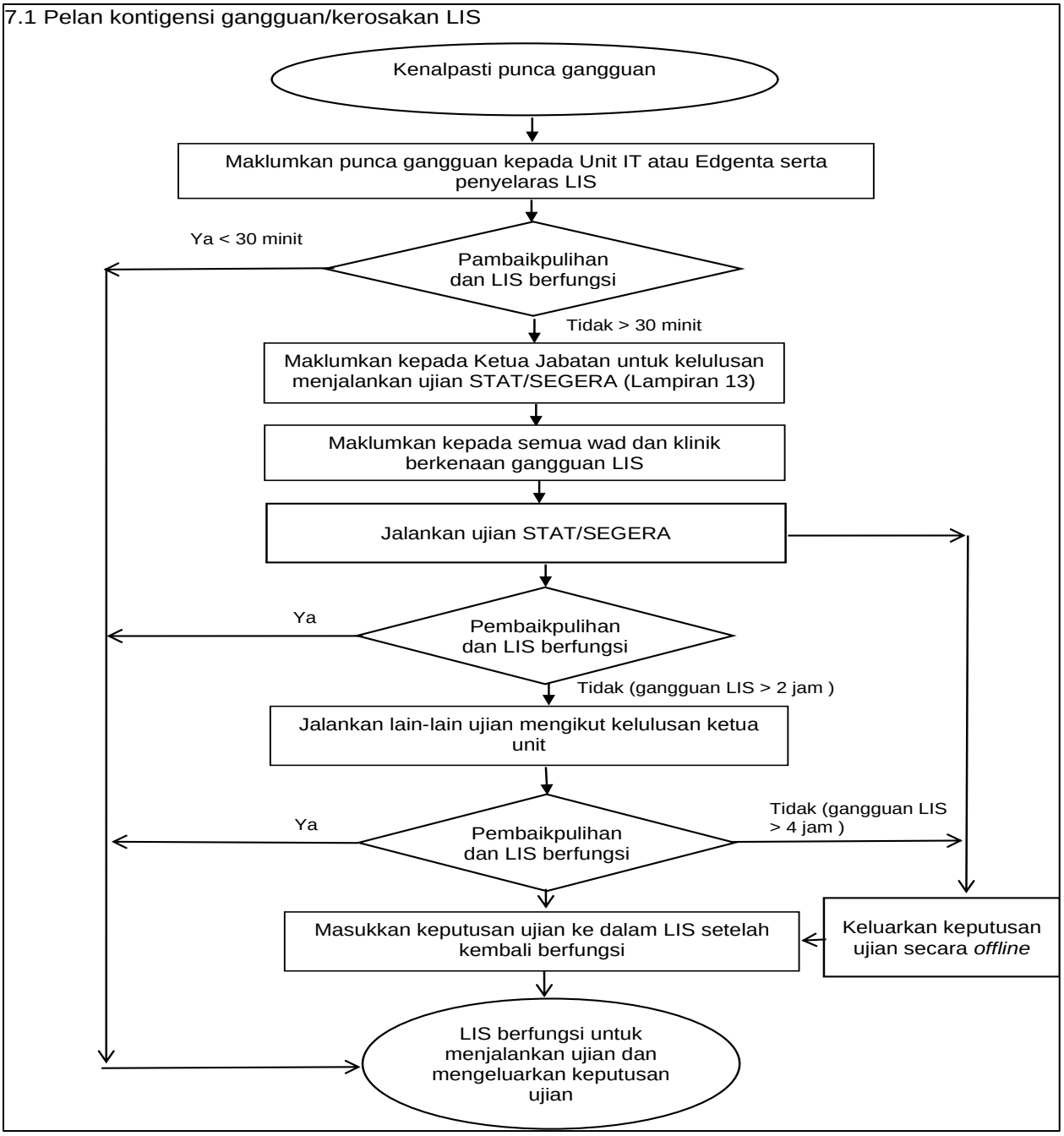
16. Remove gloves and place them in the general waste. Perform hand hygiene. If using soap and water, dry hands with single-use towels.

12. GENERAL WORKFLOW FOR HANDLING OF SPECIMEN IN THE DEPARTMENT OF PATHOLOGY, HOSPITAL TAIPING



13. LIS CONTIGENCY PLAN

The laboratory will notify the requester when an examination is delayed that could compromise patient care through WhatsApp/telephone/letter. The contingency plan for Laboratory Information System (LIS) breakdown is as below (extracted from Quality Procedure LIS, HTPG/JP/PK – 16). The reference ranges for tests offered during LIS offline is listed in Appendix 2.

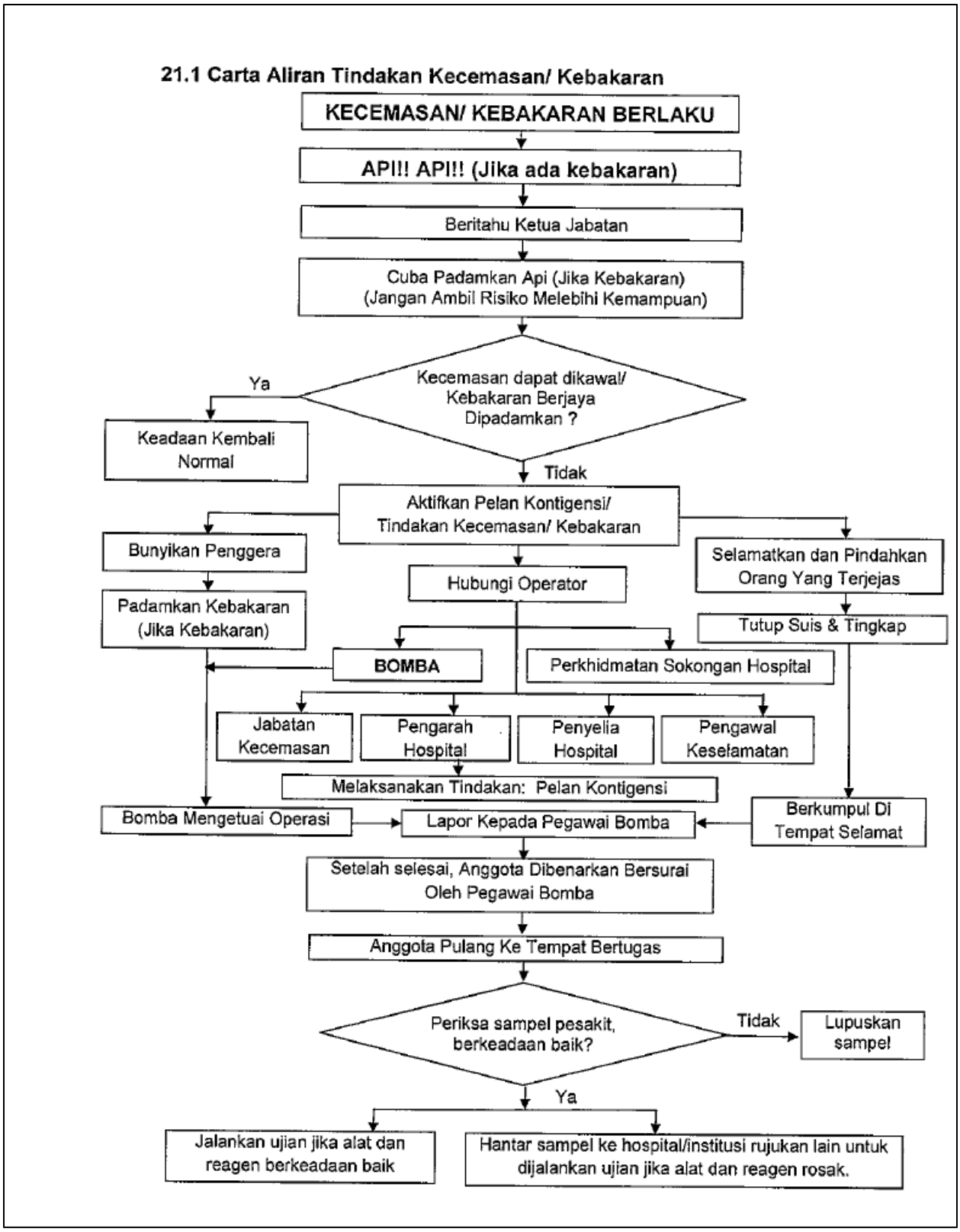


14. AMENDMENT OF PATIENT'S INFORMATION

Any amendment involving patient's information in the Laboratory Information System (LIS) such as correction of identification number and patient's name shall be informed to Officer in-charge of that particular unit and fill up form **Borang Permohonan Pindaan Maklumat Demografi Makmal HTPG/JP/QP-16/23/01 Ver.1 (2023_1108)** or using **QR code** scan as below:

BPPMDM

15. CONTIGENCY PLAN IN CASE OF EMERGENCY/FIRE



CHEMICAL PATHOLOGY

DEPARTMENT OF PATHOLOGY, HOSPITAL TAIPING LABORATORY HANDBOOK 2025

1. INTRODUCTION

The Chemical Pathology laboratory provides biochemical testing for patient management. Our services cover analysis and interpretation of biochemical changes in body fluids for purpose of screening, diagnosis and monitoring of diseases.

2. LIST OF SERVICES

2.1 Routine biochemistry tests
2.2 Specialized biochemistry tests for anemia profile, hormones, tumor markers, HbA1c and drugs of abuse.

3. SPECIMEN COLLECTION AND HANDLING

3.1 Plasma Ammonia

3.1.1 A free-flowing venous (or arterial) blood sample should be collected into a specimen tube (preferably pre-chilled) containing either lithium heparin or EDTA as an anticoagulant and which has been determined to be free of ammonia contamination.
3.1.2 Ideally, the patient should not be stressed, as difficult venipuncture can cause a spurious increase in ammonia concentration.
3.1.3 The sample should be transported on ice to the laboratory immediately so that it can be centrifuged within 15 minutes of collection and the plasma obtained is analyzed immediately.
3.1.4 These precautions are necessary as the ammonia concentration of standing blood increases spontaneously, due to generation and release of ammonia from red blood cells and, to a lesser extent, the deamination of amino acids by enzymes in the circulation, such as γ-glutamyltransferase.
3.1.5 Unless in an emergency, the sample should be collected in a fasted state (or at least 4–6 hours after a meal), not following physical exercise, and smoking should be avoided for at least 9 hours before the sample is collected.
3.1.6 Clotted samples, samples collected via indwelling catheters and capillary samples should not be used, as any significant hemolysis of the sample will cause spuriously elevated ammonia levels.

Note: Once separated, plasma ammonia is stable for 4 hours at 4 °C and 24 hours at -20 °C.

3.2 Plasma Lactate

3.2.1 The patient should be fasting and at complete rest for at least 2 hours to allow the blood lactate concentration to stabilize. Patients should avoid exercise of the hand or arm before and during the collection of blood.
3.2.2 Ideally, venous specimens should be obtained without the use of a tourniquet because venous stasis will increase lactate levels. If a tourniquet must be used, the blood should be drawn immediately after the tourniquet is applied.
3.2.3 Blood cells continue to metabolize glucose following collection, resulting in the production of lactic acid. For this reason, a gray-top tube containing sodium fluoride, which inhibits glycolysis, is usually recommended for plasma lactate sample collection.

3.2.4 Send sample chilled in ice slurry to the laboratory immediately to further inhibit glycolysis and lactic acid formation.
3.2.5 Plasma lactate concentration can be falsely increased if the plasma is not separated from the cells shortly after sample collection (Centrifugation and separation of plasma from cells is recommended within 15 minutes of collection).
3.2.6 Sample stability after separation from cells: 2 - 8°C for up to 14 days.

3.3 Hormone, Anemia Profile and Tumor Markers

3.3.1 Blood should be collected in the morning.
3.3.2 Send sample to laboratory immediately.
3.3.3 Please refer to subsequent list of tests for the type of specimen, required container to be used, and laboratory turnaround time (LTAT) and other specific remarks.

3.4 Random Urine Specimen

3.4.1 An early-morning, first voided specimen is usually preferred for testing.
3.4.2 Clean groin area prior to collecting urine.
3.4.3 Catch mid-stream urine using 60 mL sterile container during emptying of the bladder.
3.4.4 Send specimen immediately to laboratory; never send urine sample through pneumatic tube system.
3.4.5 Never keep urine sample in the ward/ clinic/ home as urine sample collected more than 1 hour will affect result reliability.

3.5 24 hours urine specimen

3.5.1 Determine the type of qualitative assays planned to be performed on the collected specimens**.** This is important to determine whether preservative is required, the special container is available at laboratory upon request. For urine collection without preservative, the normal 24-hours urine container may be used. When specimens are to be collected over a specified period of time, the patient's close adherence to instructions is important.
3.5.2 On the day of the collection, discard the first morning urine void, and begin the collection After this void. Collect all urine for the next 24 hours so that the morning urine void on the second day is the final collection.
3.5.3 Urine should be passed into a separate container at each voiding and then emptied into a larger container for the complete specimen. This two-step procedure prevents the danger of patient splashing himself/herself with the preservative (e.g., acid) in the container.
3.5.4 Store the bottle at room temperature or in the refrigerator.
3.5.5 If patient needs to have a bowel movement, any urine passed with the bowel movement should be collected. Try not to include feces with the urine collection. If feces do get mixed in, do not try to remove the feces from the urine collection bottle.
3.5.6 After the collection period has been completed, label the container appropriately and, state the collection date and time. Send the collected urine to laboratory immediately for processing.

3.6 Urine for Drugs of Abuse (DOA) for medico-legal cases

Sample collection must follow the guidelines as in the *'Pekeliling Ketua Pengarah Kesihatan Bil 1/2021: Garis Panduan bagi Pengesanan Penyalahgunaan Dadah Dalam Air Kencing Versi 2.0'* as below: -

3.6.1 Sample collection must be properly supervised**. Laboratory personnel shall not be involved in the sample collection.** Collection site must have suitable toilet facilities and are free from soap, dispenser or cleaning agent.
3.6.2 The urine volume should be at least **30 mL.**
3.6.3 The person supervising the collecting should stand close enough to the patient/suspect to see that the urine specimen is genuinely passed out by the person and there is no attempt to falsify or adulterate the specimen.
3.6.4 The urine bottle must be securely capped and sealed with **sealing wax.**
3.6.5 Bottle must be labeled in front of the patient/suspect with the following information:
  3.6.5.1 Patient's full name
  3.6.5.2 Full identity card number
  3.6.5.3 Date and time of specimen collection
  3.6.5.4 Signature of Supervising Officer
  3.6.5.5 Drug(s) suspected
3.6.6 Proper **Chain of Custody** procedures for urine collection shall be maintained.
3.6.7 Donor shall not be permitted to transport samples to the laboratory.

3.7 Cerebrospinal Fluid (CSF) biochemistry test

Tests include Total Protein, Globulin, Glucose and Chloride.

3.7.1 Specimen should be collected in a sterile manner and placed in a Bijou bottle.
3.7.2 Collect minimum of 3-5 mL of specimen.
3.7.3 If glucose and protein tests are requested, serum levels should be requested at the same time. The normal CSF glucose is about 60% compared to serum level.
3.7.4 Do not refrigerate specimens.
3.7.5 Send specimen immediately to laboratory. Never keep CSF specimen as specimen collected more than 1 hour as it will affect result integrity. Specimens more than 1 hour will be processed but the results may be erroneous due to a delay in transit/processing.
3.7.6 A delay in examining CSF falsely low glucose value due to glycolysis.
3.7.7 Other body fluids that require certain biochemical test should be informed and discussed with the Scientific Officers / Chemical Pathologist prior to sending.

3.8 Other body fluids biochemistry test

3.8.1 Other body fluids that require certain biochemical test should be informed and discussed with the Scientific Officers/ Chemical Pathologist prior to sending.

4. TESTS OFFERED IN CHEMICAL PATHOLOGY LABORATORY, HOSPITAL TAIPING & LTAT

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Alanine Amino Transferase (ALT)	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Albumin					
Albumin*	Urine 24 hours collection	24 hours urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.
Albumin Creatinine Ratio (UACR)*	Spot urine, midstream	Sterile urine container	30 ml	1 working day	
Alkaline Phosphatase (ALP)	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Alpha Fetoprotein (AFP)*				5 working days	
Ammonia	Plasma	EDTA tube	2.0 ml	1 hour (Urgent)	Please make appointment before send the sample. Send to lab immediately with ice.
Amylase	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Amylase*	24 hours urine collection	24-hour urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.
Aspartate Transaminase (AST)	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Bilirubin - Total & Direct					
Bilirubin-Indirect					Calculated value.
Body Fluids Biochemistry*	Body fluids	Sterile container	3.0 ml	1 working day	Send immediately to lab after sample collection.
CA 125*	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	5 working days	
CA 19-9*					

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Cannabis*	Urine	Sterile urine container	Minimum 30.0 ml	10 working days	Container must be sealed with wax.
Carcinoembryonic Antigen (CEA)*	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	5 working days	Plasma specimens collected in lithium or sodium heparin have been shown to exhibit an average of 7% to 8% higher results compared to corresponding serum results.
Calcium	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Calcium*	24 hours urine collection	24-hour urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.
C-Reactive Protein (CRP)	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	1 working day	
Chloride				3 hours (Routine) 1 hour (Urgent)	
Chloride*	24 hours urine collection	24-hour urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.
Cholesterol Total	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours	
Cortisol*				3 working days	Indicate time of specimen collected.
Cortisol*	24 hours urine collection	24-hour urine bottle	Minimum 500 ml	5 working days	If <500ml, will be rejected except in pediatric and ESRD patient.
Creatine Kinase	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Creatinine	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Creatinine*	Urine 24 hours	24-hour urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.
Creatinine Clearance*	24 hours urine	24-hour urine bottle	Minimum 500 ml	1 working day	Both urine and blood samples are required. Calculated value
	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml		
CSF Biochemistry i) Glucose ii) Total Protein iii) Chloride	CSF	 Sterile bijou bottle	3.0-5.0 ml	1 hour	Send immediately to lab after sample collection.
Ferritin*	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	5 working days	Morning samples are preferred. Fasting at least 12 hours.
Folate*					
Free T4*				3 working days	
Glucose	Plasma	Sodium fluoride tube (adult) / Sodium Fluoride tube-microtainer (paed)	Adult: 2.0 ml Paed: 0.5 ml	3 hours (Routine) 1 hour (Urgent)	Fasting at least 12 hours (Fasting plasma glucose).
Glucose Tolerance Tests (OGTT) i) Fasting Blood Glucose ii) Two (2) Hours Post Prandial				3 hours (Routine)	

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
HDL Cholesterol	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine)	
Hemoglobin A1C*	Whole blood	EDTA tube	2.0 ml	5 working days	Minimum retesting period is >90 days except for pediatric & maternity cases.
Human Chorionic Gonadotrophin*	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 Working days	
Iron Total*	Serum	Plain tube	3.5 ml	5 working days	Morning samples are preferred. Fasting at least 10-12 hours. TIBC=Iron † UIBC (TIBC is calculated).
Unbound Iron Binding Capacity (UIBC)*					
Lactate	Plasma	Sodium fluoride tube	2.0 ml	1 hour (STAT)	Send to lab immediately on ice.
Lactate Dehydrogenase (LDH)	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
LDL-Cholesterol				3 hours (Routine) 1 hour (Urgent)	Calculated value.
Magnesium				3 hours (Routine) 1 hour (Urgent)	
Magnesium*	Urine 24 hours collection	24 hours urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.
Microalbumin*	Fresh morning urine	Sterile urine container	2.0 ml	1 working day	
Morphine*	Urine	Sterile urine container	Minimum 30 ml	10 working days	Container must be sealed with wax.

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Osmolality	Serum	Plain tube	3.5 ml	1 working day (Routine) 4 hours (Urgent)	Send immediately to lab after sample collection.
Osmolality	Random Urine	Sterile urine container	2.0 ml		
Parathyroid Hormone (intact) IPTH*	Plasma	EDTA tube	2.0 ml	5 working days	Send to lab immediately with ice.
Paraquat	Random urine	Sterile urine container	2.0 ml	1 hour	
Phosphate	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Phosphate*	Urine 24 hours collection	24 hours urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.
Potassium	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Potassium*	Urine 24 hours collection	24 hours urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.
Protein Creatinine Index (PCI)	Spot urine	Sterile urine container	30 ml	1 working day	
Protein, Total	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Protein*	Urine 24 hours collection	24 hours urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.
PSA, Total*	Serum	Plain tube	3.5 ml	5 working days	
RBC Cast	Random Urine	Sterile urine container	3.0-5.0 ml	1 working day	
Salicylate	Serum	Plain tube	3.5 ml	1 hour	

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Sodium	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Sodium*	Urine 24 hours collection	24 hours urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.
Stool for Occult Blood	Fresh stool	Stool container	One fourth of a container	1 working day	
Thyroid Stimulating Hormone (TSH)*	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 working days	
Thyroid Stimulating Hormone (TSH)*	Cord Blood	 Test tube 16/100 mm cylindrical (TSH tube)	3.0 ml	48 hours	National newborn screening for congenital hypothyroidism.
Triglycerides	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours	Fasting at least 12 hours.
Troponin I (High Sensitive)	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Urea	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Urea*	Urine 24 hours collection	24 hours urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Uric Acid	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube	Adult: 3.5 ml Paed: 0.4-0.6 ml	3 hours (Routine) 1 hour (Urgent)	
Uric Acid*	Urine 24 hours collection	24 hours urine bottle	Minimum 500 ml	1 working day	If <500ml, will be rejected except in pediatric and ESRD patient.
Urine Biochemistry (Qualitative) i) Blood ii)Bilirubin iii)Urobilinogen iv)Ketone v)Protein vi)Nitrite vii)Glucose viii)pH ix)Specific Gravity x)Leukocytes xi) Ascorbic Acid xii) Urine Colour xiii) Clarity	Random Urine	Sterile urine container	3.0-5.0 ml	4 hours (Routine) 2 hours (Urgent)	Send immediately after collection. Suitable sample (midstream urine). Early morning urine is preferable.
Urine Pregnancy Test (UPT)	Random urine	Sterile urine container	2.0-5.0 ml	4 hours	Early morning urine is preferable.
Vitamin B12*	Serum/ Plasma	Plain tube (adult) / Lithium heparin with gel tube (microtainer/paed)	Adult: 3.5 ml Paed: 0.4-0.6ml	5 working days	Morning samples are preferred. Fasting at least 10-12 hours.
Therapeutic Drug Monitoring (TDM) Acetaminophen Amikacin Carbamazepine Digoxin Gentamicin Phenytoin Theophylline Valproic acid Vancomycin	Serum/ Plasma	Plain tube (adult)/ Lithium heparin with gel tube (microtainer/ paed)	Adult: 3.5ml Paed: 0.4-0.6 ml	Toxicity case: 1 Hour Non toxicity case: 2 Hours	Please use the dedicated TDM form and fill up accordingly. Please consult the pharmacist on call before send any TDM sample to the laboratory.

Notes:
1. Tests marked with asterisk (*) are not offered during weekend/public holiday.
2. In emergency cases such as to rule out ectopic pregnancy or thyroid emergencies, please call

Chemical Pathology Medical Officer or Chemical pathologist during office hour (after office hour/ public holiday/weekend, please call the on-call pathology Medical Officer).

3. Request forms to be used:
   All use **PER-PAT 301 form** except for **drug of abuse medicolegal use UPD-1 (Pindaan 2)** form and for **TDM please use TDM form**.
   For **clinical case**, urine morphine and cannabis, PER PAT 301 form can be used but **include more clinical history**.
4. Patients do not need to fast for lipid profile. Fasting lipid profile should be considered or preferred:
   - If the non-fasting TG is 4.5 mmol/L samples
   - In cases of familial hyperlipidemia/hypertriglyceridemia
   - Following recovery form hypertriglyceridemic pancreatitis
   - When initiating medication(s) that may cause hypertriglyceridemia (e.g., steroids, anti-retroviral therapy).
   - When other tests that are requested require fasting or morning samples (e.g., fasting glucose).

5.FACTORS KNOWN TO SIGNIFICANTLY AFFECT PERFORMANCE OF TESTS / INTERPRETATION OF RESULTS

No	Problem	Causes	Affected analyte
1.	Delay in processing	• Overnight storage • >6 hour delay in separation	Increased potassium, phosphate, LDH, AST.
2.	Incorrect storage	Storing unseparated sample in the fridge	• Increased phosphate and potassium • Decreased bicarbonate
3.	Haemolysis	• Expelling blood through needle • Vigorous shaking • Extreme temperature	Increased potassium, phosphate, LDH, AST.
4.	Inappropiate collection site	Sample taken from drip arm	• Increased drip analyte e.g. sodium, glucose • Decreased analyte-dilutional effect
5.	Incorrect container or anticoagulant	No fluoride oxalate	Decreased glucose
		K-EDTA contamination	• Increased potassium • Decreased calcium, magnesium, alkaline phosphatase
		Lithium heparin tube	Increased lithium

6. STABILITY TIME OF TEST

Please send the specimens to our Pathology Lab within stability time to ensure result accuracy.

No	Test	Stability Time
1.	Urgent: Potassium, Calcium, Magnesium, Phosphate, Glucose, Lactate Dehydrogenase	2 hours
2.	CSF	Glucose only stable for 5 hours
3.	Troponin	8 hours
4.	Routine: Other biochemistry tests	4 hours
5.	Urine / Fluid Glucose	2 hours (Urine Glucose only stable for 2 hours)
6.	Other Urine / Fluid Tests	24 hours (Urine Protein only stable for 24 hours)
7.	Special: TDM	2 days (Digoxin, Valproic Acid only stable 48 hours)
8.	Tumor Marker	24 hours (PSA only stable 24 hours)
9.	Iron Study	10 hours (Iron only stable 10 hours)

7. REPORTING AND DESPATCHING OF RESULT(S)

7.1 Routine biochemistry result will be validated by the Medical Laboratory Technologist (MLT) and Scientific Officer. Special biochemistry result will be validated by Scientific Officer, Medical Officer and Chemical Pathologist.

7.2 All results will be made available according to the respective test's LTAT.

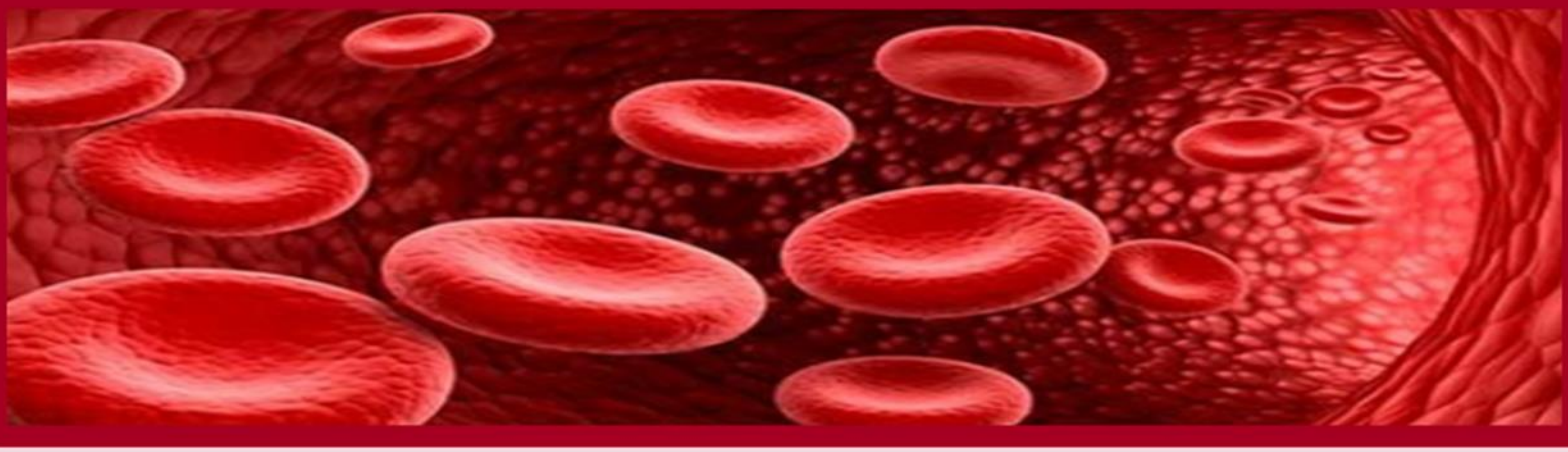
7.3 Printed test result for in-patient are dispatched via designated pigeon holes located at the main counter of Pathology Department.

7.4 Drugs of abuse result will be validated by Scientific Officer. Results will be sealed and collected by hand by representative of related agencies or strictly dispatched to requester only. Patients are not allowed to collect their own results.

8. RETENTION PERIOD OF SPECIMENS AND RESULTS/REPORTS

	RECORD/ MATERIAL	RETENTION DURATION
8.1	Request form (hard copy or electronic equivalent)	1 year following report validation
8.2	Report duplicates 6.2.1 Neonatal screening and inborn error of metabolism 6.2.2 Drug of abuse testing (confirmatory or screening) 6.2.3 All other reports	 25 years 7 years 7 years
8.3	Results	1 years
8.4	Samples 6.4.1 Serum, plasma, blood, frozen urine and other frozen body fluids 6.4.2 Other body fluids e.g., cerebrospinal fluid, pleural fluid 6.4.3 Urine and faeces	 2 days after issue of report/result 24 hours after test done Discard after issuance of report/ result

HEMATOLOGY



DEPARTMENT OF PATHOLOGY, HOSPITAL TAIPING LABORATORY HANDBOOK 2025

1. INTRODUCTION

The Hematology Laboratory provides services involving hematology testing. The services involve screening, diagnosis and monitoring of general and hematological conditions such as anemia, thalassemia and leukemia. Other than Hospital Taiping, this laboratory also provides hematology services to district hospitals (ie; Parit Buntar, Selama, Gerik and Kuala Kangsar Hospital) and health clinics in the northern zone of Perak.

2. LIST OF SERVICES

The Hematology Laboratory offers routine and selected specialised hematology tests. Tests offered in Hospital Taiping are listed in table of 'Test Offered In Hematology Laboratory, Hospital Taiping & LTAT'.

3. SPECIMEN COLLECTION AND HANDLING

All specimens sent to Hematology Laboratory must comply with pre-analytical requirements mentioned in General Information chapter. Additional requirements are as mentioned below. Please note that specimen that not comply with the requirements will be rejected.

1.1 Full Blood Count (FBC)/ Reticulocyte count/ Full Blood Picture (FBP)

a. Collect blood sample in an **EDTA tube (lavender/ purple top tube)** and fill up to the mark as instructed by the manufacturer.
b. **Mix well** by inverting the tube gently for according to the recommendation (about 5 -10 times).
c. Send to the laboratory immediately after collection (blood sample should be analysed within 6 hours after blood collection).
d. For Full Blood Picture:
    i. Please provide relevant clinical history and diagnosis upon each request. If required information is not available, the smear will not proceed.
    ii. Do not send a post transfusion sample (within 3 months) unless clinically indicated.

1.2 PT / APTT / Fibrinogen / D-Dimer/ Mixing tests

a. Collect blood sample in **trisodium citrate tube (blue top tube)** and fill up to the mark as instructed by the manufacturer.
b. Blood sample volume **must comply with 9:1** blood to anticoagulant ratio:
    i. Please ensure that the blood sample is collected up to the indicated mark on the collection tube (± 10%).
    ii. Inadequate filling or overfilling of the blood sample in collection tube will affect this ratio, and may result in erroneous test results.
c. **Mix well** by inverting the tube gently for about 5 times.
d. Send the specimens immediately to the laboratory to avoid incorrect results due to stored specimens (blood sample should be analysed within 4 hours after sample collection).
e. For Fibrinogen/ D-Dimer:
    i. Sample from outside Hospital Taiping, sample need to be processed prior to transportation.
    ii. Centrifuge sample, aliquot plasma into new plain tube and freeze the sample. Keep sample frozen until transport to the laboratory.

4. TESTS OFFERED IN HEMATOLOGY LABORATORY, HOSPITAL TAIPING & LTAT

4.1 ROUTINE TESTS

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Full Blood Count (FBC) Differential Count Reticulocyte Count	Whole Blood	EDTA tube 	1 EDTA tube (2 ml) Neonate: 0.5 ml	4 hours (Routine) 45 minutes (Urgent)	Mix well. Must be received within 6 hours of collection. Internal sample only.
Erythrocyte Sedimentation Rate (ESR)	Whole Blood	Westergen Tube 	1.2mL Or To fill blood sample up to indicator mark on the tube.	4 hours	Mix well. Must be received within 6 hours of collection. Internal sample and **office hour only**.
Glucose-6-Phosphate Dehydrogenase (G6PD) Spot test	Whole blood	Newborn: Filter Paper, a single blot of blood Adult: EDTA tube 	Newborn: Filter Paper, a single blot of blood 1 EDTA tube (2 ml)	24 hours (Routine) 1 hour (Urgent)	Allow the blood-stained filter paper to air dry before sending to the lab. Internal sample and samples from Health Clinic under PKD Larut, Matang and Selama only.
Coagulation i) Prothrombin Time (PT) / International Normalized Ratio (INR) ii) Activated Partial Thromboplastin Time (APTT)	Plasma	Trisodium Citrate tube (3.2%) 	1 tube (1.8 or 2.7ml) To fill blood sample up to indicator mark.	4 hours (Routine) 60 minutes (Urgent)	Invert sample gently (3-4 times) and immediately send to the lab not more than 4 hours after blood collection. Internal sample only.
iii) Fibrinogen level iv) D-dimer					Invert sample gently (3-4 times) and immediately send to the lab not more than 4 hours after blood collection.For external sample, sample should be processed and kept frozen until reach the laboratory.

4.2 SPECIALIZED TESTS

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Full Blood Picture (FBP)	Whole Blood	EDTA tube 	Adult: 2 ml Neonate: 0.5 ml	5 working days (Routine) 24 hours (Urgent)	For urgent cases, please consult Medical Officer: 1) Office hour: ext.5328 2) After office hour: Medical officer on call Please refer to indications of FBP in Attachment 1.
Mixing test	Plasma	Trisodium Citrate tube (3.2%) 	3 tubes (1.8 or 2.7ml) To fill blood sample up to indicator mark .	2 working days	1) All case needs to be discussed with Medical Officer/ Hematopathologist. 2) Make an appointment with Hematology lab staff 3) All blood samples should be sent immediately to the laboratory. 4) All blood samples must reach Hematology laboratory by 9.00 am during office hour.
Bone Marrow Aspirate	Bone Marrow	Direct smear on glass slide by hematology laboratory staff		7 working days (Routine) 3 working days (Urgent)	i) All cases need to be discussed with hematopathologist. ii) Make an appointment with hematology laboratory staff. iii) Please inform if require outsource tests.
Hemoglobin analysis	Whole Blood	EDTA tube 	Adult: 2 ml Neonate: 0.5 ml (x2 tubes)	21 working days	For District Hospitals & Health Clinics; the Hb analysis sample should be sent together with: i) FBC result ii) One stained peripheral blood smear iii) One unstained peripheral blood smear

5. REPORTING AND DISPATCHING OF RESULT(S)

5.1 All routine hematology tests result will be validated by Medical Laboratory Technologist or Scientific Officer. All specialized hematology tests will be reported and validated by Medical Officer and/or Hematopathologist.

5.2 All test results will be available in the Laboratory Information System (LIS). If required, printed test result will be dispatched via designated pigeon holes located at the main counter of Pathology Department.

6. RETENTION PERIOD OF SPECIMENS AND RESULTS/REPORTS.

	RECORD/ MATERIAL	RETENTION DURATION
1.1	Request form accompanying specimen 1.1.1 Routine test 1.1.2 Test with interpretive report	 1 month after issue of result 3 years after issue of report
1.2	Reported blood film (i.e., slide)	1 year after issue of report
1.3	Blood samples	2 days after the issue of report
1.4	Bone marrow slides	7 years after issue of report
1.5	Final reports 1.5.1 Minors 1.5.2 Normal adults 1.5.3 Individual without capacity	 Until the child is 25 years of age 10 years Indefinite*
1.6	Results 1.6.1 Full blood count 1.6.2 Routine coagulation test (e.g., PT, INR, APTT, disseminated intravascular coagulation) 1.6.3 G6PD Screening	 3 years 3 years 7 years

***applicable only if adequate storage facilities, and if the status of the patient is known to the laboratory upon reception.**

Attachment 1
GUIDELINES FOR FBP REQUEST

Indication for FBP:

1. **History and clinical findings of**
    a. Unexplained anaemia
    b. Neutropenia
    c. Thrombocytopaenia (petechial rash, easy bruising)

2. **Clinical suspicion of hemolysis**
    a. Microangiopathic hemolytic anaemia (MAHA)
    b. Fragmentation syndrome, supported by relevant biochemical, coagulation & hematological investigation results (eg. Se bilirubin, reticulocyte count, LDH, Coombs test, PT, APTT
    c. Other hemolysis

3. **Suspicion of hematological malignancy**
    eg: Acute/Chronic leukaemias, MPN, MDS, LPD based on:
    a. **Symptoms** – weight loss, fever, PUO, itching, easy bruising, hyperviscosity syndrome
    b. **Clinical findings**– lymphadenopathy, hepatomegaly, splenomegaly, plethora/petechiae
    c. **FBC**- Pancytopenia/ Leucocytosis/ Neutropenia/ Lymphocytosis, thrombocytopenia

4. **Abnormal blood cell parameters.**
    a. WBC >30 x 10^9/L or <4 x 10^9/L
    b. Platelet >1000 or <100 x 10^9/L
    c. Red cells, Hb < 7g/dL or >18.5 g/dL (male) or 16.5g/dL (female)

5. Clinical suspicion of thalassaemia (intermedia /major) and membrane disorder (eg. Hereditary Spherocytosis).

6. When performing bone marrow aspirates procedure or as part of treatment protocol eg; Bone marrow transplant, therapeutic apheresis, chemotherapy protocol.

7. Other cases based on clinical indications.

FBP is not indicated in the following situation:
1. Healthy patient with normal blood cell indices planned for elective procedures/operations e.g. cataract for operation.
2. Medical checkup – if blood cell indices normal.
3. Daily FBP for hospitalized patient.

***For urgent Full Blood Picture, please consult medical officer at ext 5328 (during office hour) or Pathology Medical Officer Oncall (after office hour).**

Source: *Standardization in Hematology Test Reporting in MOH Lab 2.0 Workshop (18&19 May 2022).*

MICROBIOLOGY

DEPARTMENT OF PATHOLOGY, HOSPITAL TAIPING LABORATORY HANDBOOK 2025

1. INTRODUCTION

Microbiology laboratory is particularly involved in isolating and establishing the causative agents as well as monitoring and screening of infectious diseases.

2. LIST OF SERVICES

2.1 Diagnostic microbiological service which comprise of Bacteriology, Parasitology, Serology and Mycology.
2.2 Participation in hospital wide infection control activities related to surveillance, control and prevention of nosocomial infection.
2.3 Provision of Microbiology studies of the Hospital environment and sterility testing.
2.4 Microbiological investigations for medicolegal cases.

3. SPECIMEN COLLECTION AND HANDLING

3.1 GENERAL GUIDELINES

3.1.1 The quality of laboratory results depends greatly on the proper collection and handling of the specimens as well as obtaining satisfactory materials for examination.
3.1.2 The clinical specimen must be material from the actual infection site and must be collected with minimum contamination from adjacent tissues, organs or secretions.
3.1.3 A sufficient quantity of specimen must be obtained in order to perform the examination required.
3.1.4 Appropriate collection devise, specimen containers and culture media must be used to ensure optimal recovery of microorganisms.
3.1.5 Ideally the specimen must be collected before the commencement of antibiotic therapy.
3.1.6 The specimen container must be properly labeled, placed in a biohazard plastic bag and accomplished by a completed laboratory request form.
3.1.7 Specimens are best transported immediately to the laboratory.

3.2 SPECIFIC GUIDELINES (BACTERIOLOGY)

3.2.1 Blood culture

i. Determine the type of culture bottles to utilize, aerobic and anaerobic.
ii. Check name, IC, RN to avoid clerical error.
iii. Wash or sanitize hands before and after removing gloves. Follow Standard Precautions for all patients.
iv. Apply tourniquet to the extremity and identify the phlebotomy site.
v. Preparation of the phlebotomy site:
   a. Using the povidone-iodine or chlorhexidine cleanse a 5 cm area using circular motion starting at the site and working outward.
   b. If using iodine product, clean patient's skin with alcohol to remove excess iodine.
   c. If unable to use iodine (e.g., allergic):

- Use Chlorhexidine.
- Use alcohol pad to cleanse the patient's skin, using a circular motion starting at the site and moving outward.
- Do not touch the venipuncture site after skin preparation. If palpation is absolutely necessary, sterile gloves must be applied immediately prior to palpation.

vi. Appropriate amount of blood for culture draw (BACTEC bottles):
   a. 8-10 ml blood per Adult aerobic and anaerobic culture bottle. Do not overfill.
   b. 5ml blood per Myco-F-Lytic bottle.
   c. 1-3 ml blood per Pediatric bottle.

vii. Label culture bottles with patient's name and hospital number. Do not place label over bar-coded area of the bottle. Fill out Pathology request form:
   a. State clinical history.
   b. Indicate site from which blood was collected in the comment(s) section. If using a catheter to draw culture, indicate type and site of catheter in the comments section (i.e., left subclavian triple lumen).
   c. Indicate suspected diagnosis, if necessary (required for endocarditis).
   d. Include date and time of collection.

viii. Send specimens to the laboratory as soon as possible. Never refrigerate blood culture specimens.If delayed, it must be not more than 36 hours.

ix. Send second set of blood cultures using the same procedure as above.

x. Send 2 or 3 set of blood culture if indicated.

xi. In order to suspected catheter related stream infection (CRBSI) and subacute endocarditis, more specific blood culture procedures may be necessary. See below for recommendations:

A. Suspected catheter related blood stream infection (CRBSI):

i. One set is obtained from a suspected site/s. (Central catheter).
ii. Second set must be from a separate peripheral site.
iii. If catheter is removed, send tip using sterile procedure for cultures. Do not send catheter tip without sending concomitant blood cultures.
iv. Type of acceptable catheter tips: Central CVP, Hickman's Broviac, peripheral, arterial, umbilical, hyperalimentation, Swan-ganz.

B. Subacute endocarditis:

i. Draw 2-3 blood culture sets on day 1.
ii. With 1 hour apart per set.
iii. Establishing a specific microbial diagnosis is more important than starting immediate antibiotics**.**

3.2.2 Bone marrow

i. Prepare skin using aseptic technique.
ii. Drape the surrounding skin with sterile linen.
iii. Aspirate the marrow percutaneously using a sterile needle and syringe.

iv. Transfer 3-5ml for each:
For suspected bacterial infection, uses aerobic/ anaerobic a blood culture bottle. Whereas for suspected AFB and fungal infection uses mycobacteria/fungal blood culture bottle (Myco/F Lytic bottle which is available in microbiology lab).

3.2.3 Cerebrospinal fluid (CSF)

i. Wear proper Personal Protective Equipment (PPE).
ii. An open tube is held to collect the fluid; other personnel should stand away or wear masks in order to avoid respiratory contamination.
iii. Decontaminate the skin with povidone iodine, followed by 70% alcohol using an increasingly outward circular movement.
iv. Drape sterile linen over the skin surrounding the puncture site.
v. Insert the needle. Collect 3-4 ml of CSF into sterile Bijoux bottles for the examination of:
    a. microscopy and culture for bacterial (Cryptococcus and mycobacterium if indicated)
    b. biochemistry
vi. Send the specimen immediately to the laboratory.
vii. Do not store in the refrigerator for suspected bacterial meningitis.
viii. If viral pathogen is suspected, please refrigerate (keep to 2-8°C).

3.2.4 Sterile body fluids (except urine and cerebrospinal fluid)

i. Prepare the skin using aseptic technique.
ii. Collect the fluid using a sterile needle and syringe.
iii. Transport immediately.
iv. Do not send sterile body fluids on swabs.

3.2.5 Peritoneal dialysis fluid

A sample from the bag is obtained as follows:
i. Disinfect the port of the bag with alcohol.
ii. Collect at least 20 ml of fluid through the disinfected area using a needle and syringe.
iii. Place the sample into the sterile container and send to the laboratory immediately.

3.2.6 Genital samples

3.2.6.1 High vaginal swabs

i. Using a sterile speculum lubricated with sterile normal saline and not antiseptic cream, swab either from the posterior fornix or the lateral wall of the vagina.
ii. Inoculate the swab into Amies Transport Medium.

3.2.6.2 Endocervical swab

i. Under direct vision, gently compress cervix with blades of speculum and use the rotating motion with swab, obtain exudates from the endocervical canal.
ii. Inoculate the swab into Amies Transport Medium.

3.2.6.3 Urethral discharge (male)

i. Wipe the urethra with sterile gauze or swab.
ii. Collect the exudates with a sterile swab and inoculate into Amies Transport Medium.
iii. If discharge cannot be obtained by milking the urethra, use a sterile swab to collect material from about 2 cm inside the urethra.
iv. Place the swab into Amies Transport Medium.

3.2.7 Urine culture

3.2.7.1 Midstream urine

Male patients

i. Withdraw the prepuce and cleanse the glans penis with soapy water and thoroughly rinse with water.
ii. Pass the first few milliliters of urine to flush out the bacteria from the urethra, then collect the mid-stream portion in a sterile universal container and close it tightly.

Female patient

i. Clean the periurethral area and perineum with soapy water and thoroughly rinse with water.
ii. Hold the labia apart during voiding and pass the first few milliliters of urine.
iii. Collect the midstream portion in a sterile container and close it tightly.

Note: When culture for tubercle bacilli is required, collect at least 50 ml of early morning midstream urine of 3 consecutive mornings into sterile container.

3.2.7.2 Catheterized urine

i. Catheter urine specimen should be taken by aseptic puncture of the catheter conduit and syringe out into a sterile container.
ii Urine from catheter bags is generally unsuitable for culture.

Note: Culturing urinary catheter tips is a waste of time because the catheter tips are invariably contaminated with urethral organisms.

3.2.7.3 Bladder urine samples

i. This is obtained via suprapubic aspiration or cystoscopically.
ii. Urine is collected in a sterile container.

3.2.8 Respiratory specimens

3.2.8.1 Nasal swab

This is commonly done for screening of MRSA carriage.

i. Moisten a swab with sterile saline.
ii. Swab both the anterior nares and insert the swab into the nose and gently rotate against the nasal mucosa.

3.2.8.2 Nasopharyngeal swab

This is especially useful for the diagnosis of whooping cough (Bordetella pertussis) *Bordetella pertussis* Culture and PCR.

i. Use nasopharyngeal swab on a flexible wire handle to collect the specimen.
ii. Swab is used to inoculate the Charcoal Transport Medium.
iii. Only Rayon and Dacron swabs are used for PCR. Calcium alginate and cotton swabs are not suitable for PCR test.
iv. Techniques:
    a. Seat the patient comfortably. Tilt the head back.
    b. If available, insert a nasal speculum. Press the swab through the nares until resistance is met due to contact with the nasopharynx.
    c. Rotate the swab gently and allow the swab to maintain contact with the nasopharynx for 20-30 seconds or until coughing is induced.
    d. Place the swab into the transport medium. Label the tube with the patient's name and identification number. Leave the swab embedded in the tube during transport.
    e. Transport immediately.

3.2.8.3 Throat swab

i. Ask the patient to open his/her mouth widely, gently depress the tongue with a tongue depressor and rub the sterile swab over the tonsillar areas and the mucosa on the posterior pharyngeal wall behind the uvula.
ii. Gently turn the swab so that its whole surface comes in contact with the inflamed mucosa or tongue with the swab.
iii. Avoid touching the oral mucosa or tongue with the swab.
iv. Place the swab in Amies Transport Medium immediately.

Notes: In suspected *Diphtheria* case, in which patient may presented with pseudo membrane, pieces of pseudo-membrane may also be submitted for culture. Pseudo-membrane should be placed in sterile container with small amount of sterile saline (not formalin) and transported to the lab immediately.

3.2.8.4 Sputum

i. Collect the sputum early in the morning, after a deep cough or after a session of physiotherapy. If tuberculosis is suspected, send 3 consecutive specimens.

ii. Ask the patient to cough deeply and spit directly into a sterile universal container.
iii. If delay is anticipated, store the sample in a refrigerator.

3.2.8.5 Bronchial alveolar lavage (BAL/ brushing/ biopsies)

i. Place the specimen which is obtained via bronchoscopy into a sterile container.
ii. Send the specimen to the laboratory immediately.

3.2.9 Pus, swab, tissue

3.2.9.1 Pus C&S

Specimen collection:
i. Should be done under aseptic technique.
ii. Aspirate purulent material from the depth of the wound with a sterile needle and syringe.
iii. Transfer at least 2-3 ml into sterile screw capped container.
iv. Send immediately to the laboratory.
v. Wherever possible collect pus by aspiration rather than swab.

3.2.9.2 Swab

Special note: dry swab is not suitable for culture.

i. Ear Swab/Eye swab.
a. Clean the external meatus / skin around the eye with sterile water.
b. Collect exudates with a sterile swab.
c. Place swab in Amies Transport Medium and send to the laboratory as soon as possible.

ii. Wound swab.
a. Collect pus prior to any antiseptic dressing.
b. Clean wound & surrounding area with sterile water or sterile saline to remove all superficial environmental bacteria colonizing the wound.
c. Soak a sterile swab thoroughly in the exudates and place in Amies Transport Medium. Transport to the laboratory at room temperature as soon as possible.

iii. Mouth /Gum swab
a. Instruct patient to rinse mouth before sampling.
b. Rub a sterile swab over the inflamed area.
c. Place in Amies Transport Medium and send to the laboratory as soon as possible.

3.2.9.3 Tissue C & S

i. Aseptically cut a sample of the suspected infected site.
ii. Put in a sterile screw cap container. DO NOT ADD FORMALIN.
iii. Dispatch to the laboratory as soon as possible.

3.2.10 Stool C & S

i. Stool C&S requires feces (stool) specimen or rectal swab for testing.
ii. Volume required: ¼ of stool container.
iii. If it is not possible to obtain feces, collect a specimen by inserting a cotton swab into the rectum for rectal swab and use Cary-Blair Transport Medium.
iv. Send immediately to the laboratory.

Note: For *Clostridium difficile* toxin detection:

a. Collect fresh stool in a sterile container. Only loose or diarrheal stools are recommended for *Clostridium difficile* test. Specimens collected in formalin or swabs are not acceptable.
b. Transport to the laboratory immediately.

3.2.11 TIP Catheter/UVC Tip C & S

i. Clean skin around the catheter. Remove the tip in an aseptic manner.
ii. Cut-off the catheter/UVC tips using an alcohol-wiped scissors and then, places the tip into a sterile container.
iii. Send specimen to the laboratory as soon as possible.

Note: Catheter tips are not advisable to be sent for C & S.

3.2.12 Sterility Testing for Milk and Total Parenteral Nutrition (TPN)

i. Sterile test for Milk / TPN.
ii. Send 5 mL of material prepared in sterile container to the laboratory.

3.3 SAMPLE FOR MYCOLOGY

3.3.1 Skin, nails and hair

Clean cutaneous and scalp lesions 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 specimen should be collected into folded squares of paper or directly onto an agar plate.

i. Skin

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

ii. Hair

a. Specimen from the scalp should include hair roots, the content of plugged follicles and skin scales.

b. Hairs should be plucked from the scalp with forceps or the scalp is brushed with a plastic hairbrush and collected onto an agar plate.

iii. Nails

Nail specimen should be taken from any discolored, dystrophic or brittle parts of the nail.

3.3.2 Mouth

Swabs from the buccal mucosa should be moistened with sterile water prior to taking the samples and send in Amies Transport Medium.

3.3.3 Ears

Scrapings of material from the canal are to be preferred, although swabs can also be used.

3.3.4 Ocular specimens

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

3.3.5 Blood

i. Blood culture for fungal is collected in the same manner as for blood culture for bacteria using manufacturer fungal bottle.
ii. The request for fungal culture should be indicated clearly on the request form and a total of two weeks incubation will be carried out.

3.3.6 Cerebrospinal fluid

CSF specimens (3-5 ml) should be collected in a sterile container for microscopy and culture.

3.3.7 Bone marrow

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

3.3.8 Pus

i. Pus from undrained subcutaneous abscesses or sinus tracts should be collected with a sterile needle and syringe.
ii. If grains are visible in the pus (as in mycetoma), these must be collected. In mycetoma, if the crusts at the opening of the sinus tracts are lifted, grains can often be found in the pus underneath.

3.3.9 Tissue

i. If possible, material should be obtained from both the middle and edge of the lesions.
ii. Small cutaneous, subcutaneous or mucosal lesions can often be excised completely.
iii. Tissue specimen should be placed in a sterile container without formalin.

3.3.10 Specimen for serological tests

These comprise of test in bacteriology, virology, parasitology and immunology.
Methods of blood collection:
i. Draw 3-5 ml of blood into a plain tube without anticoagulant.
ii. Clot at ambient temperature and dispatch to the lab as soon as possible.

Note: Hemolysis, icteric or lipaemic specimens invalidate certain tests. If such specimens are received, the samples will be rejected to ensure quality.

3.4 BLOOD FILM FOR MALARIA (BFMP) or FILARIA

Thick film: Always handle slides by the edges or by a corner to make the thick film. Using the corner of the spreader, quickly join the drops of the blood and spread them to make an even, thick film. The blood should not be excessively stirred but can be spread in circular form with 3 to 6 movements. The circular thick film should be about 1 cm in diameter.

Thin film: Using a second clean slide as “spreader” and, with the slide with the blood drops resting on a flat, firm surface, touch the small drop with the spreader and allow the blood to run along the edge. Firmly push the spreader along the side, keeping the spreader at an angle of 45°C. Make sure that the spreader is in even contact with the surface of the slide all the time the blood is being spread.

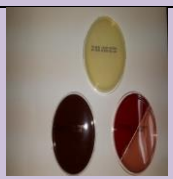
Notes: For filarial, sample should be taken between 10.00 pm-4.00 am.

4. TESTS OFFERED IN MICROBIOLOGY LABORATORY, HOSPITAL TAIPING AND LTAT

<table>
<tr><th>TEST</th><th>TYPE OF SPECIMEN</th><th>CONTAINER</th><th>VOLUME</th><th>LTAT</th><th>REMARKS</th></tr>
<tr><td>Aspirate C&S</td><td>Pus / exudates</td><td rowspan="13"> 
Sterile Bottle</td><td rowspan="9">10-30ml</td><td rowspan="8">3-5 days</td><td rowspan="8">The cap of the bottle must be closed tightly to avoid sample from leaking. Send to the lab IMMEDIATELY.

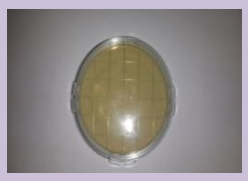
Sample for urine culture:
For container without preservative, sample must be sent within 2 hours after collection. If sample is more than 2 hours after collection, sample will be rejected.

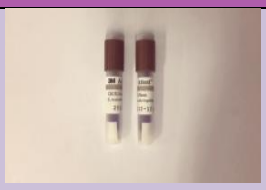
For container with preservative (Boric acid) usually from district hospital, sample can be sent within 48 hours.

More than one urine and sputum culture sample submitted on the same day from same source will be rejected.</td></tr>
<tr><td>Body fluid C&S</td><td>Other than CSF, blood and urine</td></tr>
<tr><td>Urine C&S</td><td>Mid-stream urine (MSU) Suprapubic urine (SPU)</td></tr>
<tr><td>Gram stain</td><td>Fluid</td><td>1 Hour</td></tr>
<tr><td>Sputum C&S</td><td rowspan="4">Respiratory Specimen</td><td rowspan="7">3-5 days</td></tr>
<tr><td>Tracheal Aspirate C&S</td></tr>
<tr><td>Nasopharyngeal Aspirate C&S</td></tr>
<tr><td>Broncho alveolar Lavage C&S</td></tr>
<tr><td>Bronchial Washing C&S</td><td rowspan="3">Biopsy Specimen</td><td rowspan="4">-</td></tr>
<tr><td>Tissue C&S</td></tr>
<tr><td>Bone C&S</td></tr>
<tr><td>Catheter Tip C&S</td><td>Catheter</td><td>Cut the catheter tip (5cm) using sterile scissor.</td></tr>
<tr><td>IUCD C&S</td><td>IUCD</td><td>Send to the lab immediately.</td></tr>
<tr><td>Intravascular Fluid (Vitreous Taping) C&S</td><td>Vitreous Fluid</td><td rowspan="2"> 
Sabouraud, Chocolate and Blood/ MacConkey Agar</td><td rowspan="2">-</td><td rowspan="2">3-5 days</td><td rowspan="2">Please get the agar from lab.</td></tr>
<tr><td>Corneal Scrapping C&S</td><td>Corneal scraping</td></tr>
</table>

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Blood C&S	Blood	 Bactec FA Plus aerobic  Bactec FN Plus Anaerobic  Bactec PF Plus Paediatric  Bactec Myco/F Lytic	8-10 ml (Adult) 1-3 ml (Paeds)	5-10 days For Fungal, may up to 14 days. For TB culture, may up to 42 days.	
Pus/ Exudate swab C&S	Pus	 Amies Transport Medium without charcoal	-	3-5 days	No dry swab allowed.
Eye / Ear swab C&S	Eye/Ear				
Nasal swab C&S	Nasal				
Throat swab C&S	Throat				
CSF C&S	Cerebrospinal Fluid	 Sterile Bijou Bottle	3-4 ml	3-5 days	The cap of the bottle MUST BE closed tightly to avoid leaking. Room temperature. DO NOT store in the refrigerator except for request of virology, where specimens should be kept at 4-8°C.
CSF FEME				1 Hour	

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Stool C&S	Stool	 Swab with Carry Blair Medium	-	3-5 days	If sending fresh stool, place in container and send to the lab Immediately. (Within 2 Hours) **More than one stool culture sample submitted on the same day from same source will be rejected.**
Rectal Swab C&S	Swab from Rectal				
Genital swab C&S	Genital	 Amies Transport Medium (With Charcoal)	-	3-5 days	
High Vaginal Swab C&S	High Vaginal				
Endocervical Swab C&S	Endocervical				
Penis Swab C&S	Penis				
Urethral Swab C&S	Urethral				
Direct smear for AFB	Sputum, Urine, Cerebrospinal fluid, Body fluid, Respiratory secretion, Gastric lavage	 Sputum Container		24 Hours (Routine)	Early morning sputum preferred. Room Temperature. Store at 4°C if delay.
Blood Film Malaria Parasite	Blood	 Glass slide	*20 µl (about 10 cent coin size) *Thick smear 60 µl *Room Temperature	1 Hour (To get positive or negative result)	Leave to air dry (DO NOT use hair dryer). Prepare a thick smear on slides in oval shape (after 10 pm till 4 am).
Blood Film Filarial Parasite					

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Stool FEME	Fresh stool	 Stool Container	One fourth of a container	3 Hour	
Stool for *Clostridium difficile* toxin					
Stool for rotavirus and adenovirus				1 working day	
Environmental Sampling	Environmental	 Tryptic Soy Agar Plate	-	3 Days	Procedure done at operation theatre room by Infectious Control Nurse. Usually after change the HEPA filters.
Mycological Examination (Microscopy) Fungal stain Fungal C&S	Hair Nail Skin Scraping	 Sabouraud, Chocolate, Blood/MacConkey Agar  Slide	-	14 Days (For No Growth)	Please get the agar and slides from lab.
Cryptococcal Antigen	CSF Blood	 Sterile Bijou Bottle  Plain Tube with Gel		1 hour	

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Spore Test	Spore	 Attest indicator vials	-	3 days	Attest / Spore strip. Send attest indicator vials that gone through the autoclaving cycle together with control attest. Both test and control attest must be from the same batch.
Corynebacterium diphteriae C&S	Throat swab	 Swab with Amies Transport Medium	-	3-5 days	Positive isolates will be sent to IMR for toxin testing. Slides were also prepared if preliminary Gram Staining result needed. Please get the swab and slides from lab. Transport in Room Temperature.
Bordetella pertussis culture	Nasopharyngeal swab	 For Culture, Amies Transpor Medium with charcoal	-		Transport in room temperature.

5. TESTS OFFERED IN SEROLOGY LABORATORY TAIPING HOSPITAL AND LTAT

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Anti-Streptolysin 0 titre (ASOT)	Blood/ Plasma/ serum	 Plain Tube with Gel	3-3.5 ml	1 working day	
Rheumatoid factor (RF)					
Anti-HIV, HbsAg, Anti Hbs, Anti HCV				3-5 working days	* For Anti HIV, HbsAg, Anti Hbs, Anti HCV– If needle prick test @ Transplant – Please call MO/ CM On call *LTAT 24 Hours for needle prick and 4 hours for transplant.
VDRL and TPPA					
Dengue IgM and IgG ELISA		 Plain tube with gel for baby	1 ml-2 ml	3 working days	
Dengue NS1 Antigen/Combo				3 hours	
Leptospiral IgM				1 working day	
Mycoplasma Antibody				5 working day	
Anti-Nuclear Antibody (ANA) (CLIA Method)				14 working days	Keep at 2-8°C up to 48 hours, if more than 48 hours, please frozen at -20°C. Reflex Testing (Will be done if ANA is Positive.
DsDNA (double stranded DNA) (CLIA Method)					
Extractable Nuclear Antigen (ENA) (Sm, RNP, Ro52, Ro60, SS-B, Scl-70, Centromere, Jo-1 and Ribosomal-P) (CLIA Method)					Keep at 2-8°C up to 48 hours, if more than 48 hours, please frozen at -20°C. Reflex Testing (Will be done if ANA is Positive.
Anti-Myeloperoxidase Ab (MPO) (CLIA Method)					Keep at 2-8°C up to 48 hours, if more than 48 hours, please frozen at -20°C.

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Anti-Proteinase 3 (PR3) (CLIA Method) Anti-Cardiolipin IgM/IgG (ACL) (CLIA Method) B-2 Glycoprotein (CLIA Method) Anti-Cyclic Citrullinated Peptide (Anti-CCP) (CLIA Method)	Blood/ Plasma/ serum	 Plain Tube with Gel	3-3.5 ml	14 working days	Keep at 2-8°C up to 48 hours, if more than 48 hours, please frozen at -20°C.
Specific Liver Antibodies Panel (Anti Mitochondrial Antibody-AMA, Anti Smooth Muscle Antibody-ASMA, Anti Parietal Cells Antibody-APC, Anti Liver Kidney Microsomal Antibody-LKM) Immunofluorescent (IF) Method		 Plain tube with gel for baby	1 ml-2 ml	21 working days	
Respiratory Viral Screening (Influenze A, Influenza B, RSV Adenovirus)	Naso-pharyngeal swab, Naso-pharyngeal wash, any aspirate specimens (tracheal aspirates, naso-pharyngeal aspirates)		5 – 10 ml	24 hours	
Rapid Test Covid 19	Naso-pharyngeal swab				To get triple packaging container from lab.

TEST	TYPE OF SPECIMEN	CONTAINER	VOLUME	LTAT	REMARKS
Rapid PCR for SARS-COV-2	Naso-pharyngeal swab/ Oro-pharyngeal swab	Swab in Virus Transport Media (VTM)		24 hours	To obtain sampling kit from lab.
Rapid PCR for Respiratory Pathogen (QIASTAT)	Naso-pharyngeal swab	Swab in Universal Transport Media (UTM)		24 hours	To obtain sampling kit from lab. Test must be spoken to and granted by Clinical Microbiologist.
Rapid PCR for Meningitis (QIASTAT)	Cerebrospinal fluid (CSF)	Bijou bottle		24 hours	Send sample at room temperature.
Rapid PCR for *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoeae* (NG)	Urine	Universal container	20-50 ml	24 hours	Test must be spoken to and granted by Clinical Microbiologist.
Rapid PCR for *Mycobacterium tuberculosis*	Sputum, Bronchoalveolar lavage (BAL), Tracheal aspirate, Cerebrospinal fluid (CSF)	Sterile bottle, Bijou bottle (CSF)		24 hours	Sample storage: Room temperature – 3 days 2-8°C – 10 days

6. REPORTING AND DESPATCHING OF RESULT(S)

6.1 Preliminary results will be informed to the ward and recorded in LIS.

6.2 Test results will be validated by Clinical Microbiologist, Medical Officer, and Scientific Officer. Medical Lab Technologist will only validate gram stain, cell count and result culture that shows no growth of any organism.

6.3 All results will be made available in Schuynet according to the respective test's Lab turnaround time (LTAT).

6.4 Printed test result for in-patient are dispatched via designated pigeon holes located at the main counter of the Department of Pathology.

6.5 The results for HIV, HCV, HBs Ag will NOT be informed by phone, and will be directly dispatched to the respective departments by laboratory attendants.

7. RETENTION PERIOD OF SPECIMENS AND RESULTS/REPORTS

	RECORD/ MATERIAL	RETENTION DURATION
7.1	Request form accompanying specimen for Bacteriology, Parasitology, Virology and Mycology	1 month after issue of report/result
7.2	Specimens for culture & sensitivity 7.2.1 All specimens except urine & blood 7.2.2 Urine 7.2.3 Blood (including fungal culture)	 2 days after issue of report/result Discard after issues of report/ result Negative - Discard after issue of report/result Positive - 7 days after issue of report/result
7.3	Serum/plasma for serology	Negative - Discard after issue of report/result Positive - 7 days after issue of report/result
7.4	Slides 7.4.1 Wet preparation 7.4.2 Stained/ Immunofluorescence slides	 Discard after issue of report/result Negative- Discard after issue of report/result Positive- 2 days after issue of report/result

Note: Negative culture and sensitivity, serology and slides are discarded after issue of reports/results.

HISTOPATHOLOGY

DEPARTMENT OF PATHOLOGY, HOSPITAL TAIPING LABORATORY HANDBOOK 2025

1. INTRODUCTION

Histopathology lab deals with the ***macroscopic*** and ***microscopic*** examination of surgical specimens as well as biopsies.

2. LIST OF SERVICES

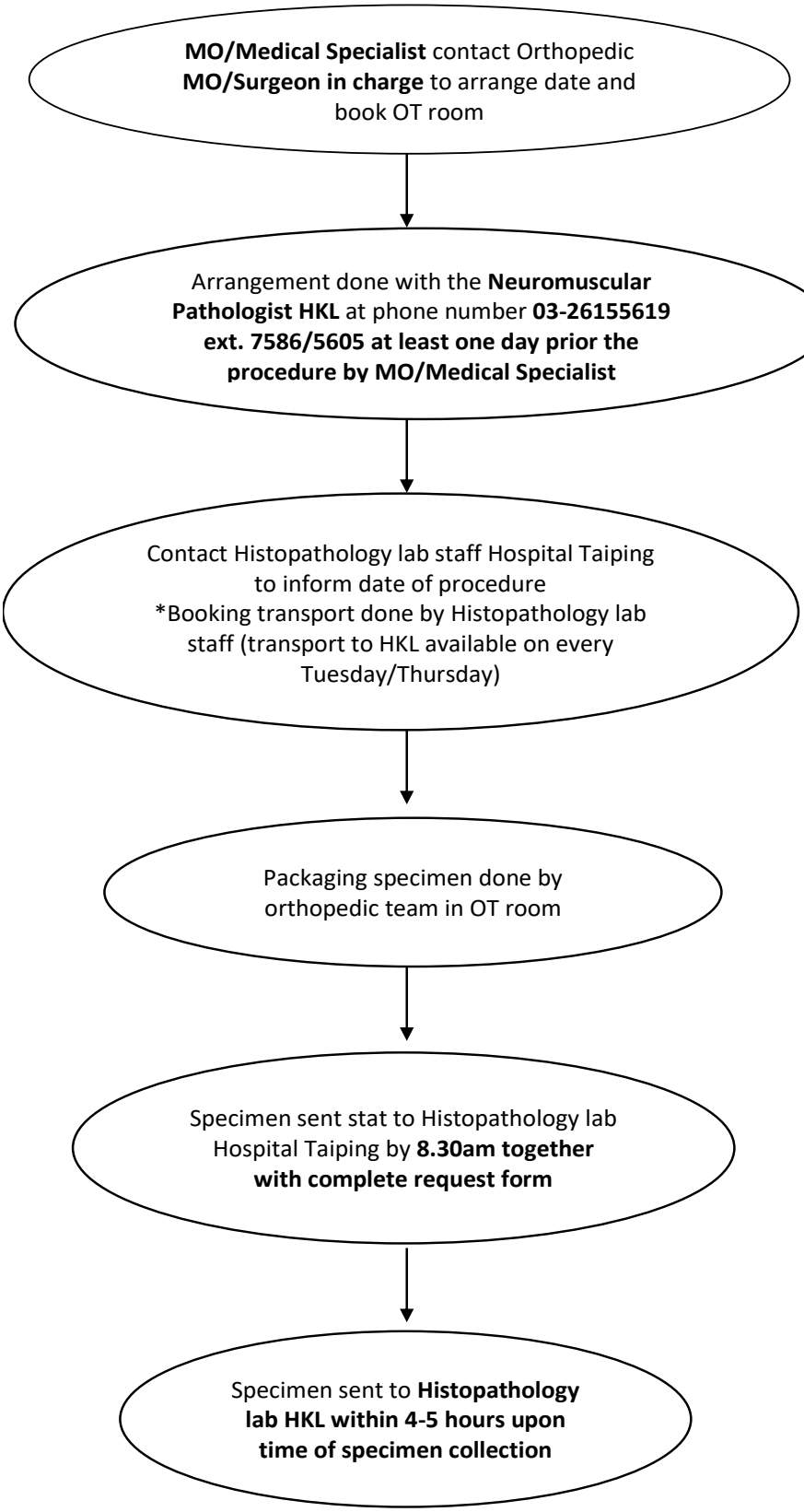
2.1 General (routine) diagnostic histopathology examination of tissue.
2.2 Intraoperative frozen section
2.3 Histochemistry
2.4 Immunohistochemistry
2.5 Clinical autopsy

3. REQUEST FOR HISTOPATHOLOGY SERVICE

3.1 General (routine) histopathology.

3.1.1 Use HTPG/JP/HIS/20/02 form filled in with relevant clinical information for all histopathological examination requests.
3.1.2 If the report is needed urgently, please mark the request form with the word 'URGENT' clearly at the top right-hand corner preferably in red ink.
3.1.3 Routine specimen can be sent anytime (during office hours) to the histopathology laboratory of Department of Pathology, Hospital Taiping.
3.1.4 Specimen collected after 5.00 pm can be sent to the histopathology laboratory counter by 8.00 am on the next working day.
3.1.5 Renal/skin biopsies for Immunofluorescence:
i. Fresh tissue for renal biopsies should be placed in sterile container with **Phosphate Buffer Saline solution pH 7.0.**
ii. Fresh tissue for skin biopsies should be placed in sterile container with **Normal Saline solution.**
iii. Specimen sent to the referral laboratory, HRPB Ipoh.
iv. Skin biopsy specimens will be read and reported by Pathologist Hospital Taiping once staining is ready.
v. Renal biopsy specimens will be read and reported by Pathologist Hospital Taiping once staining is ready.
3.1.6 Muscle biopsy:
Histopathology assessment of muscle biopsy is not provided in our service. Hence, the clinician ordering this test should make appointment with the referral laboratory, HKL and the proper arrangement done by Histopathology Unit Hospital Taiping.

GUIDELINES ON MUSCLE BIOPSY PROCEDURE



For open biopsy:

- Remove at least one good cylinder of biceps/quadriceps muscle.
- Measuring 10mm in diameter and 5mm in depth.
- For optimal processing muscle specimen must be wrapped with clean aluminium foil.
- **Sent fresh** in a dry, air tight and sterile container.
- **Triple packaging** with biohazard plastic bag.
- Put in **polystyrene box** containing **ice pack/gel** (no dry ice) for transportation.
- Do not tie the muscle to stretch it
- Do not put tissue on gauze.
- Do not put tissue in saline/formalin solution.

Important information to be included in the request form are:

- Relevant clinical history.
- Family history of similar problems.
- Creatinine kinase level.
- Lactate dehydrogenase (LDH).
- Electromyography (EMG), Nerve Conduction Study (NCS), Muscle Specific Antibody and/or Muscle MRI if available.
- Contact number and email address of treating clinician.

3.2 Frozen Section.

3.2.1 All requests for frozen section examination must be preceded by appointment and discussion with the pathologist on call at least **24 hours before date of operation**. This is followed by filling up of the request form (HTPG/JP/HIS/20/02) for the frozen section. Please fill in the request form completely (including location of operating theater, operating theater extension number, name of the Surgeon or Medical Officer to be informed of the result and the previous HPE report or other relevant investigations for correlation purpose) and submitting it to the Histopathology laboratory for notification. If previous HPE is done elsewhere, slide and report should be submitted prior to posting of the case for frozen section.

3.2.2 All cases scheduled for frozen section examination are best placed first in the operating list.

3.2.3 Please inform the: Pathologist on call's extension number:

i. When the patient is wheeled into the operating room or

ii. If the frozen section examination is cancelled.

3.2.4 Transport the specimen immediately to the histopathology laboratory **fresh with no formalin** added.

3.2.5 Result of first specimen will be informed within 30 minutes after specimen received. Please make sure that the contact line is available to ensure that the result can be informed.

4. SPECIMEN COLLECTION AND HANDLING

4.1 All specimens for routine histological examination are to be fixed in 10% Neutral Buffered Formalin in suitable clean leak-proof container. The container should have wide opening and if possible, with screw cap to prevent leakage.

✓ Leak proof, wide opening and non-fragile container

× Non-leak proof and fragile containers are not appropriate for usage

4.2 The volume of formalin used must be at least 10 times the volume of specimen to be fixed.

✓ Fully immersed specimen

× Partial immersed specimen

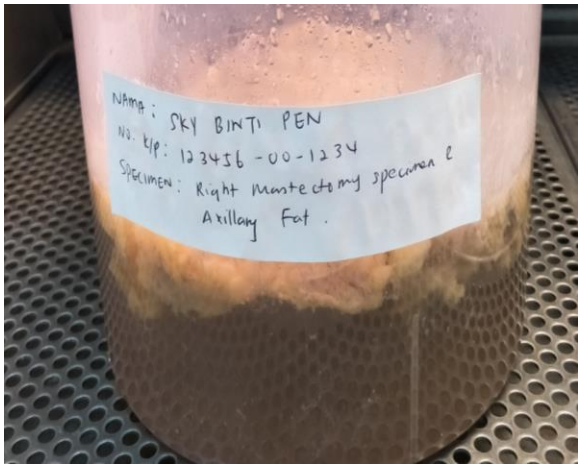
4.3 Do not put large specimen in small containers as this would prevent proper fixation of the tissue, distort the specimen. Also, if a small mouthed container is used, there will be difficulty in taking out the specimen from the container a possibility of damaging/crushing the specimen.

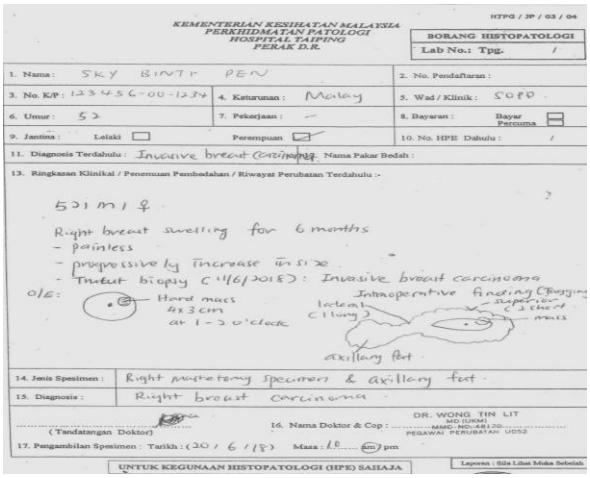
✓ Appropriate size container

× Shallow and small mouthed containers are in appropriate for usage

4.4 All specimen containers should have the same identification details as that written on the request forms.

Correct method of labeling specimen(s) on the container based on request form





4.5 Specimens from different anatomical sites should be sent in separate containers, properly labelled, and must be clearly itemized in the request form.

4.6 For cases that require confirmation of the adequacy of surgical excision, the margins of the specimens must be marked or tagged accordingly with suture and/or diagrammatic representation of the excised specimens.

5. REJECTION CRITERIA

a) Request form
- Patient name/RN/IC no – incomplete /not available /not clear on form
- No requesting doctor' s name, signature & stamp by clinician on lab test request form
- No clinical information and /or diagnosis
- Lab test required was not available/not offered

b) Specimen
- Incorrect labelling – label on specimen not tally with request form
- Broken/ leaking/ split specimen containers
- No specimen received or empty container
- Specimen sent was not suitable for analysis – wrong fixative solution
- No label on the specimen and slide
- Type of specimen sent is not suitable to be processed

6.TESTS OFFERED IN HISTOPATOLOGY LABORATORY, HOSPITAL TAIPING & LTAT

TEST	CATEGORY	SPECIMEN	URGENT	NON-URGENT
Histopathological Examination	A: Small Biopsy (<1.0 cm)	Tissue Biopsy: Eg: liver, lung, trucut, bladder and prostate biopsies. Complex biopsies as below: Lymphoproliferative disorders/non-neoplastic liver biopsy/ non-neoplastic renal biopsy and skin biopsy requiring IF/muscle biopsy	3 working days (Standard: ≥ 90%) Exclusion criteria: 1) Diagnostic biopsies sent as ≥ 4 separate containers 2) Further ancillary tests (request that required: recut, histochemical stain and immunohistochemical stain or second opinion)	7 days 14 calendar days (Standard: ≥ 70%) Exclusion criteria: None
	B: Simple Specimen	Eg: Appendix/ Fallopiantube / Product of conception etc	14 calendar days (Standard: ≥ 70%) Exclusion criteria: None	14 calendar days (Standard: ≥ 70%)

				Exclusion criteria: None
	C: Big Specimen (>1.0 cm)	- Other than category A & B. Eg: Tumour or lesion excision - Clinical Autopsy specimens.	14 calendar days (Standard: ≥ 70%) Exclusion criteria: None	14 calendar days (Standard: ≥ 70%) Exclusion criteria: None

7. REPORTINGS AND DESPATCHING OF RESULTS

7.1 All tests will be seen and validated by Anatomic Pathologist within LTAT.

7.2 All histopathology reports can be viewed in the LIS system via Schuynet.

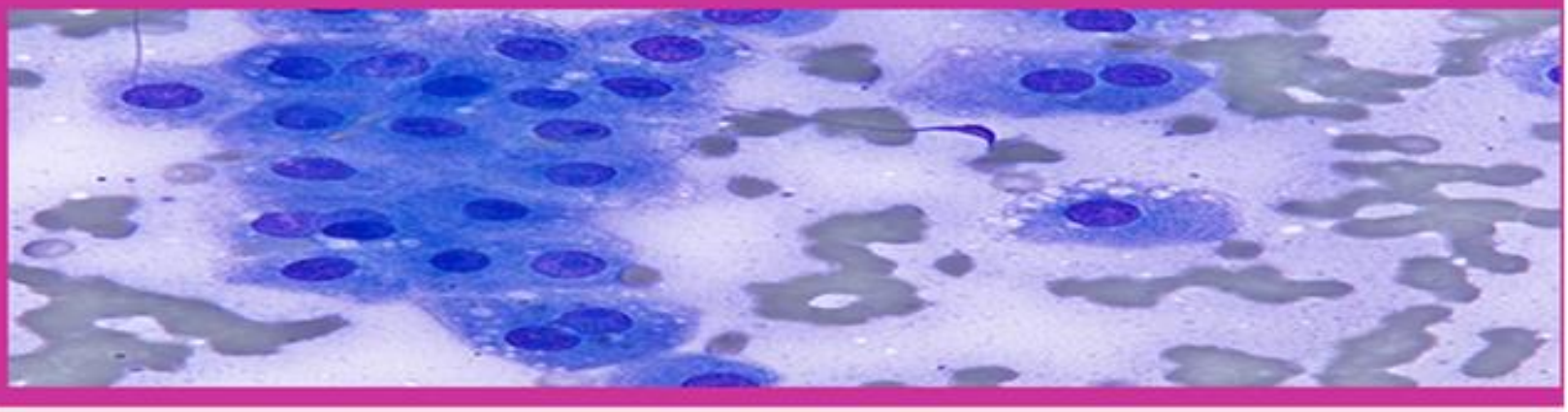
7.3 Report enquiry:

Enquiry of reports over the phone by clinical staff is discouraged. However, in case of urgent reports, the **DOCTOR** in-charge need to call the lab (ext. 5308) or speak to the Medical Officer (ext.5325/5327) or Pathologist in charge (ext. 5313/5318).

8. RETENTION PERIOD OF SPECIMEN AND RESULT/ REPORTS

	RECORD/ MATERIAL	RETENTION DURATION
8.1	Request form (hard copy or electronic equivalent) accompanying specimen	As long as the corresponding report is kept
8.2	Final reports (hard copy or electronic equivalent)	20 years
8.3	8.3.1 Immunofluorescence slides 8.3.2 All other slides including special stains and frozen sections	2 days after issue of report 7 years
8.4	Blocks, including paraffin blocks from frozen section tissue	20 years
8.5	Frozen tissue blocks for special stains/immunofluorescence studies	3 months
8.6	8.6.1 Unblocked tissue removed at surgery	1 month after issue of report
8.7	Clinical /non – coronial autopsy 8.7.1 Registers/consent form/images/gross photographs/ results and report 8.7.2 Unblock tissue retained at autopsy 8.7.3 Tissue blocks 8.7.4 Slides	 10 years 3 months issue of autopsy report 20 years 7 years

CYTOPATHOLOGY



DEPARTMENT OF PATHOLOGY. HOSPITAL TAIPING LABORATORY HANDBOOK 2025

1. INTRODUCTION

Cytopathology is a discipline in Pathology that involves the morphologic study of cells. It is broadly divided into exfoliative cytology and aspiration cytology.
Exfoliative cytology involves examination of specimens that contain cells exfoliated from body cavities and surfaces. It is further subdivided into gynecological cytology and non-gynecological cytology.
Aspiration cytology involves examination of cells that are actively obtained by fine needle aspiration.

2. LIST OF SERVICES

2.1 Exfoliative cytopathology

2.1.1 Gynecologic- a) conventional pap smear
b) liquid based cytology, pap smear (only provided for primary healthcare setting)

2.1.2 Non-gynecologic-body fluids, sputum, brushing (bronchial brushing, bronchial washing), Tzanck smear.

2.1.3 Spermatozoa examination

2.1.4 Seminal fluid analysis

This test is carried out by appointment only:

i. Instruct patient to abstain from sex for 4 days prior to collection of semen.
ii. Do not use condoms that are treated with spermicide.
iii. It is preferable to ask patient to masturbate as most condoms come treated chemically.
iv. Collect the full ejaculation in wide mouth sterile specimen container.
v. Take note the time of collection.

2.2 Aspiration cytopathology (FNAC)

2.2.1 The FNAC clinic is conducted once a week (on Wednesdays, except Public Holiday) 2.00 – 4.00 pm at the Surgical Outpatient Department (SOPD), Hospital Taiping where medical officer from the Department of Pathology will be placed on site for the assessment of cellularity i.e adequacy.

2.2.2 A medical officer from The Department of Pathology will access the cellularity of the aspirates done for admitted ill patients in the ward on appointment basis.

2.2.3 Please note that:

i. Lumps and bumps that are palpable and superficial in location only are applicable for FNAC.

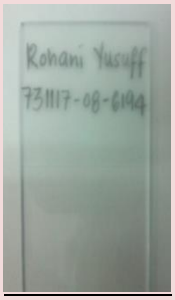
Note: FNAC for deep seated lesions are performed by radiologists under radiological guidance on appointment basis a medical officer from Department of Pathology will be available to access the cellularity on site.

ii. Vascular lesions or those of vascular origin are not suitable for FNAC.

3. SPECIMEN COLLECTION AND HANDLING

3.1 TESTS OFFERED IN CYTOLOGY LABORATORY, HOSPITAL TAIPING

TEST /TYPE OF SPECIMEN	CONTAINER	VOLUME/ QUANTITY	REMARKS
Body fluid for cytology (Pericardial Fluid, Pleural Fluid, Peritoneal Fluid, Cyst fluid)	 Sterile specimen container (Universal leak-proof container)	Small Fluid: As collected Large Fluid: 50-200 ml	Dispatch immediately. If delay anticipated refrigerate at 2°C-8°C.
Bronchial brushing for cytology	a) Air dried-smear b) Wet fix smear with 95% Alcohol/ Cytospray	1-3 smears	a) Slides should be placed in a slide mailer before dispatched to the laboratory. b) The patient's name and full IC number should be written with a pencil.
Tzank smear for cytology	Air-dried smear	1 smear	
Bronchial washing for cytology	Sterile specimen container	As collected	Dispatch immediately. If delay is anticipated, refrigerate at 2°C-8°C.
Bronchial alveolar lavage (BAL) for cytology	Sterile specimen container	As collected	a) Dispatch immediately. b) If delay is anticipated, refrigerate sample at temperature between 2°C-8°C.
Cerebrospinal fluid for cytology	 Sterile bijou bottle	As collected	

TEST /TYPE OF SPECIMEN	CONTAINER	VOLUME/ QUANTITY	REMARKS
Urine for cytology	Sterile specimen container	20-50 ml	Dispatch immediately for processing. If delay anticipated refrigerate at 2°C-8°C.
Eye fluids/Eye washing for cytology	Sterile specimen container	As collected	Dispatch immediately for processing. If delay anticipated refrigerate at 2°C-8°C.
Sputum for cytology	Sterile specimen container	As collected	Early morning deep cough specimen (not saliva). Transport immediately.
Conventional Pap Smear Type of sample a) Cervical vaginal	Wet fix smear with 95% Alcohol for 15-20 minutes or Cytospray immediately	1 smear	a) Slide should be placed in a slide mailer before dispatch to laboratory. b) Write patient's name and full IC number using a **pencil.** 
b) Liquid based preparation	BD Surepath liquid-based container	As collected	Dispatch to laboratory
Fine Needle Aspiration (FNAC) (of all organ)	a) Wet fix smear with 95% Ethanol/Cyto spray. b) Air dried smears. c) Specimens for cell blocks in "cell block" solution.	As collected As collected As collected	a) Dispatch immediately. b) If delay is anticipated, refrigerate cell block between temperature of 2^{o}C to 8^{o}C.
Seminal fluid analysis	Sterile specimen container	As collected	Dispatch immediately.

3.2 REQUEST FORM

3.2.1 PER-PAT 301 form for routine cytological examination. If urgent result is required, indicate with word "URGENT" written clearly at the top right-hand corner of the request form.

3.2.2 PS 1/98 (Pindaan 2019) form for gynecologic examination.

3.2.3 All request form should be filled legibly, complete with relevant clinical history and findings by medical officer/ specialist, name of medical officer and specialist in-charge.

3.2.4 All fluids and washings must be sent immediately to the lab.

3.2.5 Specimen for cytological examination should be sent directly to the cytology laboratory.

3.2.6 Where delay to lab is anticipated, refrigerate at 2°C-8°C to prevent degenerative changes.

4. REJECTION CRITERIA

a) Request form

- Patient name/RN/IC no – incomplete /not available /not clear on form
- No requesting doctor' s name, signature & stamp by clinician on lab test request form
- No clinical information and /or diagnosis
- Lab test required was not available/not offered

b) Specimen

- Incorrect labelling
- Broken/ leaking/ split specimen containers
- No specimen received or empty container
- Specimen sent was not suitable for analysis
- No label on the specimen and slide
- Type of specimen sent is not suitable to be processed

5. CYTOLOGY LAB TURN AROUND TIME

TYPE OF SPECIMEN	URGENT (without intervention*)	NON URGENT (without intervention*)
Non-gynae	3 working days (Standard:≥70%)	14 calendar days (Standard:≥80%)
FNAC	3 working days (Standard:≥70%)	14 calendar days (Standard:≥80%)
Pap Smear	14 working days (Standard:≥80%)	30 calendar days (Standard:≥90%)
Seminal Fluid Analysis	14 working days (By appointment) (Standard:≥80%)	

*Intervention includes further recuts of the blocks, special staining, immunochemical testing or referral for second opinion to other hospitals.

6. REPORTING AND DISPATCHING OF RESULTS

6.1 All FNAC, non gynaecology, unsatisfactory and abnormal pap smear will be reported by a Anatomic Pathologist.

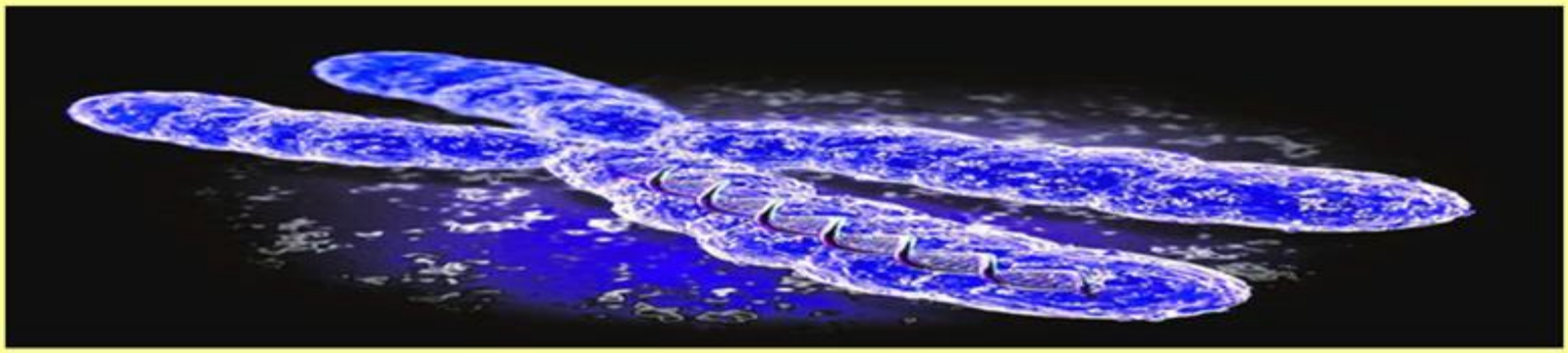
6.2 All cytology reports can be viewed in the LIS system via Schuynet.

6.3 Enquiry of reports over the phone is discouraged. However, in case of urgent reports, the doctor in-charge can call the lab (ext. 5366) or speak to the medical officer (ext. 5327) or pathologist (ext. 5313/5318.

7. RETENTION PERIOD OF SPECIMEN AND RESULT/ REPORTS

	RECORD/ MATERIAL	RETENTION DURATION
7.1	Request form accompanying specimen	As long as corresponding report is kept
7.2	Report duplicates/ records/ block keys/ diagrams and copies of any representative images prepared	20 years
7.3	Exfoliative and Fine Needle Aspiration Cytology (FNAC) 6.3.1 Slides 6.3.2 Cell blocks	 7 years 20 years
7.4	Urine, cerebrospinal fluid, and other body fluids	7 days after issue of report
7.5	Specimens received in liquid-based fixative	1 month after issue of report

OUTSOURCE SERVICE



DEPARTMENT OF PATHOLOGY, HOSPITAL TAIPING LABORATORY HANDBOOK 2025

1. INTRODUCTION

Outsource service is one of the important services in Pathology Department. Tests that are not offered by Pathology Department, Taiping Hospital will be sent out to other laboratory for testing. Outsource unit involved in consultation, preparing, storage, package, sending outsource samples to another laboratory. Result from other laboratory will be managed accordingly by outsource before dispatching to requesting ward or clinics.

2. LIST OF SERVICES

Provides service to Taiping Hospital and District Hospital (Parit Buntar, Selama, Gerik and Kuala Kangsar) and health center in the northern zone of Perak. Specialized tests involve Chemical Pathology, Hematology and Microbiology Unit.

For any inquiry of the service provided by Outsource unit, kindly contact the following extension number: 5358

For further clarification on the procedures and tests, you may also contact the respective officers as below:

NO	CONSULTANTS	AREA OF EXPERTISE	CONTACT NO. (ext)
1	Dr. Zarifah Bt. Zam Dr. Anis Roziana Bt. Mohmad	Microbiology	5312
2	Dr. Ainul Hana Bt. Ahmad Tajuddin Dr. Nur Syahira Bt. Mustafa Kamal	Chemical Pathology	5315
3	Dr. Nur Nazuha Bt. Mohamad & Manas Dr Faridah Hanim Bt. Zam	Hematology	5314

2.1 Outsource Operating Hour:

NO	TIME AND COLLECTION SAMPLE	HOSPITAL/ DISTRICT/ HEALTH
1	Monday- Friday 8.00am-5.00pm	All Ward/Clinic in Taiping Hospital
2	Monday-Thursday 8.00am-12.00pm 2.00pm-4.00pm Friday 8.00am-11.45pm 2.45pm-4.00pm	District Hospital (Parit Buntar, Selama, Gerik, Kuala Kangsar) and health centers in Northern Zone of Perak

2.2 Transportation Schedule to Referral Centers:

NO	TRANSPORTATION DAY	LOCATION
1	Monday, Tuesday & Thursday	Hospital Raja Permaisuri Bainun, Ipoh; Hospital Bahagia Ulu Kinta; MKA Jelapang, Ipoh; Jabatan Kimia, Ipoh
2	Tuesday & Thursday (Courier Service)	Hospital Kuala Lumpur, Hospital Tuanku Azizah (HWKKL), Institut Penyelidikan Malaysia (IMR), National Health Institute (NIH), Hospital Sungai Buloh, MKAK Sungai Buloh, Hospital Ampang, Pusat Darah Negara, Hospital Putrajaya, Institut Kanser Negara, Hospital Pulau Pinang

3. SPECIMEN COLLECTING AND HANDLING

3.1 Request for pathology tests should be written on the appropriate pathology request forms (Forms can be obtained from the website). All request forms sent must be in 2 copies.

3.2 In all cases, the request forms must provide the following information:

i. Full name of patient
ii. I/C number or hospital registration number
iii. Patient's sex
iv. Patient's location (ward or clinic)
v. Destination to report
vi. Requesting medical officer's name and signature
vii. Test requested
viii. Relevant clinical history and diagnosis including medications, fasting or non-fasting etc.
ix. Time and date of sample collection
x. Specialist signature (for certain tests)

3.3 Identify the sample type, tubes to be used and other test requirements thoroughly before collecting sample to avoid rejection. Please contact Outsource Unit for clarification on specialized tests before sample collection.

3.4 All specimen should be collected in correct tubes or containers and labeled immediately after collection at the patient's bedside with:

i. Date of collection
ii. Test requested
iii. Patient's name and Identification No.

3.5 The laboratory reserves the right to reject a specimen under any of the following condition:

i. Requisition form is not completely filled (refer to ordering of test above)

ii. Patient particulars on specimen and form does not match
iii. Specimen arrives without a requisition form or vice versa
iv. Insufficient quantity
v. Specimen unsuitable for testing e.g., clotting, hemolysis etc.

All rejections will be informed to the respective ward/ clinic/ district hospital/ health clinic and documented in LIS and a copy of the rejection form will be sent to the respective ward/ clinic/ district hospital/ health clinic.

3.6 Specimens from district hospitals and health clinics should be sent together with 2 copies of the consignment Form and the consignment should be separated according to tests and units in the Department of Pathology Hospital Taiping.

3.7 Upon reception at Outsource Unit, specimens and forms will be sorted accordingly and sent to respective referral hospitals such as Hospital Raja Permaisuri Bainun (HRPB), Jabatan Kimia Ipoh, Makmal Kesihatan Awam Jelapang (MKAI), Hospital Bahagia Ulu Kinta (HBUK), Hospital Kuala Lumpur (HKL), Hospital Tunku Azizah (HWKKL), Institute of Medical Research (IMR), National Institute of Health (NIH), Makmal Kesihatan Awam Sungai Buloh (MKAK), Hospital Sungai Buloh, Hospital Ampang, Pusat Darah Negara (PDN) and Hospital Pulau Pinang.

3.8 Type of containers

				
Plain Tube	**K_2EDTA Tube**	**Sodium Citrate Tube**	**Sodium Fluoride Tube**	**Lithium Heparin for Chromosome Study**
				
Lithium Heparin for OFT Test	**Na Heparin for Cytogenetic**	**Swab with transport medium (Carry blair)**	**Amies Transport medium (With Charcoal)**	**Bijou Bottle**
				
Viral Transport Media (VTM)	**24HR Urine container**	**Stool Container**	**Urine Container**	

5. REPORTING AND DESPATCHING OF RESULTS

1. All results will be uploaded in Schuynet & despatched.
2. For restricted test, result will be sealed in envelope and recorded in the despatch book. Personnel from ward/clinic Hospital Taiping or from district hospital/health clinic will collect the results and sign in the despatch book.

4. TEST OFFERED IN OUTSOURCE LABORATORY TAIPING HOSPITAL & LTAT

Test	Test Status	Unit/ Centre (Location)	Hospital	Specimen Type	Container Type	Volume Required	LTAT (working day)	Description/Details (PREPS/Dept Instructions)
Acanthamoeba spp - PCR	Active	Parasitology	IMR	Corneal scraping, Contact lens, Contact lens suspension, Cerebrospinal fluid	Sterile, air tight or contact lens storage	NA	2 weeks	Form: PER.PAT 301. Medium in container: Sterile distilled water or saline.
Acanthamoeba spp /Naegleria sp. microscopy	Active	Parasitology	IMR	Corneal scraping, Contact lens, Contact lens suspension, Cerebrospinal fluid	Sterile, air tight or contact lens storage	NA	1 week	Form: PER.PAT 301. By Appointment at least 3 days before the sample is taken. Medium in container: Sterile distilled water or saline.
Acute Myeloid Leukemia Mutation Studies (FLT3-ITD mutation analysis)	Active	Hematology	Unit Haematology, CaRC IMR NIH Setia Alam	Peripheral blood / Bone Marrow Aspirate	EDTA tube - mix thoroughly	2.5-5.0 ml	19 days	Form: Molecular Analysis For Haemato-Oncology Request Form (version 3.0). Fresh sample. Mix the blood thoroughly, gently, immediately after collection. Keep the sample cooled. Sample must be

								refrigerated (2-8°C) after collection and kept chilled during transportation. DO NOT FREEZE.
Acute Myeloid Leukaemia Mutation Studies (AML Mutation Panel by NGS)	Active	Hematology	Unit Haematology, CaRC IMR NIH Setia Alam	Peripheral blood / Bone Marrow Aspirate	EDTA tube - mix thoroughly	2.5-5.0 ml	35 days	Form: Molecular Analysis For Haemato-Oncology Request Form (version 3.0). Fresh sample. Mix the blood thoroughly, gently, immediately after collection. Keep the sample cooled. Sample must be refrigerated (2-8°C) after collection and kept chilled during transportation. DO NOT FREEZE.
Acute Leukemia Translocation Studies	Active	Hematology	Unit Haematology, CaRC IMR NIH Setia Alam	Peripheral blood / Bone Marrow Aspirate	EDTA tube - mix thoroughly	2.5-5.0 ml	10 days	Form: Molecular Analysis For Haemato-Oncology Request Form (version 3.0). Fresh sample.Mix the blood thoroughly, gently, immediately after collection. Keep the sample cooled. Sample must be

								refrigerated (2-8°C) after collection and kept chilled during transportation. DO NOT FREEZE.
ADAM TS-13 Inhibitor	Active	Hematology	Hospital Ampang (MRKH)	Blood (Plasma)	Trisodium citrate 3.2% (1 tube)	To fill until indicated mark	7 weeks	Form: Hospital Ampang Special Hematology Lab Requisition (Hem-RQ19.ver4.31. Aug.2021) with relevant clinical history and diagnosis. Specialist who requests the test need to make appointment with consultant in Haemostasis unit Hospital Ampang. Deliver tubes immediately to the laboratory at room temperature. Separate plasma from cells as soon as possible (double spin). Store frozen at -40°C and transport frozen plasma on dried ice
Adenocorticotrophic Hormone	Active	Chemical Pathology	HKL	Blood	EDTA tube in ice	2 ml	20 days	Form: PER.PAT 301 Fresh EDTA in ice.

(ACTH)								
Adenosine Deaminase (ADA)	Active	Biochemistry	MKAK	Pleural fluid	Plain container (without additive). Get tube from Outsource Unit (red cap tube).	3 ml (min: 1 ml)	21 days	Form: MKAK request form (MKAK-BPU-01/Rev2018). Need to send to MKAK within 48 hours. Sample rejection: contaminated, turbid, outside temperature requirements.
Adenovirus F41 PCR	Active (By consultation only)	Virology	IMR	Blood Liver biopsy/Tissue	EDTA tube Sterile container containing normal saline/VTM to keep specimen moist	1-3 ml 1-3 ml	2 weeks	Form: Virology Test Request Form Version 1.1, IMR. Medium in container: sterile distilled water or saline.
Aldolase	Private Laboratory							
Aldosterone	Active	Endocrinology	Hospital Putrajaya	Plasma in EDTA	3 EDTA tubes (If each tube max volume 2 ml)	6 ml	21 days	Form: PER.PAT 301. Stamp & sign specialist, fulfill the criteria (pls state: clinical history, drug history, latest potassium level >4.0 mmol/L, requested by specialist/ endocrine specialist only, record of patient`s position (supine/upright). Do not send in ice

								(rejected).
Alkaline Phosphatase Isoenzymes	Private Laboratory							
Alpha 1 Anti-trypsin	Active	Makmal Teras	HKL	Blood	Plain tube	3 ml	15 days	Form: PER.PAT 301 Fresh sample. Sample stability 7 days in 2-8°C.
Alpha 2-Macroglobulin	Active	Special protein laboratory	Hospital Ampang	Blood	Plain tube	3 ml	21 days	Form: PER.PAT 301.
Alpha-1-Acid-Glycoprotein (Orosomucoids)	Active	Special protein laboratory	Hospital Ampang	Blood	Plain tube	3 ml	21 days	Form: PER.PAT 301.
Aluminium	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents,	Plain tube	3 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a lot of analysis.

				others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				
Amoebiasis PCR	Temporary Discontinued	Parasitology	IMR	Serum/Whole blood in EDTA, pus/ aspirate/ biopsy/ scrapings	Plain tube/EDTA tube or sterile air tight container	2.5 ml	2 weeks	Form: PER.PAT 301.
Amoebiasis Serology	Active	Parasitology	IMR	Serum, anti-coagulated blood	Plain tube, EDTA tube	2 ml	2 weeks	Form: PER.PAT 301.
Amphetamine-Type Stimulants (ATS)	Active	Drug Laboratory	HKL	Urine	Urine container	30 ml	8 weeks	Form: PER-PAT 301. form (for clinical case only)
Amino Acid Analysis (MSUD) (Plasma) - Maple Syrup Urine Disease - Phenyl ketonuria (PKU)	Temporary Suspended	Makmal Genetik	Hospital Tunku Azizah (HWKKKL)	Plasma/ Serum	Lithium Heparin/ Plain Tube	0.5ml (Peds) 2ml (Adult)	21 days	Form: IEM Request Form HTA, Specialist sign. Frozen immediately.
Amino Acid Analysis (Plasma)	Temporary Suspended	Makmal Genetik	Hospital Tunku Azizah (HWKKKL)	Paired Blood & CSF	Lithium Heparin/ Plain Tube	0.5ml (Peds-Blood) 2ml (Adult-	21 days	Form: IEM Request Form HTA, Specialist sign. Frozen

- Non-Ketotic Hyperglycemia (NKH)					Bijou Bottle	Blood) 1ml (CSF)		immediately.
Angiotensin Converting Enzyme (ACE)	Private Laboratory (Serum)							
Anti-Acetylcholine Receptor Antibody (ACHR)	Active	Autoimmune	IMR	Serum	Plain gel tube	5 ml	1 month	Form: Autoimmune Request Form Version 3.1, IMR
Anti-Aquaporin 4 (Anti-Aq4)	Active	Autoimmune	IMR	Serum CSF	Plain gel tube/ Bijou bottle	5 ml	3 weeks	Form: Autoimmune Request Form Version 3.1, IMR
Antidiuretic Hormone (ADH) / Argenine Vasopressin (AVP)	Private Laboratory (Serum)							
Anti-fungal susceptibility testing/ Fungal Identification	Active	Bacteriology	IMR	Pure fungal isolate. Mixed growth will be rejected	Pure isolate in media that support growth	Pure isolate in media that support growth	3 weeks	Mycology Form, IMR. Identify the fungus first and results sent together with pure isolate and clinical history.
Anti-Glomerular Basement Membrane (GBM)	Active	Autoimmune	IMR	Serum	Plain gel tube	Child: 3 ml Adult: 5-10 ml Serum: 1-3 ml	3 weeks	Form: Autoimmune Request Form Version 3.1, IMR.
Anti-gp210 Panel: Specific Liver Antibodies	Active	Autoimmune	IMR	Blood/ Serum	Plain gel tube	Child: 3 ml Adult: 5-10 ml Serum: 1-3 ml	1 month	Form: Autoimmune Request Form Version 3.1, IMR.

(SLA)								Compulsory to specify the tissue antibody results.
Anti-LKM1 Panel: Specific Liver Antibodies	Active	Autoimmune	IMR	Blood/ Serum	Plain gel tube	Child: 3 ml Adult: 5-10 ml Serum: 1-3 ml	1 month	Form: Autoimmune Request Form Version 3.1, IMR. Compulsory to specify the tissue antibody results.
Anti-Insulin Antibody (IAA)	Active	Diabetes and Endocrine Unit	IMR	Serum	Plain tube	3 ml	30 days	Form: Endocrine Request. Stamp and sign specialist. Complete with diagnosis & clinical history. Should be done ONLY to confirm T1DM diagnosis in children & adolescents, strong history of relatives of patients with T1DM, clinically highly suspicious of T1DM. Keep in 2°C to 8°C (Stability 3 days), -20°C (Stability 6months). Do not send Grossly Hemolysed/ Lipemic/ Icteric Specimen. Advised for IAA blood

								testing to be drawn BEFORE insulin therapy is initiated for the first time. For the IAA results to be valid, the patient must not be Insulin treated for more than 14 days.
Anti-Mullerian Hormone (AMH)	Active	Diabetes and Endocrine Unit	IMR	Serum	Plain tube (without gel)	2-3 ml	30 days	Form: Endocrine Request Form IMR. Stamp and sign specialist O&G. Complete with diagnosis, treatment & clinical history.
Anti-N-Methyl-D-Aspartate Receptor (NMDAR)	Active	Autoimmune	IMR	CSF	Bijou bottle	5 ml	2 weeks	Form: Autoimmune Request Form Version 3.1, IMR.
Anti-Xa assay	Active	Hematology	Hospital Ampang (MRKH)	Blood (Plasma)	Trisodium Citrate 3.2% (1 tube)	To fill until indicated mark	1 day	Form: Hospital Ampang Special Hematology Lab Requisition (Hem-RQ19.ver4.31. Aug.2021) with relevant clinical history and diagnosis. Specialist who requests the test need to make an appointment with consultant in

								Haemostasis unit Hospital Ampang. Deliver tubes immediately to the laboratory at room temperature. Separate plasma from cells as soon as possible, ideally within one hour of specimen collection (double spin). Store frozen at -40ºC and transport frozen plasma on dried ice
Apo A-1	Private Laboratory (Serum)							
Apo B-Total	Private Laboratory (Serum)							
Apo C-III (Phenotyping)	Private Laboratory (Serum)							
Apo E Genotyping	Private Laboratory (Serum)							
Arginino succinate Synthase Deficiency (ASS1)	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5 ml)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services IMR. To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings.

Arginino-succinate Lyase Deficiency (ASL)	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5ml)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services IMR. To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings.
Arsenic	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/	Plain tube	3 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a lot of analysis.

				vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				
Ascorbic Acid	Private Laboratory							
Avian Influenza (H5, H7 & H9)	Active	Virology	IMR	After consultation only	After consultation only	After consultation only	1 week	After consultation only. Please enter the name of Officer Virology Unit, IMR.
Barbiturate	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents,	Plain tube/ Sterile container	3 ml/ 5 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a lot of analysis.

				others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				
Bartonella PCR (Aerobic Bacteria)	Active	Microbiology	IMR	Blood in EDTA, tissue biopsies, fixed frozen paraffin Embedded (FFPE) Before antibiotics.	Blood in EDTA; tissue samples in sterile container	5ml blood in EDT	2 weeks	This is by Consultation only. Transportation at ambient temperature. If delayed keep at 2-8°C.
Bartonella hensalea IgG/IgM Bartonella quintana IgG/IgM	Active	Microbiology	Hosp Sg.Buloh	Serum	Plain tube	1-3 ml 1-3 ml	1 week	Form: PER-PAT 301. Must consult with Pakar Virology, IMR.
BCR-ABL1 Kinase Domain Mutation Analysis for suspected cases of resistance to tyrosine kinase	Active	Hematology	IMR (Molecular Analysis for Leukemia)	Peripheral blood / Bone Marrow Aspirate	EDTA bottle-mix thoroughly	2.5-5.0ml	35 days	Form: Molecular Analysis for Haemato-oncology request form (Version 3.0). Specialist sign & stamp. Fresh sample. Sample must be collected under sterile conditions.

								Mix the blood thoroughly, gently, and immediately after collection. Send to lab as soon as possible. The sample must be accompanied with a copy of the qualitative BCR-ABL1 report at diagnosis, BCR-ABL1 quantitative reports.
Beckwith Wiedemann Syndrome	Active	Molecular Diagnostic	Hospital Tunku Azizah (HWKKKL)	Blood	2 EDTA tubes	3-5 ml	3.5-6.5 months	Form: Molecular Test Request Form HTA. Specialist sign.
Benzodiazepine	Active	Special Chemical Pathology	HKL	Blood	Plain tube (Red cap)	4 ml	7 days	Form: TDM.
Beta Carotene	Private Laboratory (Serum)							
Beta-2 Microglobulin	Active	Special protein laboratory	Hospital Ampang	Blood	Sterile container	3 ml	21 days	Form: PER.PAT 301. Interval 14 days from previous sample.
Beta-2 Microglobulin	Active	Special protein laboratory	Hospital Ampang	Urine	Sterile container	20 ml	21 days	Form: PER.PAT 301. Interval 14 days from previous sample.
Beta-2 Microglobulin	Active	Special protein laboratory	Hospital Ampang	CSF	Bijoux bottle	1-2 ml	21 days	Form: PER.PAT 301. Interval 14 days from previous sample.
BK virus (BKV) - DNA PCR (Quantitative)	Active	Microbiology	Hospital Sg Buloh	Plasma CSF	EDTA tube Sterile Container	5 ml 0.5-2ml	2 weeks	Form: PER PAT 301

Blood Toksikologi	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)	Plain tube / Na fluoride tube	3 ml (2tubes)	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a lot of analysis.
Bone marrow chromosomal analysis for	Active	Hematology	Hospital Pulau Pinang (Cytogenetic	Bone marrow aspirate	Sodium heparin	4 ml	21 days	Form: Bone marrow cytogenetic HPP/PAT/HM/SD/151

hematological malignancy			Lab)					with clinical hematologist/paeds oncologist's sign. Please call hematology lab HTPG to make an appointment.
Bone-Specific Alkaline Phosphatase	Private Laboratory (Serum)							
Bordetella pertussis PCR	Active	Bacteriology	IMR	Nasopharyngeal aspirates, nasopharyngeal swabs	Sterile container	1-2 ml of nasopharyngeal isolate	2 weeks	Form: Bacteriology Request Form Version 4.0, IMR. For nasopharyngeal swabs do not use calcium alginate or cotton swabs. Transport nasopharyngeal aspirate in ice.
Borrelia burgdorferi IgM *Borrelia burgdorferi* IgG	Active	Microbiologyy	Hospital Sg. Buloh	Serum	Plain Tube	1-3 ml	1 week	Form: PER-PAT 301.
Bromide	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only), solvents,	Plain tube/ Sterile container	3 ml/ 5 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a lot of analysis.

				others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				
Brucella PCR	Active	Bacteriology	IMR	Blood in EDTA tube	EDTA tube	5 ml	2 weeks	Form: Brucellosis Laboratory Request Form Version 4.0. IMR. Must be fresh specimen, taken prior to antibiotic treatment. Laboratory must be informed prior to sending sample.

Brucella Serology (ELISA)	Active	Bacteriology	IMR	Serum	Plain tube	2 ml	2 weeks	Form: Brucellosis Laboratory Request Form Version 4.0. IMR.
Bruton Tyrosine Kinase (BTK) protein detection	Active (By appointment only)	PID	IMR	Blood	EDTA tube	2 ml	2 weeks	Form: Primary Immunodeficiency (PID) Request Form Version 5.0, IMR. By consultation only and case must be discussed with PID Officer. Transported without ice.
C1 Esterase Inhibitor	Private Laboratory (Serum)							
C3C4	Active	Biochemistry	HRPB	Blood Only (CSF Not Accepted)	Plain tube	3 ml	2 days	Form: PER.PAT 301 Stamp and sign specialist. Complete with diagnosis & clinical history.
CA-153	Active	Makmal Teras	HKL	Blood	Plain tube	3 ml	20 days	Form: Per. Pat 301
Cadmium	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only), solvents, others (toxicology)	Plain tube/ Sterile container	3 ml/ 5 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a lot of analysis.

				b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				
CA-MRSA PCR	Active	Bacteriology	IMR	Bacterial culture	Pure isolate	Pure isolate	2 weeks	Form: Bacteriology Request Form Version 4.0, IMR. Send pure isolates with clinical history.
Carbapenemase genes detection (CRE)	Active	Bacteriology	IMR	Bacterial culture	Blood agar or nutrient slant	Pure isolate	1 month	Form: Bacteriology Request Form Version 4.0, IMR. Send patient history with preliminary antibiotic susceptibility test results.
Carnitine-	Active	Molecular	IMR	Blood	2 EDTA tubes	2-5 ml blood	5.5	Form: Molecular

Acylcarnitine Translocase Deficiency		Diagnostics & Protein			(2.5ml)	EDTA (1-2 ml is acceptable for infants)/DNA	months	Diagnostic Services IMR. To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings.
Catecholamines - Epinephrine -Norepine- phrine - Dopamine	Stopped (Replace with Urine Meta-nephrine)							
CD4 / CD8 Enumeration	Active	Hematology	HRPB (Hema tology)	Fresh peripheral blood	K2EDTA	2.0 ml	10 days	Form: PER.PAT 301 . Fresh sample..Mix the blood thoroughly, gently, and immediately after collection. Avoid direct contact with ice. Test is run on daily basis during office hours. Sample stability is 48 hours. Do not send sample on Friday or long holiday, exceed 48 hours of storage.

Ceruloplasmin	Active	Special protein laboratory	Hospital Ampang	Blood	Plain tube	3 ml adult 1.5 ml paeds	21 days	Form: PER.PAT 301 Fresh sample. Sample stability 7 days in 2-8°C. (H. Ampang run in batch, on every working Wednesday).
Chikungunya PCR	Active	Molecular Biology	MKAI	Serum	Plain tube/ Gel tube	3-5 working days	10 days	Form: Borang MKAK (Laboratory Request Form BPU-2018V1). Transport sample at 4-8°C to the laboratory within 24 hours collection *Preferable onset fever <5 days.
Chikungunya Serology (IgM&IgG)	Active	Virology	MKAK	Serum	Plain tube	Child:1- 3 ml Adult: 5-10 ml	24 hours	Form: Borang MKAK-BPU-U01.
Cholinesterase Level/ Acetyl cholinesterase	Active	Biochemistry	HRPB	Blood	Plain tube	3 ml	2 days	Form: PER.PAT 301 Cop and sign specialist. Complete with diagnosis & clinical history.
Chromium	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only),	Plain tube/ Sterile container	3 ml/ 5 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a

				solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				lot of analysis.
Chromogenin A (CgA)	Private Laboratory (Serum)							

Chromosomal study / karyotyping -Edward Syndrome -Patau Syndrome -Ambiguous genitalia	Active	Hematology	HWKKL (Genetic Laboratory)	Peripheral Blood	Lithium heparin tube (1 tube)	3 - 5 ml	120days	Form: Sitogenetic/ Cytogenetic Request Form (HTA/ Path. Gen/PK- 01-01). By appointment. Call HTA : 03-26003000 Ext : 1136/1134 . To collect container from the lab (once the appointment is confirmed) 1 day before sample collection. Reflex testing: Constitutional molecular cytogenetic fluorescence in situ hybridization (FISH) is done if Indicated.

c-KIT D816V Mutation Analysis (for suspected case of systemic mastocytosis)	Active	Haematology	Unit Haematology, CaRC IMR NIH Setia Alam	Bone Marrow/ Aspirate Peripheral Blood	EDTA tube	2.5-5 ml	18days	Form: Molecular Analysis For Haemato-Oncology Version 3.0 with specialist signature. Specimen must be collected under sterile condition. Mix the blood thoroughly, gently, and immediately after collection. Send to lab as soon as possible. Sample must be refrigerated (2-8°C) after collection and kept chilled during transportation. DO NOT FREEZE. The sample must be accompanied with a copy of the FBC result, BMA report, immunophenotyping report.

COAGULATION FACTOR ASSAY a) Factor II b) Factor V c) Factor VII d) Factor X e) Factor XI f) Factor XII g) Factor XIII	Active	Hematology	HTA (Specialised Haemostasis & Thrombosis Lab)	Peripheral blood	Trisodium citrate 3.2%	Adult: 2.7mls Paeds: 1.8mls Note: 1 tube for single coagulation factor assay	28 days	Form: PER PAT 301 with relevant clinical history to be signed by attending physician. If patient had received fresh frozen plasma (FFP) transfusion must be mention date and volume transfused. Send sample at room temperature (18^{o}C-25^{o}C) or within 1 hour after blood taken.
COAGULATION FACTOR ASSAY a) Factor VIII & Factor IX level assay b) Factor VIII & Factor IX inhibitor level assay	Active	Hematology	HRPB (Hema tology)	Peripheral blood (plasma)	Trisodium citrate 3.2% (4 tubes)	To fill until indicated mark	10 days	Form: PER-PAT 301 with relevant clinical history to be signed by attending physician. Mix the blood thoroughly, gently, and immediately after collection. Send sample to hemato lab at room temperature (18^{o}C-25^{o}C) as soon as possible.
Cocaine	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon	Sterile container	5 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen

				monoxide gas (for blood samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				type & analysis needed. Need more than 1 specimen if a lot of analysis.

Congenital Infection - TORCHES IgM i) Toxoplasma iii) Rubella iv) Cytomegalo Virus vi) Herpes	Active	Microbiology	HRPB	Serum	Plain tube Baby: Adult plain tube	3-5 ml	2 weeks	Form: PERPAT 301.
Copper	Active	Chemical Pathology	Hosp Selayang	Serum	Plain tube (plain, no gel)	2 ml	35 days	Form: PER.PAT 301 Stamp & sign specialist. Full & clear Diagnostics & clinical history. Test done every Tuesday. Sampel stability 7 days (2-8^{o}c).
Copper	Active	Chemical Pathology	Hosp Selayang	24 hr urine	Urine container (plain)	5 ml	35 days	Form: PER.PAT 301 Stamp & sign specialist. Full & clear Diagnostics & clinical history. Test done every Thurdays. Sampel stability 7 days (2-8^{o}c). Volume need to be written (must be >500ml).
Copper	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas	Sterile container	25 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis

				(for blood samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				needed. Need more than 1 specimen if a lot of analysis.
Copper	Active	IEM Lab	PPUM	24 hr urine (container pre-treated with 10% HCL overnight)	Urine container (Container pre-treated with 10% HCL overnight)	> 1mL	24 days	Form: PER.PAT 301.
Coxiella burnetti IgG Coxiella burnetti	Active	Microbiology	Hosp Sg Buloh	Serum	Plain tube	1-3 ml 1-3 ml	1 week	Must consult with Pakar Virology, IMR.

IgM								
C-Peptide	Active	Chemical Pathology	HKL	Blood	Plain tube	3 ml	20 days	Form: PER.PAT 301.
CRIMEAN Congo Haemorrhagic Fever Virus (CCHFV)	Active	Virology	IMR	After consultation only	After consultation only	After consultation only	1 week	Virology Test Request Form Version 1.1, IMR. After consultation only.
Cryoglobulin	Active	Special Protein	Hospital Ampang	Blood	Prepared by the laboratory	N/A	35 days	By appointment. Call Protein lab Hospital Ampang ext 6216. External patient refer for blood taking procedure at FNAC Clinic Hospital Ampang.
CSF Glycine	Refer Iem- Amino Acid, CSF							
CSF Lactate	Active	Chemical Pathology	Hosp Pulau Pinang	CSF	Fluoride tube	1 ml	24hrs (routine)	Consult Dr Lim Chemical Pathologist HPP before sending sample. Sample should be sent immediately in ice packed.
CSF VDRL	Active	Microbiology	Hospital Sultanah Bahiyah	CSF	Sterile container	1 - 3 ml	2 weeks	Form: Per Pat 301. Serum TPPA must be positive before sending.
C-telopeptide / N-telopeptide	Private Laboratory (Serum)							

Culture for Mycobacterium tuberculosis/ BACTEC / MGIT	Active	Tuberculosis	MKAI	i) Sputum ii) Bronchial washing iii) Pus iv) Urine v) Other body fluids (pleural, synovial, CSF etc) vi) Tissue vii) Gastric lavage. If there is delay, neutralize sample by adding 1.5 ml sterile 40% anhydrous disodium phosphate (Na2HPO4) for every 35-40 ml specimens.	Sterile screw capped container	i) Sputum: 3-5 ml ii) Bronchial washing: 2-5 ml iii) NA iv) Urine: 3-5 ml v) Other body fluids: 2-5 ml vi) Tissue: Add 2-5 ml sterile saline/ distilled water to avoid drying vii) Gastric lavage: 2-5 ml	10 weeks (Negative Culture)	Form: Borang Permohonan Ujian TB TBIS 20C.
Cyclosporine	TDM test. Please call TDM pharmacy							
Cystine & Homocystine, Urine	Active	Biochemistry	IMR	Urine	Urine container	2 ml	25 days	Form: Request Form for Biochemical Genetic Tests, IMR.
Cystine, Urine	Active	Genetic Lab	Hospital Tunku Azizah (HWKKKL)	Urine	Urine container	2-5 ml	30 days	Form: IEM Form HTA, Specialist sign.

Cystinuria (SLC3A1)	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5 ml)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services IMR, To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings.
Cytomegalovirus (CMV)- IgG ELISA	Active	Microbiology	HRPB	Serum	Plain tube	3 ml	2 weeks	Form: PERPAT 301. Test for organ transplant only.
Cytomegalovirus (CMV)- IgM ELISA	Active	Microbiology	HRPB	Serum	Plain tube	3 ml	2 weeks	Form: PERPAT 301.
Cytomegalovirus Isolation	Active	Virology	IMR	i) Naso-pharyngeal aspiration, ii) Nasopharyngeal swab, iii) Throat swab, iv) Throat gargle, v) BAL vi) Sputum, vii) Nasal swab, viii) Organ biopsies ix) Urine	i) NPA: Sterile plastic vial contain 2-3 ml of VTM ii) NPS: Sterile plastic vial contain 2-3 ml of VTM iii) TS: Sterile plastic vial contain 2-3 ml of VTM iv) Throat gargle: sterile plastic container v) BAL: sterile plastic tube	i) NPA: Mucous secretion in VTM ii) NPS: A flexible, fine shafter polyester swab. Use different swab for each nostril iii) TS: Sterile swab iv) Nasal swab: Sterile swab. Use	6 weeks	Form: Virology Test Request Form Version 1.1, IMR.

					container vi) Sputum: sterile plastic container vii) Nasal swab: Sterile plastic vial contain 2-3 ml VTM viii) Biopsy: Sterile containers containing VTM to keep tissue moist ix) Urine: in sterile plastic container	different swabs for each nostrils v) BAL: sterile plastic tube container, vi) Sputum: sterile plastic container vii) Biopsy: remove portions, about 1.5 cm cube of various parts of affected organs, ix) Urine :1-3 ml in sterile plastic container		
CMV - DNA PCR Viral Load (Quantitative)	Active	Microbiology	HSB	Plasma Urine	EDTA tube Sterile container	5 ml 5 ml	2 weeks	Form: PER.PAT 301.
Dehydroepiandrosterone Sulphate (DHEAS)	Active	Chemical Pathology	HKL	Serum	Plain tube	3 ml	20 days	Form: PER.PAT 301.
Dengue Virus (Inclusive of DEN1, DEN2, DEN3 & DEN4)	Active	Virology	IMR	i) Serum ii) Plasma iii) CSF iv) Organ	i) Serum: serum separator tube ii) Plasma: EDTA tube	i) Serum: 1-3 ml ii) Plasma :1-3 ml	2 weeks	Form: Virology Test Request Form Version 1.1, IMR. Specimen should be

				biopsies	iii) CSF: sterile container iv) Organ biopsy: Sterile containers containing VTM to keep tissue moist	iii) CSF:1-3 ml iv) Organ biopsy: remove portions, about 1.5 cm cube of various parts of affected organs		collected < 5 days after onset of illness. A brief concise history of illness and physical findings is required especially the date of onset of illness and date of specimen collection. *for death cases/ severe cases only.
Detection of Burkholderia Pseudomallei IgM (Meliodosis)	Active	Bacteriology	IMR	Serum	Sterile plain tube	2-3 ml	2 weeks	Form: Bacteriology Request Form Version 4.0, IMR.
Dihydropyrimidinase Deficiency (DPYS)	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5 ml)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services IMR, To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings.
Dihydrorhodamine assay (DHR)	Active (By appointment only)	PID	IMR	Blood	Lithium Heparin	2 ml	2 weeks	Form: Primary Immunodeficiency (PID) Request Form Version 5.0, IMR. By consultation only and case must be discussed with PID

								Officer.
DNA Analysis for alpha-thalassaemia only	Active	Hematology	Hosp Sultanah Bahiyah	Peripheral blood	K2EDTA	Paeds: 500uL Adult: 2.0ml	3 months	Form: DNA Analysis for thalassaemia syndromes & haemoglobinopathy version 4.1. Signed by specialist to include: latest result of FBC (within 3 months) and Hb analysis. Must include the details of index cases, copy of index cases DNA analysis (if DNA analysis have been done), DNA analysis consent form.
DNA Analysis for beta globin gene and confirmation for hemoglobinopathy-HbS, HbE, HbC only	Active	Haematology	HKL (Molecular Haematology Laboratory)	Peripheral blood	K2EDTA	Paeds: 0.5ml Adult: 2.5ml	18 weeks	Form: DNA Analysis for thalassaemia syndromes & haemoglobinopathies version 4.1. Specialist sign & stamped. To include: latest result of FBC (within 3 months) and Hb analysis result. Must include the details of index cases, copy of index cases DNA analysis (if DNA

								analysis have been done), DNA analysis consent form.
DNA Extraction & Storage	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5ml)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)	1.5-2.5 months	Form: Molecular Diagnostic Services. To consult Clinical Genetics, Genetic Department, HKL (Dr Keng) before take sample. Only can be taken once. Form needs to be detail clinical, biochemical, imaging findings.
Duchenne/Becker Muscular Dystrophy (DMD/BMD)	Active	Molekular Diagnostik	Hospital Tunku Azizah (HWKKKL)	Blood	2 EDTA tubes	3-5 ml	3.5-6.5 months	Form: Molecular Test Request Form HTA. Specialist sign.
Ebola Nucleic Acid (By consultation only)	Active (By Consultation only)	Virology	IMR	After consultation only	After consultation only	After consultation only	1 week	Form: Virology Test Request Form Version 1.1, IMR.
Enterovirus (EV) 71 PCR	Active	Virologi	MKAK	Mouth Ulser Swab Vesicle swab Stool Rectal swab	Sterile container with 2.0-2.5 ml VTM Sterile container with 2.0-2.5 ml VTM Sterile screw capped container Sterile container	5g or pea size	1 week	Form: Borang Permohonan Ujian Makmal HFMD, MKAK.

				Throat swab	with 2.0-2.5 ml VTM Sterile container with 2.0-2.5 ml VTM			
				Pleural fluid	Sterile screw capped container	1-3 ml		
				CSF	Sterile screw capped container	1-3 ml		
				Serum	Plain tube with serum separator	1-3 ml		
				Tissue biopsy/ autopsy (post mortem case)	Sterile screw capped container	1.5 cm cube in a few drops of VTM		
Enterovirus (EV) HFMD Virus Isolation	Active	Virologi	MKAK	Mouth Swab/ Throat Swab / Rectal Swab / Stool	VTM / Sterile Container		1 month	Form: Borang Permohonan Ujian Makmal HFMD, MKAK.
Eosinophilic Cationic Protein (ECP)	Active (By Appointment only)	Allergy	IMR	Blood/ Serum	Plain tube	Blood: 3 ml Serum: 0.5 ml	3 weeks	Form: Allergy Request Form Version 2.0, IMR.
Epstein Barr Virus (EBV) - IgG/IgM ELISA	Active	Virology	Hospital Sg Buloh	Serum	Plain tube	3-5 ml	1 week	Form: PERPAT 301. Room temperature or in ice.
Epstein Barr Virus (EBV) - DNA PCR Viral load (Quantitative)	Active	Microbiology	Hospital Sg Buloh	Plasma CSF Bronchoalveol a lavage	EDTA Sterile container	3-5ml 0.3-2ml 5ml	2 weeks	Form: PERPAT 301.
Estrogen/	Active	Biochemistry	HRPB	Blood	Plain tube	3 ml	14 days	Form: PER.PAT 301

Estradiol								Stamp and sign specialist. Complete with diagnosis & clinical history.
Ethanol	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others	Plain tube/ Sterile container	3 ml/ 5 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a lot of analysis.

				(toxicology)				
Everolimus	Active	Chemical Pathology	HKL	Blood	EDTA tube	2 ml	7 days	Form: TDM.
Fecal Calprotectin	Private Laboratory (PPUM)							
Filariasis PCR	Active	Parasitology	IMR	Whole Blood in EDTA, blood on slides or filter paper	EDTA tube or slide mailer or seal plastic bag	2.5 ml	2 weeks	Form: PERPAT 301. Blood taken between 6pm-12am.
Filariasis Serology	Active	Parasitology	IMR	Serum, anti-coagulated blood	Plain tube, EDTA tube	2 ml	1 week	Form: PERPAT 301.
Flowcytometry Immunophenotyping for Leukaemia / lymphoma (Except PNH, MRD, T-All, T-cell lymphoma)	Active	Hematology	HRPB (Haematology Laboratory)	Peripheral blood or Bone Marrow Aspirate	K2EDTA (2 tubes)	To filled until indicated mark	10 days	Form: PER-PAT 301. Specialist signed with relevant clinical history. Specimen should arrive to HRPB lab before 1130am on Tuesday and Wednesday except for urgent cases eg. hyperleukocytosis syndrome and APML.
Flowcytometry Immunophenotyping for Leukaemia / lymphoma (suspected T-All, T-cell	Active	Hematology	HTA (Hematology laboratory)	Peripheral blood or Bone Marrow Aspirate	K2EDTA (2 tubes)	To filled until indicated mark	10 days	Form: PER-PAT 301. Specialist signed with relevant clinical history. Fresh sample. Avoid direct contact with ice.

lymphoma)								
Forensic Cases SARS-CoV-2 qRT-PCR	Active (By Consultation only)	Virology	IMR	i) Nasopharyngeal swab ii) Throat swab, iii) Nasal swab, iv) Organ biopsies	i) NPS: A flexible, fine shafter polyester swab. Use different swab for each nostrils ii) TS: Sterile swab iii) Nasal swab: Sterile swab. Use different swabs for each nostrils iv) Biopsy: remove portions, about 1.5cm cube of various parts of affected organ	i) NPS: Sterile plastic vial contain 2-3ml of VTM ii) TS: Sterile plastic vial contain 2-3ml of VTM , iii) Nasal swab: Sterile plastic vial contain 2-3ml of VTM viii) Biopsy: Sterile containers containing VTM to keep tissue moist	6 weeks	Form: Virology Test Request Form Version 1.1, IMR. After consultation only.
Free androgen Index (FAI)	Active	Endocrinology	Hospital Putrajaya	Blood	Plain tube	3 ml	35 days	
Free Light Chain (Kappa, Lambda) Ratio	Active	Chemical Pathology (Special Protein)	Hosp Pulau Pinang	Serum	Plain tube	1ml serum	20 days	Form: Per Pat 301.Interval between samples is 3 months.
Free Triiodothyronine FT3	Active	Biochemistry	HRPB	Blood	Plain tube	3 ml	14 days	Form: PER.PAT 301 Stamp and sign specialist. Test request by Endocrinologist only or with prior discussion with

								Endocrinologist. Complete with diagnosis & clinical history.
Fructosamine	Active	Biochemistry	Hospital Ampang	Serum	Plain tube	3 ml	21 days	Result Hb Analysis.
FSH	Active	Biochemistry	HRPB	Blood	Plain tube	3 ml	14 days	Form: PER.PAT 301 Stamp and sign specialist. Complete with diagnosis & clinical history.
Fucosidosis (FUCA1)	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5 ml)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services IMR, To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings.
Fungal PCR	Active	Bacteriology	IMR	Blood in EDTA, sterile body fluids, CSF, bronchial lavage, tissue biopsies, sinus aspirates	Sterile container	2 ml blood; other samples as much as possible	2 weeks	Form: Mycology, IMR. For better sensitivity, blood samplings should be repeated 2 or 3 times, at 3-4 hours interval.
G6PD assay	Active	Hematology	Hospital Melaka	Peripheral Blood	K2EDTA	Paediatrics – 500 ul Adult – 2ml	10 days	Form: PER.PAT. 301. Indication: Patient with G6PD screening result intermediate

								and deficient. Fresh sample (kept at 2-8°C) & avoid direct contact with ice. Inform Lab staff before sending specimen. Should arrive on Monday and Wednesday as test only done every Tuesday and Thursday. Sample stability: 48 hours Patient's criteria: 1) Reticulocytes counts <5% for neonate and <2.5% for adult and paeds. 2) 30 days after blood transfusion/ acute hemolysis.
Galactomanan	Active	Bacteriology	Hospital Seberang Jaya, P. Pinang	Serum, CSF	Sterile plain tube	As much as possible	2 weeks	Form: PER PAT 301
Gastrin	Private Laboratory (Serum)							
General Virus	Active	Virology	MKAK	CSF, Body Fluid	Sterile Container	3 – 5ml	1 month	Form: PER.PAT 301. Forensic Cases Only. Type of virus will be screened by CM in MKAK
GGT	Active	Biochemistry	HRPB	Blood	Plain tube	3 ml	2 days	Form: PER.PAT 301 Stamp and sign

								specialist. Complete with diagnosis & clinical history.
Glucagon	Private Laboratory (Serum)							
Gonadotrophin Releasing Hormone	Private Laboratory							
Growth Hormone (GH)	Active	Chemical Pathology	HKL	Blood	Plain tube	3 ml	20 days	Form: PER.PAT 301. Time of Collection: Random, Fasting sample, 5-10 min post exercise or 2h post-OGTT (75gm glucose), insulin tolerance test, other dynamic tests **Random/fasting GH is of limited diagnostic value.
Hanta Pulmonary Syndrome (Sin Nombre Ortho Hantavirus)	Active	Virology	IMR	After consultation only	After consultation only	After consultation only	1 weeks	Form: Virology Test Request Form Version 1.1, IMR. After consultation only.
Haptoglobin	Active	Special Protein	Hospital Ampang	Blood	Plain tube	3 ml adult 1.5 ml paeds	21 days	Form: PER.PAT 301 Fresh sample Sample stability 7 days in 2-8C. (H. Ampang run in batch, on every working Monday, Wednesday, Friday).

Helminth Culture	Active	Parasitology	IMR	Fresh stool not Fixed	Screw lid, air tight container	NA	3 weeks	Form: PER-PAT 301. Fresh stool in plain container (specimen to reach lab within 24hr at room temperature).
Helminth Macroscopy/microscopy	Active	Parasitology	IMR	Fresh stool/Adult worm/Larvae/ Fixed stool	Screw lid, air tight container	5g	2 weeks	Form: PER-PAT 301. Fresh specimen. Adult worm/Larvae in sterile saline. (Specimen to reach lab within 24hr at room temperature) (Before REFERRAL, Initial ID parasite to determine by customer).
Hepatitis A virus (HAV) Antibody (IgM)	Active	Microbiology	HRPB	Blood	Plain tube	3-5 ml	2 weeks	Form: PER.PAT 301.
Hepatitis B core (HBc) IgM	Active	Microbiology	HRPB	Serum	Plain tube	1-3 ml	2 weeks	Form: PER.PAT 301. Must have LFT result. Test will be done only if HBc Total Antibodies positive.
Hepatitis B core (HBc) Total	Active	Microbiology	HRPB	Serum	Plain tube	1-3 ml	2 weeks	Form: PER.PAT 301. Must have LFT result.
Hepatitis B Viral Load	Active	Microbiology	HRPB	Plasma	EDTA (4 tubes)	3.5 ml	4 weeks	Form: PER.PAT 301.Send to lab within 4 hours of blood taking. Specialist stamp.

Hepatitis B envelope (Hbe) Antibody	Active	Microbiology	HRPB	Serum	Plain tube	1-3 ml	2 weeks	Form: PER.PAT 301. Must have LFT result.
Hepatitis B envelope (HBe) Antigen	Active	Microbiology	HRPB	Serum	Plain tube	1-3 ml	2 weeks	Form: PER.PAT 301. Must have LFT result.
Hepatitis C Viral Load	Active	Microbiology	HRPB	Plasma	EDTA tube (4 tubes) Plain tubes	3.5 ml 1-3ml	4 weeks	Form: PERPAT 301.Send to lab within 4 hours of blood taking. Specialist stamp.
Hepatitis C Virus (HCV) Genotyping	Active	Virology	HKL	Plasma	EDTA	2 ml	6 weeks	Form: PERPAT 301.Packed with ice. Only offered to gastroenterologist and hepatologist Must have HCV Viral Load (>1000 iu/ml) or positive HCV Core Ag. Specialist stamp. For liver cirrhosis only.
Hepatitis E IgM	Active (By consultation only)	Virology	IMR	Serum Plasma	Plain Tube EDTA tube	1-3 ml 1-3 ml	2 weeks	Form: Virology Test Request Form Version 1.1, IMR. Must consult with Pakar Virology, IMR.
Herpes Simplex HSV I & II-DNA PCR (Qualitative)	Active	Microbiology	HKL	Plasma CSF	EDTA Sterile container	2 ml 1 ml	4 weeks	Form: PERPAT 301.
Herpes Simplex Virus Serology	Active	Virology	HKL	Serum	Plain tube	1 ml	2 weeks	Form: PERPAT 301.

(HSV I & II - IgG ELISA)								
Herpes Simplex Virus Serology (Type 1&2 IgM)	Active	Microbiology	HRPB	Serum	Plain tube	1 ml	2 weeks	Form: PERPAT 301.
Herpes viruses Isolation (Herpes Simplex 1 & 2)	Active	Virology	IMR	i)Nasopharyngeal swab ii) Throat swab iii) Cardiac biopsy iv) Rectal swab v) Stool vi) Pericardial aspirate vii) Vesicular swab/ scraping viii) Eye swab/lacrimal tears	i) NPS: Sterile plastic vial contain 2-3 ml of VTM ii) TS: Sterile plastic vial contain 2-3 ml of VTM iii) Organ biopsy: Sterile containers containing VTM to keep tissue moist iv) Rectal swab: Sterile plastic vial contain 2-3 ml of VTM v) Stool: Sterile bottle vi) Pericardial aspirate: sterile plastic vial contain 2-3 ml VTM vii) Vesicular swab/scrapping: Sterile plastic	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) vii)Vesicular	6 weeks	Form: Virology Test Request Form Version 1.1, IMR

					vial viii) Eye swab: Sterile plastic vial contain 2-3 ml of VTM; Lacrimal tears in cappilary tube	swab/scrapping: Swabs to be put into 2-3 ml of VTM viii) Eye swab: Sterile swab moistened with distilled water, Lacrimal tears: 10-20 ul tears		
Antibody test panel (PRA/DSA) . For transplant recipient only (screening test)	Active	Hematology	Unit Transplantation Immunology, AIRC IMR NIH Setia Alam	Peripheral blood	Plain tube	6 ml	25 days	Form: HLA Antibody Test Request Form (PRA/DSA) version 2.1. Appointment is not required. Fresh sample to be collected on day of transport. Samples must reach at Transplantation Immunology unit, AIRC before 10.30am. Please liase HTPG outsource laboratory to ensure proper arrangement for sample delivery. Please fill in all sections in the request form

HLA Typing Class I (Loci A, B and C) - Low/medium resolution (SSO/SSP-PCR)	Active	Hematology	Unit Transplantation Immunology, AIRC IMR NIH Setia Alam	Peripheral blood	EDTA	6 ml (if the patient is anaemic, TWC <1.5x10^3 cells/mL, 15 ml of blood is required, if patient has received blood transfusion in the past 3 weeks, please collect sample using saliva kit.)	18days	Form: Request Form for HLA Typing Test. All laboratory tests are performed on appointment basis on every working Mondays-Thursdays. Please call our unit at 03-33628382/8383 for appointment. Samples must reach at Transplantation Immunology unit, AIRC before 10.30am on appointment date. Please call to inform if there is any delay/cancellation. Please liaise with HTPG outsource laboratory to ensure proper arrangement for sample delivery.3. Please fill in all sections in the request form
HLA Typing Class II(Loci DR,DQ) - Low/medium resolution (SSO/SSP-PCR)	Active	Hematology	Unit Transplantation Immunology, AIRC IMR NIH Setia	Peripheral blood	EDTA	6mls (if the patient is anaemic, TWC <1.5x10^3 cells/mL, 15	14days	Form: Request Form for HLA Typing Test. All laboratory tests are performed on appointment basis on every working

			Alam			ml of blood is required, if patient has received blood transfusion in the past 3 weeks, please collect sample using saliva kit.)		Mondays-Thursdays. Please call Transplant unit at 03-33628382/8383 for appointment. Samples must reach at Transplantation Immunology unit, AIRC before 10.30am on appointment date. Please call to inform if there is any delay/cancellation. Please liaise with HTPG outsource laboratory to ensure proper arrangement for sample delivery. Please fill in all sections in the request form
HLA Typing Class I and II (Loci A, B, C, DR and DQ) - High Resolution: HSCT: Confirmatory Typing (CT)/Cord blood / MSCR search	Active	Hematology	Unit Transplantation Immunology, AIRC IMR NIH Setia Alam	Peripheral blood	EDTA	6mls (if the patient is anaemic, TWC <1.5x10^3 cells/mL, 15 ml of blood is required, if patient has received blood	14days	Form: Request Form for HLA Typing Test. All laboratory tests are performed on appointment basis on every working Mondays-Thursdays. Please call Transplant unit at 03-33628382/8383 for appointment.

						transfusion in the past 3 weeks, please collect sample using saliva kit.)		Samples must reach at Transplantation Immunology unit, AIRC before 10.30am on appointment date. Please call to inform if there is any delay/cancellation. Please liaise with HTPG outsource laboratory to ensure proper arrangement for sample delivery. Please fill in all sections in the request form
Homocysteine (Total), plasma	Active	Biochemistry	IMR	Plasma/Serum	EDTA tube/Plain Tube	2ml of plasma/serum	30 days	Form: Request Form for Biochemical Genetic Tests.
Homocysteine (Urine)	Active	Genetic Lab	Hospital Tunku Azizah (HWKKKL)	Urine	Urine container	2-5 ml	30 days	Form: IEM Form HTA, Specialist sign. Frozen immediately.
HIV Viral load	Active	Microbiology	HRPB	Plasma	EDTA tube (4 tubes)	1-3 ml	4 weeks	Form: Per. Pat 301. 4 EDTA tube. All tests for HIV PCR viral load must be requested only by specialist. Repeated samples must be more than 6 months.
Human immunodeficien	Active	Virology	IMR	Plasma	EDTA (2 tubes)	5-10 ml blood	8 weeks	Form: HIV Genotyping

cy virus (HIV) Drug Resistance								Resistance Testing Version 2.0. Treatment failure patient, patient's viral load must be>1000 - written in the form. 2 tubes EDTA.
HIV 1 RT PCR (Qualitative)	Active	Virology	IMR	Plasma	EDTA tube	2.5 ml blood	2 weeks	Form: Virology Test Request Form Version 1.1, IMR
HIV 2 RT PCR (By Consultation only)	Active	Virology	IMR	Plasma	EDTA tube	2.5 ml blood	2 weeks	Form: Virology Test Request Form Version 1.1, IMR
HIV PCR for babies (Baby 0-18 months)	Active	Virology	IMR	Plasma	EDTA	2.5 ml blood	2 weeks	Form: Borang Ujian Polymerase Chain Reaction (PCR) untuk Human Immunodeficiency Virus (HIV) di Kalangan Bayi Version 3.0, IMR. Mother must be HIV positive. Must be transported within 48 hours after collection at ambient temperature.
Identification of bacteria	Active	Bacteriology	IMR	Pure bacterial isolate	Agar or media which support the growth	NA	1 month	Form: Bacteriology Request Form Version 4.0, IMR. Preliminary tests must be performed first and results sent

								together with pure isolate and clinical history.
IEM- 5-hydroxy-Indol-Acetic Acid (5-HIAA), 24hr urine	Active	Biochemistry	IMR	24 hr urine	24hr urine preserve in 10mL 25% HCl	2 ml of 24hrs urine	30 days	Form: Request Form for Biochemical Genetic Tests. Frozen sample immediately.
IEM- Acid Alpha Glucosidase (POMPE), blood spot	Active	Biochemistry	IMR	Dried blood spot	Whatmann 903 Filter paper	3 circles of Dried Blood Spot (DBS)	25 days	Form: Request Form for Biochemical Genetic Tests. Properly dried at room temperature for 4 hours before putting in plastic bag. Wet blood spot will be rejected.
IEM- Amino Acid, CSF	Active	Special protein	IMR	CSF	Clean Universal bottle	1 ml	30 days	Form: UPK request form. Must send together with plasma.
IEM- Amino Acid, plasma	Active	Special protein	IMR	Plasma/serum	Heparin tube/ Plain tube	2 ml plasma	30 days	Form: UPK request form.
IEM- Amino Acid, urine	Consultation only	Special protein	IMR	Random urine	Sterile Universal bottle	2 ml	30 days	Form: UPK request form. Specialist need to contact IMR. Sample can only send after consultation from IMR. Recommended to order IEM-Dried Blood Spot, plasma amino acid or urine organic acid as

								replacement.
IEM- Argininosuccinic Acid, urine	Active	Biochemistry	IMR	Random urine	Clean Universal bottle	2ml urine	25 days	Form: Request Form for Biochemical Genetic Tests.
IEM- Biogenic amines, CSF - Neurotransmitter	Active	Biochemistry	IMR	CSF	Clean tube	2 ml	30 days	Form: Request Form for Biochemical Genetic Tests. Protect from light. (Easily destroyed by heat). Frozen sample immediately.
IEM- Biogenic amines, urine - Neurotransmitter	Active	Biochemistry	IMR	Random Urine	Clean universal bottle	2 ml	30 days	Form: Request Form for Biochemical Genetic Tests. Protect from light. (Easily destroyed by heat).

IEM- Biotinidase Enzyme Activity, blood spot	Active	Biochemistry	IMR	Dried blood spot in filter paper	Whatmann 903 Filter paper	3 circles of Dried Blood Spot (DBS)	25 days	Form: Request Form for Biochemical Genetic Tests. Properly dried at room temperature for 4 hours before putting in plastic bag. Wet blood spot will be rejected.
IEM- Carnitine, 24hr urine	Active	Biochemistry	IMR	24 hr urine	24-hour urine bottle	2 ml	20 days	Form: Request Form for Biochemical Genetic Tests. Specialist need to contact IMR. Sample can only send after consultation from IMR.
IEM- Carnitine, Total and Free, plasma	Active	Biochemistry	IMR	Plasma/Serum	Heparin tube/Plain tube	2 ml plasma/serum	20 days	Form: Request Form for Biochemical Genetic Tests.
IEM- Creatine & Guanidino acetate, Dried Blood Spot	Active	Biochemistry	IMR	Dried blood spot	Whatmann 903 Filter paper	3 circles of DBS	30 days	Form: Request Form for Biochemical Genetic Tests. Ensure blood completely dried before putting in plastic sheet.
IEM- Creatine & Guanidino acetate, Plasma	Active	Biochemistry	IMR	Plasma/ serum	EDTA/Heparin/Plain tube	1 ml plasma/ serum	30 days	Form: Request Form for Biochemical Genetic Tests.
IEM- Creatine & Guanidino acetate, urine	Active	Biochemistry	IMR	Random urine	Clean universal bottle	2 ml urine	30 days	Form: Request Form for Biochemical Genetic Tests.

IEM- Delta-Amino Levulinic Acids (D-ALA), Urine	Active	Special protein	IMR	Random urine	Protect from light.	2 ml	35 days	Form: UPK request form. Protect from light, D-ALA easily destroyed by light.
IEM-Galactosemia Screening, blood spot	Active	Biochemistry	IMR	Dried blood spot	Whatmann 903 Filter paper	3 circles of Dried Blood Spot (DBS)	21 days	Form: Request Form for Biochemical Genetic Tests. Properly dried at room temperature for 4 hours before putting in plastic bag. Wet blood spot will be rejected.
IEM- Inborn Error Metabolism (IEM) Screening, blood spot	Active (Urgent case only)	Genetic Biochemistry	Hospital Tunku Azizah (HWKKKL)	Dried blood spot	903 Filter paper	3 circles of Dried Blood Spot (DBS)	28 days	Form: IEM Request form HTA. Properly dried at room temperature for 4 hours before putting in plastic bag.
IEM- Lysine Metabolism Profile (Urine (P6C), Pipecolic Acid, a-AASA)	Active	Biochemistry	IMR	Random urine	Clean Universal bottle	2 ml urine	30 days	Form: Request Form for Biochemical Genetic Tests.
IEM-Mucopolysaccharides (GAGs/HRE), urine	Active	Biochemistry	IMR	First morning Urine	Clean universal bottle	5 ml urine	25 days	Form: Request Form for Biochemical Genetic Tests.
IEM-Oligosaccharide, urine	Active	Biochemistry	IMR	First morning Urine	Clean universal bottle	2 ml	30 days	Form: Request Form for Biochemical Genetic Tests.

IEM- Organic Acids, plasma (Forensic Only)	Active	Biochemistry	IMR	Plasma/ serum	EDTA/Heparin tube/Plain tube	1 ml plasma/ serum	25 days	Form: Request Form for Biochemical Genetic Tests.
IEM- Organic Acids, urine	Active	Biochemistry	IMR	Random urine	Clean universal bottle	2 ml	20 days	Form: Request Form for Biochemical Genetic Tests. Organic acids easily destroyed by heat.
IEM- Organic Acids, vitreous Humour (Forensic Only)	Active	Biochemistry	IMR	Vitreous humour	Clean tube	2 ml vitreous humour	25 days	Form: Request Form for Biochemical Genetic Tests. Transport Frozen. Organic acids easily destroyed by heat.
IEM- Orotic Acids, urine	Active	Biochemistry	IMR	Random urine	Clean universal bottle	2 ml	20 days	Form: Request Form for Biochemical Genetic Tests. Frozen sample immediately.
IEM- Panel Test: Lysosomal Storage Disorder Enzyme Assay: (Option max. 2 diseases) 1. Total Aspartylglucosaminidase (GASP), 2. Total Hexosaminidase (BHEX) Sandhoff	Consultation only	Biochemistry	IMR	Whole blood	EDTA tube	6 ml whole blood	40 days	Form: Request Form for Biochemical Genetic Tests. Specialist need to contact IMR. Sample can only send after consultation from IMR. Fill up column under others. Option maximum up to 2 diseases of enzyme. Must arrive to IMR within 3 days after collection.

Disease, 3. Total-Mannosidase (BMAN) B-Mannosidosis, 4. Beta-hexosaminidase A (MUGS) Tay-Sachs Disease, 5. Alpha-galactosidase (AGAL) Fabry Disease, 6. Alpha-mannosidase (AMANP) Mucolipidosis, 7. Aryl sulphatase A (ASA) Leukodystrophy , 8. Beta-galactosidase (BGAL) GM1-Gangliosidosis, 9. Alpha-mannosidase (AMAN) A-Mannosidosis, 10. Alpha-fucosidosis (AFUC)								

Fucosidosis, 11. Palmitoyl-protein thioesterase (PPT) Ceroid Lipofuscinosis, 12. Beta-glucosidase (BGLU) Gaucher Disease, 13. Galactocerebrosidase (GALC) Krabbe Disease, 14. Chitotriosidase (CHITO) General LSD Marker, 15. a-N-acetyl galactosamidase (ANAG) Schindler Disease, 16. Acid Sphingomyelinase (ASM) Niemann Pick A/B								
IEM- Panel Test: Mucopolysaccharidoses Enzyme Assay: (Maximum up	Consultation only	Biochemistry	IMR	Whole blood	EDTA tube	6 ml whole blood	40 days	Form: Request Form for Biochemical Genetic Tests. Specialist need to contact IMR. Sample

to 2 diseases of enzyme) i. alpha-Iduronidase (IDA) MPS Type I ii. Iduronate-2-sulphatase (IDS) MPS Type II iii. Sulphaminidase (SULP) MPS Type IIIa iv. alpha-N-acetyl glucosaminidase (AHEX) MPS Type IIIb v. Galactose-6-sulphatase (GALSO) MPS Type IVa vi. ß-galactosidase (BGAL) MPS Type IVb vii. Aryl sulphatase B (ASB) MPS Type VI viii. ß-glucuronidase (BGLUCU) MPS								can only send after consultation from IMR. Fill up column under others. Option maximum up to 2 diseases of enzyme. Must arrive to IMR within 3 days after collection.

Type VII ix. Aryl Sulphatase A (ASA) Multiple Sulphatase								
IEM- Peroxisomal Disorder Profile, Plasma / Serum (VLC)	Suspended. Consult first.							
IEM- Pipecolic acid (PIPA), Plasma	Active	Special Protein	IMR	Plasma	Heparin tube	2 ml	30 days	Form: UPK Request Form.
IEM- Porphyria Profile (Porphobilinogen (qualitative), Quantitation of Uro-, Hepta-, Hexa-, Penta-, Coproporphyrin & Total porphyrin)	Active	Biochemistry	IMR	Random urine	Clean universal bottle	2 ml	30 days	Form: Request Form for Biochemical Genetic Tests. Protect from light.
IEM- Pterins, CSF	Active	Biochemistry	IMR	CSF	Clean universal bottle	0.5 ml CSF	30 days	Form: Request Form for Biochemical Genetic Tests. Cover from light, Pterins easily destroyed by heat and light).

IEM- Pterins, urine	Active	Biochemistry	IMR	Random urine	Clean universal bottle	2 ml	30 days	Form: Request Form for Biochemical Genetic Tests. Cover from light. (Pterins easily destroyed by heat and light).
IEM- Sialic Acid, Total and Free	Active	Biochemistry	IMR	First morning urine	Clean universal bottle	2 ml	30 days	Form: Request Form for Biochemical Genetic Tests.
IEM- S-Sulphocysteine, urine	Active	Special Protein	IMR	Random urine	Clean universal bottle	2 ml	30 days	Form: UPK Request Form.
IEM-Succinylacetone, urine	Active	Biochemistry	IMR	Random urine	Clean universal bottle	2 ml	30 days	Form: Request Form for Biochemical Genetic Tests. Cover from light.
IEM- Sugar & Polyols, urine	Active	Biochemistry	IMR	Random urine	Clean universal bottle	2 ml	30 days	Form: Request Form for Biochemical Genetic Tests.
IgE, Specific RAST (Radioallergosorbent test)	Active	Allergy	IMR	Blood/ Serum	Plain tube	< 5 tests: Blood: 3 ml/ Serum: 0.5 ml; > 5 tests: Blood: 5-10 ml/ Serum: 1-3 ml	2 weeks	Form: Allergy Request Form Version 3.0, IMR.
IgE, Total	Active	Allergy	IMR	Blood/ Serum	Plain tube	Blood: 3ml/ Serum: 0.5 ml	2 weeks	Form: Allergy Request Form Version 3.0, IMR.

IGF-1 (Insulin Like Growth Factor-1)	Active	Chemical Pathology	Hospital Putrajaya	Serum	Plain tube	3 ml	35 days	Form: PER.PAT 301.
IGRA (Interferon Gamma Release Assay)	Active	TIBI	MKAI	Whole blood	Quantiferon gold tubes	1 ml each tube	30 days	Special collection, incubation and centrifugation procedures Inform TB Unit before collect sample. must be followed.
Immunoglobulin A (IgA)	Active	Chemical Pathology	Hospital Ampang	Blood	Plain tube	3.5 ml	21 days	
Immunoglobulin G (IgG)	Active	Chemical Pathology	Hospital Ampang	Blood	Plain tube	3.5 ml	21 days	
Immunoglobulin M (IgM)	Active	Chemical Pathology	Hospital Ampang	Blood	Plain tube	3.5 ml	21 days	
Immunoglobulin G Subclasses IgG1, IgG2, IgG3 dan IgG4	Active (By appointment only)	PID	IMR	Serum	Plain tube	5 ml	1 month	Form: Primary Immunodeficiency (PID) Request Form. By appointment only.
Immunoreactive Trypsin	Private Laboratory (Serum)							
Insulin	Active	Chemical Pathology	HKL	Blood	Plain tube	3 ml	20 days	Form: PER.PAT 301.
Insulin-like Growth Factor Binding Protein (IGFBP3))	Private Laboratory (Serum)							

Interferon Gamma Release Assay (IGRA) OR TB Quantiferon	Active	TB Unit	MKAI	Blood	Special container needs to collect from MKAI	1 ml	30 days	Form: Borang Permohonan Ujian TB TBIS 20C. Tub need to be inverted 10x.
Intrinsic Factor Antibody	Active	Microbiology	Hosp Selayang	Serum	Plain tube	3-5 ml	4 weeks	Form: PERPAT 301.
Japanese Encephaliti (JE) PCR	Active	Virology	MKAI	CSF Serum	Sterile container Plain tube/gel tube	1-3 ml 1-3 ml	10 days	Form: PERPAT 301.
Japanese Encephaliti (JE) Serology	Active	Serology Unit	MKAK	CSF Serum	Sterile container Plain tube/gel tube	1-3 ml 1-3 ml	1 week	Form: Borang MKAK-BPU-U01/ Rev2018.
Kleihaeur Test	Suspended	Hematology	HRPB (Hematology)	Whole Blood	EDTA	12.0 ml	1 day	By appointment. Fresh sample. Mix the blood thoroughly, gently & immediately after collection.
Lassa Virus (By Consultation only)	Active	Virology	IMR	After consultation only	After consultation only	After consultation only	1 weeks	Form: Virology Test Request Form Version 1.1, IMR. After consultation only.
Lead	Active	Chemical Pathology	Hosp Selayang	Whole Blood	K2EDTA	2 ml	35 days	Form: PER.PAT 301 Stamp & sign specialist. Full & clear Diagnostics & clinical history. Test done every Tuesday. Sampel stability 7 days (2-8^{o}c).

Lead	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)	Plain tube	3 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a lot of analysis.
Leber Hereditary Optic	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5mL)	2-5 ml blood EDTA (1-2 ml is acceptable	5.5 months	Form Molecular Diagnostic Servies, To consult Clinical

Neuropathy (LHON) Panel						for infants)/DNA		Genetics, Genetic Department, HKL (DR KENG) before take sample. Only can be taken once. Form need to be detail clinical, biochemical, imaging findings.
Legionella pneumophila Antigen	Active	Microbiology	HRPB	Urine	Sterile container	5 ml	1 weeks	Form: PERPAT 301.
Leishmaniasis Diagnosis - Microscopy	Active	Parasitology	IMR	Whole blood in EDTA, Lymph biopsy film, Bone marrow film	Slide mailer or EDTA tube	2.5 ml	1 weeks	Form: PERPAT 301.Before REFERRAL, Initial ID parasite to determine by customer.
Leishmaniasis PCR	Temporary Discontinued	Parasitology	IMR	Whole blood in EDTA, skin / tissue scrapings	EDTA tube, filter paper	2.5 ml	2 weeks	Form: PERPAT 301.
Leishmaniasis Serology	Active	Parasitology	IMR	Serum, anti coagulated blood	Plain tube, EDTA tube	2 ml	2 weeks	
Leptospira MAT (Microscopic Agglutination Test)	Active	Bacteriology	MKAI	Serum	Plain tube	1 ml	2 weeks	Form: PER PAT 301.
Leptospiral culture	Active	Bacteriology	IMR	Whole blood	EMJH Media / HAN Media - One or two drops (~50	EMJH Media / HAN Media - One or two drops (~50	1 month	Form: Leptospirosis Laboratory Request Form Version 3.0, IMR. Send

					microlitre) Heparin tubes (5 ml). Send immediately at room temperature	microlitre) Heparin tubes (5 ml)		immediately at room temperature.
Leptospiral PCR	Active	Bacteriology	IMR	i) Blood in EDTA ii) Sterile body fluids iii) CSF, iv) Bronchial lavage v) Tissue biopsies/post mortem samples. Before antibiotics.	i) Blood in EDTA ii) Other samples in sterile container	3 ml	2 weeks	Form: Leptospirosis Laboratory Request Form Version 3.0, IMR. For better sensitivity, blood samplings should be repeated 2 or 3 times, at 3-4 hours interval. For ICU cases and after consultation only.
LH	Active	Biochemistry	HRPB	Plain tube	Plain tube	3 ml	14 days	Form: PER.PAT 301.
Lipase	Private Laboratory (Serum)							
Lithium	Active	Biochemistry	Hospital Bahagia Ulu Kinta	Blood	Plain tube	3 ml	20 days	Form: TDM.
Lupus Anticoagulant	Active	Hematology	HRPB	Peripheral Blood (Plasma)	Trisodium citrate 3.2%	Minimum 3 tubes for adult (>12years old) Minimum 2 tubes for paeds	35 days	Form: PERPAT 301. Specialist signed with relevant clinical history & attached with Lupus anticoagulant check list. Send to lab immediately at room

								temperatures.
Lymphocyte Proliferation Assay/Lymphocyte Transformation Test	Active (By appointment only)	PID	IMR	Blood	Sodium heparin	5 ml	6 weeks	Form: Primary Immunodeficiency (PID) Request Form Version 5.0, IMR. By consultation only and case must be discussed with PID Officer.
Lymphocyte Subset Enumeration Test (TBNK)	Active (By appointment only)	PID	IMR	Blood	EDTA	2 ml	2 weeks	Form: Primary Immunodeficiency (PID) Request Form Version 5.0, IMR. By appointment only.
Macroprolactin	Private Laboratory (Serum)							
Malaria PCR	Active	Parasitology	MKAI	Whole Blood	EDTA	3.5 ml	2 weeks	Form: PER-PAT 301
Marburg Nucleic Acid	Active	Virology	IMR	After consultation only	After consultation only	After consultation only	1 week	Form: Virology Test Request Form Version 1.1, IMR. After consultation only.
Measles (Serology)	Active	Serology	MKAK	Serum	Plain Tube/ Gel Tube (Without anticoagulant)	1 -3 ml	1 weeks	Form: Measles - Borang Permohonan dan Keputusan Ujian Makmal.
Mercury	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood	Plain Tube	3 ml		Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more

				samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				than 1 specimen if a lot of analysis.
MERS-CoV RT-PCR (Qualitative)	Active	Microbiology	HRPB	NPA, BAL, Tracheal Aspirate	Plain Sterile Container	1-2 ml	3 days	Form: PER.PAT 301.
Metachromatic Leukodystrophy (MLD) / Arylsulphatase A (ARSA)	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5 ml)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services IMR, To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs

								to be detail clinical, biochemical, imaging findings.
Metanephrine (Replace Catecholamines)	Stopped (Analyser breakdown)	Chemical Pathology	HKL	24 hr urine	24H Urine container Storage stability: 1week: 4-8ºC 1year: -20ºC	Adult: > 1000 ml (Send to HKL 10 ml)	20 days	Form: PER.PAT 301 Reject criteria: 1. Inadequate urine collection, (Adult: < 1L; Children: volume depend on body weight & calculated normalized to creatinine) 2. Urine pH > 2 3. Paed patient must write body weight on form.
Metanephrine (Replace Catecholamines)	Active (Only for urgent cases)	Chemical Pathology	Hospital Putrajaya	24 hr urine	24H Urine container with 10ml of 25% HCl Storage stability: 1month: 2-8ºC 3month: -20ºC	Adult: > 750 ml (Send to HPJ 10 ml)	45 days	Form: PER.PAT 301 Reject criteria: 1. Inadequate urine collection, (Adult: < 750 ml; Children: volume depend on body weight & calculated normalized to creatinine) 2. Urine pH > 5 3. Min volume the container received <3.5ml.
Metanephrine (Replace Catecholamines)	Active	Special Chemistry Lab	PPUM	24 hr urine	24-hour urine container contained of 10mL of 25% HCl		14 days	

Methanol	Active	Toxicology	Jabatan Kimia, Ipoh	Urine / Blood Container suspected methanol	Sodium fluoride tube (urine & blood)	3 ml	-	
Methanol (For fake alcohol poisoning case)	Active	Biochemistry	MKAK (Replace HSB)	Whole Blood/Urin	Sodium fluoride tube/ K Oxalate	3 ml	30 days	Form: Borang Permohonan ujian MKAK (MKAK-BPU-U-01/Rev2018), T:2-8 °C (24 hr) Poisoning: make appointment at ext 1287. After office hr, call officer oncall.
Methotrexate	Active (Under Pharmacy, Sent to HRPB)	Patologi Diagnostik	Hospital Tunku Azizah (HWKKKL)	Serum	Plain tube (Red cap)	3 ml	6 hrs (working days)	Form: TDM
Methyl Malonic Acidemia (MMA) (MMAA, MMAB, MUT)	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5 ml)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services, To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings.
Methylation Analysis - Angelman Syndrome (SNRPN / UBE3A	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5 ml)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services, To consult Clinical Genetics, Genetic Department, HKL

Sequencing) - Prader & Willi Syndrome (SNRPN)								before take sample. Form needs to be detail clinical, biochemical, imaging findings.
Hemophilia A Genetic Testing	Active	Hematology	Unit Haematology , CaRC IMR NIH Setia Alam	Peripheral Blood (Whole blood)	EDTA	2.5 ml	65 days	Form: Haemophilia Genetic Testing Request Form (version 5.0) IMPORTANT: Patient's blood sample must be accompanied with a complete request form and factor assay report. Family member's blood sample must be accompanied with index specimen and complete clinical data.Keep the sample cooled. Sample must be refrigerated (2-8°C) after collection and kept chilled during transportation. DO NOT FREEZE.
Hemophilia B Genetic Testing	Active	Hematology	IMR NIH Setia Alam (Hematology	Peripheral Blood (Whole Blood)	EDTA	2.5 ml	35 days	Form: Haemophilia Genetic Testing Request Form

			Unit)					(version 5.0) IMPORTANT: Patient's blood sample must be accompanied with a complete request form and factor assay report. Family member's blood sample must be accompanied with index specimen and complete clinical data.Keep the sample cooled. Sample must be refrigerated (2-8°C) after collection and kept chilled during transportation. DO NOT FREEZE.
Molecular Marfan	Private laboratory							
Molecular red cells membrane disorder (Southeast Asian Ovalocytosis)	Active	Hematology	Hospital Sultanah Bahiyah	Peripheral blood	EDTA	Adult: 3ml Peds:1 m	7 weeks	Form: PERPAT. REQUIREMENT: 1)Complete history 2) FBP report together with FBC parameters (less than 3 months) 3) Consent form HSBAS PAT HEM PP5.09 4) Samples need to be sent to lab

								as soon as possible INDICATION: 1) FBP showed RBC morphology features of SAO in neonatal anaemia/hyperbilirubinaemia, severe anaemia in adult and haemolysis picture, both husband and wife with history of hydrops fetalis,distal tubular acidosis. 2) suspected homozygous SAO 3) TDT and non-TDT Thalassaemia patient co-inheritance SAO.
Molecular test for cancer genetics	Active	Histopathology	Hospital Tunku Azizah (HTA)	1.Tissue 2. Blood	1.Paraffin block/5-10 unstained slide (5um thick) 2. EDTA tube	1.Paraffin block at least 70% or 50 tumour cells 2. 5ml blood	6 – 8 weeks	Form: Borang Ujian Molekular (HTA/PATH.GEN/O2-2021). By appointment with Makmal Genetik HTA. Fresh sample to be sent on the same day of transportation.
Molecular test for FISH, PCR and Pyrosequencing	Active	Histopathology	Hospital Kuala Lumpur	1.Tissue	One (1) Paraffin block One (1) H&E slides One (1) HPE	Paraffin block at least 20% viable tumour cells	2 – 4 weeks	Form: Borang Ujian Molekular. By appointment with Makmal Molekular HKL.

					report			
Muenke Syndrome	Active	Molekular Diagnostik	Hospital Tunku Azizah (HWKKKL)	Blood	2 EDTA tubes	3-5 ml	3.5-6.5months	Form: Molecular Test Request Form HTA. Specialist sign. Sampl need to reach HTA within 48hours.
Mumps PCR/Virus Isolation	Active	Virology	MKAK	Oral or buccal swab	Sterile container with 2.0 - 2.5 ml of VTM	-	PCR – 1 weeks Virus Isolation – 1 month	Form: Borang MKAK-BPU-U01/Rev2018.
Mycobacterium tuberculosis (MTB) PCR	Active	Tb unit	MKAI	sputum, pus, CSF & other body fluids	Sterile container	For CSF 1-2ml	2 weeks	Form: Borang Permohonan Ujian TB TBIS 20C. For CSF send to lab immediately; for sputum ideally collect 3 consecutive specimens. A single well collected specimen is adequate. Specialist stamp & sign.
Mycophenolic Acid	Active	Chemical Pathology	HKL	Blood	EDTA tube	3 ml	7 days	Form: TDM.
Nikel	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas	Plain Tube	3 ml/5ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis

				(for blood samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				needed. Need more than 1 specimen if a lot of analysis.
Nipah Virus Antibody	Active	Virology	IMR	Serum, CSF	i) CSF: sterile container ii) Serum: plain tube	i) CSF: 1-3 ml ii) Serum: 1-3ml	3 weeks	Form: Virology Test Request Form Version 1.1, IMR.
Nipah Virus PCR	Active	Virology	MKAK	CSF Serum Urine Throat swab	Sterile container Plain tube/gel tube Sterile container	1-3 ml 1-3 ml 10 ml -	1 weeks	Form: MKAK-BPU-U01/Rev2018.

				Tissue biopsy/ autopsy	Swab should be put into 1.5 - 2.0 ml of VTM 1.5 cm cube in a few drops of VTM	-		
Noonan Syndrome (PTPN11)	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5mL)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form Molecular Diagnostic Services IMR, To consult Clinical Genetics, Genetic Department, HKL (DR KENG) before take sample. Only can be taken once. Form needs to be detail clinical, biochemical, imaging findings.
Normetanephrine	Private Laboratory (24HR Urine)							
Oligoclonal Bands, CSF & Serum	Active	Special Protein	Hospital Ampang	CSF & Serum	Bijou Bottle & Plain tube	3 ml blood & 2 ml CSF (at least 0.5mL CSF)	35 days	Form: PER.PAT 301. CSF must be accompanied by patient's serum. CSF and serum must reach the lab not more than 7 days after collection date. CSF Frozen.

Organophosphate	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)	Plain Tube/ Sterile Container	3 ml/ 5 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a lot of analysis.
Osteocalcin	Private Laboratory (Serum)							
Other	Active	Hematology	IMR NIH	Peripheral	K2EDTA	2.5 ml for	18 weeks	Form: DNA Analysis

hemoglobin variant and further testing of alpha/beta thalassaemia (i.e if suggested from molecular haematology Lab HSB/HKL)			Setia Alam	blood		adult 0.5 ml for Paeds		for thalassaemia syndromes & haemoglobinopathy version 4.1. Signed by specialist. To include latest result of FBC and Hb analysis. For Paediatric case (<12 year old), Sample must be accompanied by both parents' Fbc and Hb analysis result).
Panel Coeliac Antibodies: Anti-Endomysium, Anti Gliadin, Anti Tissue Transglutaminase	Active	Autoimmune	IMR	Blood/ Serum	Plain gel tube	Child: 3 ml Adult: 5-10 ml Serum: 1-3 ml	1 month	Form: Autoimmune Request Form Version 3.1, IMR.
Panel Cytokines (IL-6): IL-1 beta, IL-6,IL-8 & TNF-alpha	Active (by appointment only) B	Autoimmune	IMR	Serum	Plain tube	5 ml	35 days	Form: Autoimmune Request Form Version 3.1, IMR. Applicable for government only. By appointment only. For appointment, please contact Dr Fatimah: 0163807873.

Panel Diabetes Antibodies - Anti-Glutamic Acid Decarboxylase (GAD65) - Anti Islet Cells (ICA) - Anti-Insulinoma-Associated Antigen 2 (IA2) - Insulin Auto Antibodies (IAA) (Start offer Mac 2022)	Active	Diabetes and Endocrine Unit	IMR	Serum	Plain tube	3 ml	30 days	Form: Endocrine Request. Stamp and sign specialist. Complete with diagnosis & clinical history. Should be done ONLY to confirm T1DM diagnosis in children & adolescents, strong history of relatives of patients with T1DM, clinically highly suspicious of T1DM. Keep in 2°C to 8°C (Stability 3 days), -20°C (Stability 6months). Do not send Grossly Hemolysed/ Lipemic/ Icteric Specimen. Advised for IAA blood testing to be drawn BEFORE insulin therapy is initiated for the first time. For the IAA results to be valid, the patient must not be Insulin treated for more than 14 days.
Panel IgG Subclass (IgG1,	Active	PID	IMR	Serum	Plain tube	5 ml	2 weeks	Form: Primary Immunodeficiency

IgG2, IgG3 & IgG4)								(PID) Request Form Version 5.0, IMR. By consultation and appointment only and case must be discussed with PID Officer.
Panel Skin Antibodies Anti-BP 180, Anti BP-230, Anti-Desmoglein 1 & Anti-Desmoglein 3	Active	Autoimmune	IMR	Blood/ Serum	Plain gel tube	Child: 3 ml Adult: 5-10 ml Serum: 1-3 ml	3 weeks	Form: Autoimmune Request Form Version 3.1, IMR.
Panel Specific Liver Antibodies: Anti M2-3E/BPO, Sp100, PML, gp210, LC-1, SLA/LP, Ro-52	Active	Autoimmune	IMR	Blood/ Serum	Plain gel tube	Child: 3 ml Adult: 5-10 ml Serum: 1-3 ml	3 weeks	Form: Autoimmune Request Form Version 3.1, IMR COMPULSORY to specify the tissue antibody results: ASMA, AMA, LKM (IF).
Panel: Anti-Ganglioside Antibodies (Anti-GM1, Anti-GM2, Anti-GM3, Anti-GM4, Anti-GD1a, Anti-GD1b, Anti-GD2, Anti-GD3, Anti-GT 1a,	Temporarily discontinued	Autoimmune	IMR	Blood/ Serum/ CSF	Plain gel tube/ Bijou bottle	Child: 3 ml Adult: 5-10 ml Serum: 1-3 ml	1 month	Form: Autoimmune Request Form Version 3.1, IMR.

Anti-GT 1b, Anti--GQ1b)								
Panel: Paraneoplastic Neurological Syndrome (PNS) (Anti-Amphiphysin, Anti-Ma, Anti-Yo, Anti-Ri, Anti-Hu, Anti-CV2)	Active	Autoimmune	IMR	Blood/ Serum	Plain gel tube	Child: 3 ml Adult: 5-10 ml Serum: 1-3 ml	1 month	Form: Autoimmune Request Form Version 3.1, IMR.
Parvovirus B19 IgG/IgM ELISA	Active	Virology	Hospital Sg Buloh	Blood	Plain tube	3-5 ml	2 weeks	Form: Per. Pat 301. Room temp. or in ice.
Parvovirus B19 PCR	Active	Virology	MKAK	CSF Serum	Sterile container Plain tube/ Gel tube	1 ml 1-3 ml	1 weeks	Form: MKAK-BPU-U01/Rev2018.
BCR-ABL Qualitative Diagnostic Analysis (for suspected cases of CML.MPN or MDS/MPN)	Active	Hematology	IMR (Bone Marrow Cytogenetics, Genetic Laboratory)	Bone marrow aspirate/ peripheral blood	EDTA tube	2.5 – 5ml	15 days	Form: Molecular Analysis for Leukemia version 2. Form to be signed by specialist. To collect under sterile condition. Mix the blood thoroughly, gently and immediately after collection. Send to lab as soon as possible. The sample must be accompanied with a copy of the FBC result, BMA report,

								immunophenotyping report and unstained bone marrow slide. Sample stability is only up to 24 hours
PCR Rickettsial Disease	Active	Bacteriology	IMR	Blood in EDTA, tissue biopsies. Before antibiotics	Blood in EDTA; tissue samples in sterile container	5ml blood in EDTA	2 weeks	Form: Rickettsiosis Laboratory Request Form Version 4.0, IMR.
Phospholipase A_2 Receptor antibody (PLA2R)	Active	Autoimmune	IMR	Serum	Plain gel tube	5 ml	1 month	Form: Autoimmune Request Form Version 3.1, IMR. Send Immediately to the lab.
Platelet Aggregation Tests (Agonist: Ristocetin, Collagen, ADP)	Active	Hematology	Pusat Darah Negara	Peripheral blood	Trisodium citrate 3.2%	20 ml	5 days	By appointment. Requesting Dr shall inform pathologist in charge and then to get appointment. Patient have to walk in to PDN for blood sampling.
Platelet Factor 4 @ HiTT/ViTT	Active	Hematology	Hospital Ampang (MRKH)	Fresh whole blood (plasma)	2 plain tube	To fill until indicated mark	9 weeks	Form: Hospital Ampang Special Hematology Lab Requisition (Hem-RQ19.ver4.31. Aug.20212) Form to be signed by specialist. Samples must be fresh;

								allowed to clot for 30 mins Centrifuge for 10 mins at 3000g Remove serum and store at -20 to -80 degrees .Send frozen after informing lab staff
Polio Virus AND Non-Polio Virus /Acute Flaccid Paralysis (AFP)	Active	Virology	IMR	i) Stool (prefered)*(to collect within 14 days of onset, 2 adequate sample to collect in 24-48hrs apart) ii)Rectal swab iii)Throat swab, iv) CSF	i)Stool: Sterile bottle ii) Rectal swab: Sterile plastic vial contain 2-3ml of VTM iii) Throat Swab: Sterile plastic vial contain 2-3ml of VTM vi) CSF: sterile container	i) Stool: >5gm (thumb size) ii) Rectal swab: Stool on sterile swab moistened with distilled water iii) TS: Sterile swab iv) CSF: 0.5ml in sterile container	3 weeks	Form: Acute Flaccid Paralysis Case Investigation Form.
ProBNP	IJN. Test need to be paid.							
Procalcitonin	Active	Chemical Pathology	Institut Kanser Negara	Blood	Plain tube	3 ml	20 days	Form: PER.PAT 301. Request by specialist only. Form completes with history. Specialist ordering the test need to call IKN before order test. Sample must reach IKN within 3 days.

Progesterone	Active	Biochemistry	HRPB	Blood	Plain tube	3 ml	14 hours	Form: PER.PAT 301. Stamp and sign specialist. Complete with diagnosis & clinical history.
Progesterone, 17-OH	Active	Endocrinology	Hospital Putrajaya	Serum	Plain tube	3 ml	35 days	Form: PER.PAT 301.
Pro-insulin	Private Laboratory (Serum)							
Prolactin	Active	Biochemistry	HRPB	Blood	Plain tube	3 ml	14 days	Form: PER.PAT 301. Stamp and sign specialist.
Prostate Specific Antigen (free)	Active	Makmal Teras	HKL	Blood	Plain tube	3 ml	20 days	Form: PER-PAT 301
Protein Electrophoresis / paraprotein (SPE), Serum	Active	Chemical Pathology (Special Protein)	Hosp Pulau Pinang	Serum	Plain tube	3 ml serum	45 days	Form: Per Pat 301. Specialist sign & stamp. Interval between samples is 3 months.
PTH related peptides	Private laboratory							
Purine and Pyrimidine - Adenylosuccinate Lyase (ADSL) Deficiency - MNGIE (Thymidine Phosphorylase Deficiency)	Active	Genetic Lab	Hospital Tunku Azizah (HWKKKL)	Urine	Urine container	5 ml	30 days	Form: IEM Form HTA, Specialist sign. Sample must reach HTA Genetic Laboratory as soon as possible.

Pyruvate Dehydrogenase Deficiency (PDHA1)	Active	Molecular Diagnostics & Protein	IMR	Whole Blood	EDTA tube	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services, To consult Clinical Genetics, Genetic Department, and HKL before take sample. Form need to be detail clinical, biochemical, imaging findings.
Qualitative BCR-ABL Diagnostic Analysis (New case suspected MPN or MDS/MPN)	Active	Hematology	Unit Haematology , CaRC IMR NIH Setia Alam	Bone marrow aspirate/ peripheral blood	EDTA tube	2.5 – 5ml	10 days	Form: Molecular Analysis for Haemato-oncology request form (Version 3.0). Form to be signed by specialist. To collect under sterile condition. Mix the blood thoroughly, gently and immediately after collection. Send to lab as soon as possible. The sample must be accompanied with a copy of the FBC result, BMA report, immunophenotyping report . Keep the sample cooled. Sample must be refrigerated (2-

								8°C) after collection and kept chilled during transportation. DO NOT FREEZE.
Quantitative RT-PCR BCR-ABL1 (*CML AND Ph+ve ALL/AML case) FOLLOW UP (monitoring)	Active	Molecular Haematology Unit	Hospital Ampang (MRKH)	Bone marrow aspirate in Ph+ ALL/AML case) Peripheral blood is preferred in CML case	K2 EDTA	Bone marrow aspirate:1-2ml, Peripheral blood: 01931746529 99026 Minimum 10ml	13 weeks	Form: Hospital Ampang Special Haematology Lab Requisition (Hem-RQ19.ver4.31. Aug.2021). Stamp & sign by Specialist. Mix the blood thoroughly, gently, and immediately after collection. Transport samples without delay preferably within 24 hours at room temperature. DO NOT freeze specimens.
Qualitative PCR for JAK2 / CALR Calreticulin (this test only carry out if JAK2V617F mutation negative)	Active	Molecular Haematology Unit	Hospital Ampang (MRKH)	Peripheral blood Bone Marrow Aspirate blood is preferred in CML case	K2 EDTA	Peripheral blood: minimum 5 ml Bone Marrow Aspirate: 1-2 ml	9 weeks	Form: Hospital Ampang Special Haematology Lab Requisition (Hem-RQ19.ver4.31. Aug.2021). Stamp & sign by Specialist. Mix the blood thoroughly, gently, and immediately after collection. Transport

								samples without delay preferably within 24 hours at room temperature. DO NOT freeze specimens.
Quantitative RT-PCR PML: RARA (bcr1, bcr2 & bcr3) (Monitoring)	Active	Molecular Haematology Unit	Hospital Ampang (MRKH)	Bone Marrow Aspirate (initial/follow up)	K2 EDTA	Bone Marrow Aspirate: 1-2 ml	7 weeks	Form: Hospital Ampang Special Haematology Lab Requisition (Hem-RQ19.ver4.31. Aug.2021). Stamp & sign by Specialist. Mix the blood thoroughly, gently, and immediately after collection. Transport samples without delay preferably within 24 hours at room temperature. DO NOT freeze specimens.
Quantitative RT-PCR RUNX1:RUNX1 T1 (Monitoring)	Active	Molecular Haematology Unit	Hospital Ampang (MRKH)	Bone Marrow Aspirate (initial/follow up)	K2 EDTA	Minimum 1-2ml	7 weeks	Form: Hospital Ampang Special Haematology Lab Requisition (Hem-RQ19.ver4.31. Aug.2021). Stamp & sign by Specialist. Mix the blood thoroughly, gently, and

								immediately after collection. Transport samples without delay preferably within 24 hours at room temperature. DO NOT freeze specimens.
Quantitative RT-PCR CBFβ:MYH11A [Monitoring]	Active	Molecular Haematology Unit	Hospital Ampang (MRKH)	Bone Marrow Aspirate	K2 EDTA	Minimum 1-2ml	7 weeks	Form: Hospital Ampang Special Haematology Lab Requisition (Hem-RQ19.ver4.31. Aug.2021). Stamp & sign by Specialist. Mix the blood thoroughly, gently, and immediately after collection. Transport samples without delay preferably within 24 hours at room temperature. DO NOT freeze specimens.
Qualitative PCR FLT3 ITD (AML: follow-up only)	Active	Molecular Haematology Unit	Hospital Ampang (MRKH)	Bone Marrow Aspirate or Peripheral blood	K2 EDTA	Peripheral Blood: Minimum 1-2ml BMA: Minimum 5ml	5 weeks	Form: Hospital Ampang Special Haematology Lab Requisition (Hem-RQ19.ver4.31. Aug.2021). Stamp & sign by Specialist. Mix the blood thoroughly,

								gently, and immediately after collection. Transport samples without delay preferably within 24 hours at room temperature. DO NOT freeze specimens.
Qualitative PCR for NPM1 (AML: follow-up)	Active	Molecular Haematology Unit	Hospital Ampang (MRKH)	Bone Marrow Aspirate or Peripheral blood	K2 EDTA	Peripheral Blood: Minimum 1-2ml BMA: Minimum 5ml	5 weeks	Form: Hospital Ampang Special Haematology Lab Requisition (Hem-RQ19.ver4.31. Aug.2021). Stamp & sign by Specialist. Mix the blood thoroughly, gently, and immediately after collection. Transport samples without delay preferably within 24 hours at room temperature. DO NOT freeze specimens.
Rabies Virus PCR	Active	Virology	MKAK	Saliva Skin biopsy of the hair follicles (at the nap of the neck)	Sterile container Sterile container	1-3 ml 1.5 cm cube in a few drops of VTM	1 weeks	Form: MKAK-BPU-U01.

				Brain autopsy				
Renin	Active	Endocrinology	Hospital Putrajaya	Plasma in EDTA	3 EDTA tubes	6 ml	35 days	Form: PER.PAT 301 Stamp & sign specialist, state on form-clinical history, drug history, latest potassium level >4.0 mmol/L-pls state on the form, requested by specialist/ endocrine specialist only, record of patient`s position (supine/upright) Sample cannot send in ice (rejected).
Respiratory Virus Isolation and Identification (Influenza Virus A and B, Adenovirus, Respiratory syncytial Virus, Parainfluenza Virus 1, 2 and 3, Human Metapneumovirus	Active	Virology	IMR	i) Nasopharyngeal aspiration, ii) Nasopharyngeal swab, iii) Throat swab, iv) Throat gargle, v) BAL, vi) Sputum, vii) Nasal swab, viii) Organ biopsies	i) NPA: Mucous secretion in VTM ii) NPS: A flexible, fine shafter polyester swab. Use different swab for each nostril iii) TS: Sterile swab iv) Throat gargle v) BAL vi) Sputum vii) Nasal swab:	i) NPA: Sterile plastic vial contain 2-3ml of VTM ii) NPS: Sterile plastic vial contain 2-3ml of VTM iii) TS: Sterile plastic vial contain 2-3ml of VTM, iv) Throat gargle: sterile plastic container 2-	6 weeks	Form: Virology Test Request Form Version 1.1, IMR

					Sterile swab. Use different swabs for each nostril viii) Biopsy: remove portions, about 1.5cm cube of various parts of affected organs	3ml v) BAL: sterile plastic tube container, vi) Sputum: sterile plastic container vii) Nasal swab: Sterile plastic vial contain 2-3ml VTM viii) Biopsy: Sterile containers containing VTM to keep tissue moist		
Rett Syndrome	Active	Molekular Diagnostik	Hospital Tunku Azizah (HWKKKL)	Blood	2 EDTA tubes	3-5 ml	3.5-6.5 months	Form: Molecular Test Request Form HTA. Specialist sign. Sample must reach HTA Genetic Laboratory within 48 hours after sample collection.
Rickettsia serology/ IIP	Active	Microbiology	HRPB	Serum	Plain tube	3-5 ml	2 weeks	Form: PERPAT 301.
Rift Valley - PCR	Active	Virology	IMR	After consultation only	After consultation only	After consultation only	1 week	Form: Virology Test Request Form Version 1.1, IMR. After consultation

								only.
Rubella - IgG ELISA	Active	Virology	Hospital Sg Buloh	Serum	Plain tube	3-5 ml	2 weeks	Form: PERPAT 301.
Rubella IgM ELISA	Active	Microbiology	HRPB	Serum	Plain tube	3-5 ml	2 weeks	Form: PERPAT 301.
Rubella PCR	Active	Virology	MKAK	Nasopharyngeal secretion Urine Throat swab Tracheal aspirate	Sterile container Sterile Container Swab should be put into 1.5-2.0 ml of VTM Sterile Container	1-3 ml 10 ml (Early morning first void) NA 1-3 ml	1 weeks	Form: MKAK-BPU-U01/Rev2018.
Russell Silver Syndrome	Active	Molekular Diagnostik	Hospital Tunku Azizah (HWKKKL)	Blood	2 EDTA tubes	3-5 ml	3.5-6.5 months	Form: Molecular Test Request Form HTA. Specialist sign. Sample must reach HTA Genetic Laboratory within 48 hours after sample collection.
Salivary Cortisol	Active	Patologi kimia & Integrasi	HPP	Saliva	SARSTEDT Salivette	1.5 mL, swab/ span putih haruslah basah sepenuhnya	21 days	Need to discuss case with Chemical Pathologist.
SARS CoV 2 Antibody	Active (By consultation only)	Virology	IMR	Serum Plasma	Plain Tube EDTA tube	1-3 ml 1-3 ml	2 weeks	Must consult with Pakar Virology, IMR.
SARS-CoV-2 Viral Isolation	Temporarily suspended until July	Virology	IMR	i) Nasopharyngeal swab ii)	i) -iv) Sterile plastic vial contain 2-3ml of	i) NPS, NPS&OPS: A flexible, fine	6 weeks	Form: Virology Test Request Form Version 1.1, IMR.

	2024 (Surat NIH 22.04.2024)			Throat swab, iii) Nasal swab, iv) Nasopharyngeal swab (NPS) & Oropharyngeal swab (OPS) iv) Oropharyngeal swab (OPS) v)Organ biopsies	VTM, v) Biopsy: remove portions, about 1.5cm cube of various parts of affected organs	shafter polyester swab. Use different swab for each nostrils ii) TS: Sterile swab iii) Nasal swab: Sterile swab. Use different swabs for each nostrils v) Biopsy: Sterile containers containing VTM to keep tissue moist		After consultation only.
Saline Loading Test	Refer Renin Aldosterone							
Schistosomiasis Serology	Active	Parasitology	IMR	Serum, plasma	Plain tube, EDTA tube	2 ml	2 weeks	Form: Per Pat 301.
SCN1A Related Seizure Disorder	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5 ml)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services IMR, To consult Clinical Genetics, Genetic Department, and HKL before take sample. Form need to be detail clinical, biochemical, imaging

								findings.
Selenium	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only), solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)	Plain tube	3 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a lot of analysis.

Serum Bile Acid	Active (Discuss case with Chemical Pathologist)	Biochemistry	H. Selayang	Serum	Plain tube	5 ml	45 days	Form: Per.Pat 301 (2 copy). Specialist stamp with clinical history & diagnosis.
Serum Erythropoetin	Active	Red Cell Unit	Hospital Ampang (MRKH	Peripheral blood (serum)	Plain tube	3.5 ml	MDS: 9 weeks MPN & PRV: 13 weeks	Form: Hospital Ampang Special Hematology Lab Requisition (Hem-RQ19.ver4.31. Aug.2021). Specialist signed with relevant clinical history and diagnosis. Deliver tubes immediately to the laboratory at room temperature. OR Separate serum from cells as soon as possible. Store frozen at -40°C and transport frozen serum on dried ice
Sex Hormone Binding (SHBG)	Active	Endocrinology	Hospital Putrajaya	Blood	Plain tube	5 ml	35 days	Form: PER.PAT 301 Stamp and sign specialist. Complete with diagnosis & clinical history.
Short Syndrome (PIK3R1)	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5ml)	2-5 ml blood EDTA (1-2 ml is acceptable for	5.5 months	Form: Molecular Diagnostic Services IMR, To consult Clinical Genetics,

						infants)/DNA		Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings.
Single Gene Testing: -EGFR -ALK -ROS1 -KRAS -1p19q deletion -IDH1/IDH2	Active	Cancer Genetics	Hospital Tunku Azizah (HWKKKL)	Paraffin Block / Slide	Suitable container / Plastic slide holder		3.5 months	Form: Molecular Test Request Form HTA. Specialist sign. Sample must reach HTA Genetic Laboratory as soon as possible.
Sirolimus	Active	Biochemistry	Hospital Tunku Azizah (HWKKKL)	Blood	EDTA tube	3 ml	7 days	Form: TDM.
Specific Mutation Screening (1 mutation)	Active	Molecular Diagnostics & Protein	IMR	Blood/ Urine sediment/muscle biopsy	EDTA tube/Urine Container/Sterile Container	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/urine sediment (20 mL of early morning urine)/muscle biopsy/DNA	3.5 months	Form: Molecular Diagnostic Services IMR, To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings. Send blood at ambient temperature. If >3 hours, keep sample cooled. Urine must be refrigerated after collection and kept

								chilled at all times until it arrives at the laboratory. Tissue biopsy must be placed inside sterile container. Tissue biopsy must be frozen immediately after collection and sent in ice.
Spinal Muscular Atrophy (SMA) - MLPA / Sequencing	Active	Molecular Diagnostics & Protein	IMR	Blood	EDTA tube	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services, IMR. To consult Clinical Genetics, Genetic Department, HKL before take sample. Form need to be detail clinical, biochemical, imaging findings.
Spinocerebellar Ataxia (SCA) CAG Repeat Analysis - SCA1, SCA2, SCA3, SCA6, SCA7)	Active	Molecular Diagnostics & Protein	IMR	Blood	EDTA tube	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	6.5 months	Form: Molecular Diagnostic Services, IMR. To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings. Send blood at ambient temperature. If >3

								hours, keep sample cooled.
St. Louis Encephalitis	Active	Virology	IMR	After consultation only	After consultation only	After consultation only	2 weeks	Form: Virology Test Request Form Version 1.1, IMR. After consultation only.
Stool FEME (Wet mount, fecal concentration, trichrome stain, DMSO stain and Gram Chromotrope stain)	Active	Parasitology	IMR	Fresh stool or Fixed stool	Screw lid, air tight container	5 g	2 weeks	Form: Per Pat 301. Fresh stool in plain container (specimen to reach lab within 24hr at room temperature). Before REFERRAL, Initial ID parasite to determine by customer.
Stool for: Cryptosporidium spp., Cyclospora spp. and Isospora spp. (DMSO stain) and Microsporidium spp.(Gram Chromotrope stain)	Active	Parasitology	IMR	Fresh stool or Fixed stool	Screw lid, air tight container	5 g	2 weeks	Form: Per Pat 301. Fresh stool in plain container (specimen to reach lab within 24hr at room temperature). Fixed stool must be in PVA or SAF.
Stool Reducing Sugar, Urine Reducing Sugar	Suspended (Alternative: PPUM but need payment)	Patologi Diagnostik	Hospital Tunku Azizah (HWKKKL)	Stool, Urine	Urine container	5mL	7 days	Form: PER.PAT 301.

Stool for fat globule	Private laboratory							
Sulfite Oxidase Deficiency (SUOX)	Active	Molecular Diagnostics & Protein	IMR	Blood	2 EDTA tubes (2.5 ml)	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA	5.5 months	Form: Molecular Diagnostic Services IMR, To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings.
Sulphite (Urin Dipstick)	Active	Makmal Genetik	Hospital Tunku Azizah (HWKKKL)	Freshly void urine	Clean Universal bottle	5 ml	30 days	Form: IEM Request Form HTA. Sample must reach HTA Genetic Laboratory as soon as possible.
Sulphonylurea	Private laboratory							
Sweat Test	Active	Biochemistry	Hospital Tunku Azizah (HWKKKL)	Sweat collector	15 ul	24 hours	7 days	By appointment. Test performed for in-patient only. Patient must be reviewed by Paediatric Chest Specialist. Call ext. 6902 to set appointment.
Tacrolimus (FK LEVEL)	Active	Makmal teras	HKL	Blood	EDTA tube	2 ml	7 days	Form: TDM
Taeniasis / cysticercosis - Serology	Active	Parasitology	IMR	Serum, anticoagulated blood	Plain tube, EDTA tube	2 ml	2 weeks	Form: Per. Pat 301

Targeted Gene Panel: -Lung Cancer -Breast/Ovarian Cancer -Colorectal Cancer	Active	Cancer Genetics	Hospital Tunku Azizah (HWKKKL)	Paraffin Block / Slide	Suitable container / Plastic slide holder		3.5 months	Form: Molecular Request Form HTA. Specialist sign. Sample must reach HTA Genetic Laboratory as soon as possible.
Testing of familial mutations / Carrier Testing	Active	Molecular Diagnostics & Protein	IMR	Blood/ Urine sediment/ Muscle biopsy	EDTA tube/Urine Container/Steril e Container	2-5 ml blood EDTA (1-2 ml is acceptable for infants)/urine sediment (20 mL of early morning urine)/muscle biopsy/DNA	3.5 months	Form: Molecular Diagnostic Services IMR, To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings. Send blood at ambient temperature. If >3 hours, keep sample cooled. Urine must be refrigerated after collection and kept chilled at all times until it arrives at the laboratory. Tissue biopsy must be placed inside sterile container. Tissue biopsy must be frozen immediately after collection and sent in ice.

Testosterone	Active	Biochemistry	HRPB	Blood	Plain tube	3 ml	14 days	Form: PER.PAT 301 Stamp and sign specialist. Complete with diagnosis & clinical history.
Inherited Thrombophilia Test a) Antithrombin Activity b) Protein C Activity c)Protein S Activity d) Activated Protein C Resistance (APCR)	Active	Hematology	HTA (Haematology)	Peripheral blood (Plasma)	Trisodium citrate 3.2%	Paeds: 1.8 ml x 3 tubes Adult: 2.7 ml x 4 tubes	7 weeks	Form: Per Pat 301 Request Form with relevant clinical history to be signed by attending physician. Mix the blood thoroughly, gently and immediately after collection at room temperature OR Separate plasma from cells as soon as possible (double spin). Store frozen at -40ºC and transport frozen plasma on dried ice
Thyroglobulin	Active	Chemical Pathology (Special Protein)	Hosp Pulau Pinang	Serum	Plain tube	3 ml	21 days	Form: PER.PAT 301 Please provide relevant history and latest thyroid function (TFT) test result. TG & Anti-Tg for thyroid cancer monitoring can share sample from same

								tube. Interval between samples 1 year except for thyroid cancer 6 months.
Thyroglobulin Antibody (Anti-Tg)	Active	Patologi Kimia (Special Protein)	Hosp Pulau Pinang	Serum	Plain tube	3 ml	21 days	Form: PER.PAT 301 Please provide relevant history and latest thyroid function (TFT) test result. TG & Anti-Tg for thyroid cancer monitoring can share sample from same tube. Interval between samples 1 year except for thyroid cancer 6 months.
Thyroid Stimulating Hormone Receptor Antibody (Anti-TSHR)/ Thyrotropin receptor antibodies (TRab)	Active	Chemical Pathology	HKL	Blood	Plain tube	3 ml	25 days	Form: PERPAT 301 Please provide relevant history and latest thyroid function (TFT) test result. Stamp and sign Endocrinologist/ Pakar Perubatan Am / Pakar Perubatan Keluarga (for hosp without in-house endocrinologist).
Thyroid-specific Peroxidase	Active	Patologi Kimia (Special Protein)	Hosp Pulau Pinang	Serum	Plain tube	3 ml	21 days	Form: PER.PAT 301 Please provide

Antibody (Anti-TPO)								relevant history and latest thyroid function (TFT) test result. TG & Anti-Tg for thyroid cancer monitoring can share sample from same tube. Interval between samples 1 year except for thyroid cancer 6 months.
Thyroxine Releasing Hormone (TRH)	Not offer in KKM							
Toxocariasis Serology	Active	Parasitology	IMR	Serum, plasma	Plain tube, EDTA tube	2 ml	2 weeks	Form: PERPAT 301.
Toxoplasma IgG ELISA	Active	Microbiology	HRPB	Serum	Plain tube	3-5 ml	2 weeks	Form: PERPAT 301.
Toxoplasma IgM ELISA	Active	Microbiology	HRPB	Serum	Plain tube	3-5 ml	2 weeks	Form: PERPAT 301.
Toxoplasmosis serology screening and Confirmatory Test	Active	Parasitology	IMR	Serum, anti-coagulated blood	Plain tube, EDTA tube	2 ml	3 weeks	Form PER PAT 301
Transferin	Active	Makmal teras	HKL	Blood	Plain tube	3 ml	15 days	Form: PER.PAT 30. Fresh sample, must keep 2-8°C. Sample stability 7 days in 2-8°C.
Transferin	Active	Special Protein	IMR	Blood	Plain tube	3 ml serum	35 days	Form: UPK Request

Isoform, CDG Type I & II								Form. Serum must reach the lab not more than 7 days (at 2°C-8°C) after collection date.
Transferin Receptor	Private Laboratory (Serum)							
Trichinellosis Diagnosis - Serology	Active	Parasitology	IMR	Serum, plasma	Plain tube, EDTA tube	2 ml	2 weeks	
Trypanosomiasis Microscopy	Active	Parasitology	IMR	Whole blood in EDTA, Thick blood film, Lymph node film	EDTA tube, Slide Mailer or Sterile air tight lid container	2.5 ml	1 weeks	Send sample in ice (Before REFERRAL, Initial ID parasite to determine by customer.
Tryptase	Active	Allergy	IMR	Blood/ Serum	Plain tube	Blood: 3 ml Serum: 0.5 ml	3 weeks	Form: Allergy Request Form Version 3.0, IMR. Tryptase test: Within 15 min up to 24 hr after onset of allergic symptoms; Tryptase test after anaphylaxis: 1st sample within 15 min up to 3 hrs after onset of symptoms, 2nd sample after 24-48 hrs to confirm return to baseline level, 3rd sample after 1-2 wks if incidents of

								mastocytosis or other causes of elevated basal levels are suspected.
Urine Bence Jones	Test not offered							
Urine for fat globulin	Private Laboratory							
Urine Reducing Sugar	Private Laboratory							
Urine P-Carboxylase	Refer IMR: Lysine Metabolism							
Urine Phase Contrast	Active	Nephro Clinic HKL & SCACC Lab HKL	HKL	Urine	Clean universal bottle	5 ml	NA	Ward/Clinic need to call & discuss Dr Wan Mohd Rasif, Pakar Nephro HKL.MO/HO make appointment Tue/Thurs & write on form, "Spoken to Dr Rasif".
Urine Toxicology	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only), solvents, others (toxicology) b) Urine	Sterile container	25 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis needed. Need more than 1 specimen if a lot of analysis.

				(alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				
Vanillylmendelic	Test not offered, replace with metanephrine							
Varicella Zoster Virus (VZV) DNA PCR (Qualitative)	Active	Microbiology	Hospital Sg Buloh	CSF Serum	Sterile container Plain tube	1 ml 1 ml	2 weeks	Form: PERPAT 301.
Varicella Zoster Virus (VZV) - IgM/IgG	Active	Microbiology	Hospital Sg Buloh	Serum	Plain tube	1 ml	2 weeks	Form: PERPAT 301
Vasopressin	Private Laboratory (Serum)							
Novel CORONAVIRUS qRT-PCR	Active	Virology	IMR	i) Nasopharyngeal swab ii) Throat swab, iii) Nasal	i) NPS: Sterile plastic vial contain 2-3ml of VTM, ii) TS: Sterile plastic vial	i) NPS: A flexible, fine shafter polyester swab. Use different	6 weeks	Virology Test Request Form Version 1.1, IMR. After consultation only.

				swab, iv) Nasopharyngeal swab (NPS) & Oropharyngeal swab (OPS) iv) Oropharyngeal swab (OPS)	contain 2-3ml of VTM iii) Nasal swab: Sterile plastic vial contain 2-3ml VTM	swab for each nostrils ii) TS: Sterile swab iii) Nasal swab: Sterile swab. Use different swabs for each nostrils		
Viral Screening (AES)	Active	Virology	MKAI	CSF	Sterile Container	0.5 1.0 ml	2 weeks	Form: AES MKAI. Specimen should be collected < 5 days after onset of illness. Specialist stamp & sign.
Vitamin B1 (Thiamin)	Private Laboratory (Serum)							
Vitamin B12 (Cobalamin)	Private Laboratory (Serum)							
Vitamin B3	Private Laboratory (Serum)							
Vitamin B6 (Pyridoxin)	Private Laboratory (Serum)							
Vitamin D	Active (Start 1 Okt 2023). Please call endocrinologist HRPB DR HIJJAZ	Biochem	HRPB	Serum	Plain Tube	3 mL	14 days	Only can be requested by endocrinologist/ endocrin ward. Stability 72hr (rt), 12 days (2-8°C), 1 year (-20°C).
Vitamin D	Stopped (No reagent)	Endocrinology	Hospital Putrajaya	Blood	Plain tube	4 ml	35 days	Form: PER.PAT 301 Stamp and sign

								MO/SPECIALIST. Complete with diagnosis & clinical history.
Vitamin E	Private Laboratory (Serum)							
VON WILLEBRAND FACTOR ASSAY a) VWF Antigen b) VWF Activity c) VWF: Ricof d) Collagen Binding Assay (CBA)	Active	Hematology	HTA (Haematology Laboratory)	Peripheral blood (Plasma)	Trisodium citrate 3.2%	Paeds: 1.8 ml x 3 tubes Adult: 2.7 ml x 4 tubes	5 weeks	Form: PERPAT 301 Request Form with relevant clinical history to be signed by attending physician. If patient had received fresh frozen plasma (FFP) transfusion must mention date and volumed transfused. Send sample to lab at room temperature ASAP or within 1 hour after blood taken. Separate plasma from cells as soon as possible.Store frozen at -40ºC and transport frozen plasma on dried ice.
West Nile Virus -PCR	Active	Virology	IMR	After consultation only	After consultation only	After consultation only	2 weeks	Form: Virology Test Request Form Version 1.1, IMR. After consultation only.
Whole Mitochondrial	Active	Molecular Diagnostics &	IMR	Blood	2 EDTA tubes (2.5 ml)	2-5 ml blood EDTA (1-2 ml	5.5 months	Form: Molecular Diagnostic Services

DNA (mtDNA hotspots)		Protein				is acceptable for infants)/DNA		IMR, To consult Clinical Genetics, Genetic Department, HKL before take sample. Form needs to be detail clinical, biochemical, imaging findings.
Yellow Fever Virus -PCR	Active	Virology	IMR	After consultation only	After consultation only	After consultation only	2 weeks	Form: Virology Test Request Form Version 1.1, IMR.After consultation only.
Y-Microdeletion	Active	Molekular Diagnostik	Hospital Tunku Azizah (HWKKKL)	Blood	2 EDTA tubes	3-5 ml	3.5-6.5 months	Form: Molecular Test Request Form HTA. Specialist sign. Sample must reach HTA Genetic Laboratory within 48 hours after sample collection.
Zika Virus Method: RT-PCR	Active	Microbiology	HRPB	Serum Urine CSF	Plain tube Sterile Container Sterile bijou bottle	5ml 10 ml 1 ml	3 days	Inform microbiology lab in HRPB before taking blood. Stamped the form by Specialist.
Zinc	Active	Toxicology	Jabatan Kimia, Ipoh	a) Blood (alcohol, drugs, pesticides, carbon monoxide gas (for blood samples only),	Plain tube	5 ml	-	Form: Pemeriksaan Forensik/ Toksikologi. Clear stamp of requesting doctor. Must tick specimen type & analysis

				solvents, others (toxicology) b) Urine (alcohol, drugs, pesticides, metal -copper (only for urine samples only,> 10ml), solvents, others (toxicology) c) Stomach/ vomiting (drugs, pesticides, solvents, corrosives/ acids, others (toxicology)				needed. Need more than 1 specimen if a lot of analysis.

APPENDIX

DEPARTMENT OF PATHOLOGY, HOSPITAL TAIPING LABORATORY HANDBOOK 2025

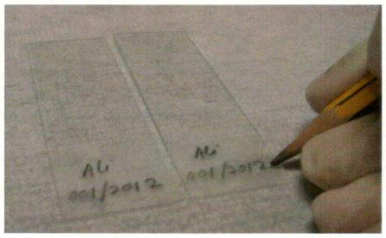
APPENDIX 1

PREPARATION OF THICK BLOOD SMEAR

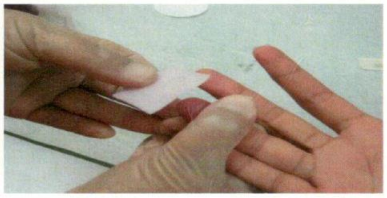
PENYEDIAAN SLAID FILEM DARAH TEBAL DAN NIPIS

1) Sediakan bahan-bahan di bawah sebelum membuat calitan darah:
- kapas
- lanset steril
- bekas buang bahan tajam
- alkohol 70%
- slaid kaca bersih, 3 x 1 inci
- rak slaid
- pensel
- kain gauz kapas 'Lint-free'
- sarung tangan getah

2) Label 2 keping slaid kaca dengan nama dan ID pesakit seperti dalam gambar



3) Pilih jari manis, lap dengan kapas yang dibasahkan dengan alkohol 70%, sehingga semua kotoran dan minyak dibuang dari hujung jari



4) Gunakan lanset steril untuk mencucuk hujung jari secara aksi cepat ("rolling action")

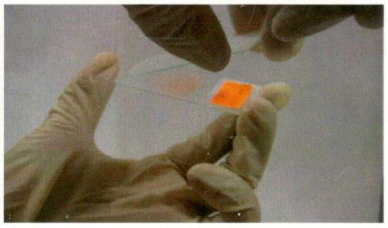
5) Lapkan titisan darah pertama dengan kain kapas gauz. Picitkan jari secara perlahan untuk keluarkan titisan darah baru.

6) Untuk membuat calitan darah tebal, Terbalikkan slaid kaca dan sentuhkan beberapa tompokan darah. Buat untuk beberapa keping slaid (2 calitan tebal dan 2 calitan nipis). Jika darah tidak keluar, picit jari secara perlahan

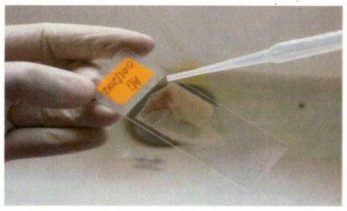
7) Gunakan bucu (tepi) slaid bersih, untuk serakkan tompokan darah tadi dalam bentuk bulatan (diameter 1-2 cm). Elakkan membuat calitan terlalu tebal supaya ia tidak tertanggal semasa proses pembasuhan slaid.

8) Untuk membuat calitan darah nipis, Buat satu tompokan darah di tengah slaid. Dengan menggunakan hujung slaid baru sebagai 'spreader', halakan dalam posisi menegak sebanyak 45° darjah. Pastikan tompokan darah telah tersebar di hujung "spreader" ini.

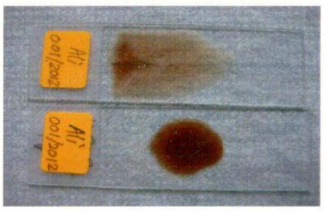
9) Tolak "spreader" secara stabil di sepanjang slaid dan pastikan ia berada dalam posisi 45° darjah. Hujung spreader harus sentiasa menyentuh permukaan slaid apabila calitan darah nipis dibuat.



10) Awetkan filem darah nipis dengan methanol (100% atau alkohol "absolute") dan biar kering di suhu bilik sepenuhnya sebelum pewarnaan. Filem darah tebal tidak boleh diawetkan.



11) Tunggu sehingga filem darah tebal dan nipis kering sepenuhnya sebelum pewarnaan.



Standard Operating Procedure

APPENDIX 2

Reference Range For Tests Offered During LIS Offline

1) Routine Biochemistry

Panel	Test	Age Min		Age Max		Reference Interval Male Min	Male Max	Female Min	Female Max	Comment	Age Min		Age Max		Critical Interval Min	Critical Interval Max	Unit	Method
BUSE / RP	Urea	0	month	12	months	1.8	4.9	1.8	4.9		0	year	12	years		>19.0	mmol/L	Urease
		1	year	3	years	1.8	6.0	1.8	6.0									
		4	years	13	years	2.5	6.0	2.5	6.0									
		14	years	19	years	3.0	7.5	3.0	7.5									
		20	years	50	years	3.2	7.4	2.5	6.7									
		51	years	130	years	3.0	9.2	3.5	7.2									
	Sodium	0	day	29	days	133	146	133	146		1	month	130	years	<125	>155	mmol/L	Ion-selective electrode diluted (ISE Indirect)
		1	month	12	months	139	146	139	146									
		1	year	18	years	138	145	138	145									
		19	years	90	years	136	145	136	145									
		91	years	130	years	132	146	132	146									
	Potassium	0	day	29	days	3.7	5.9	3.7	5.9		1	month	130	years	<2.80	>6.0	mmol/L	Ion-selective electrode diluted (ISE Indirect)
		1	month	12	months	4.1	5.3	4.1	5.3									
		1	year	18	years	3.4	4.7	3.4	4.7									
		19	years	130	years	3.5	5.1	3.5	5.1									
	Chloride	0	day	29	days	98	113	98	113								mmol/L	Ion-selective electrode diluted (ISE Indirect)
		1	month	90	years	98	107	98	107									
		91	years	130	years	98	111	98	111									
	Creatinine	0	month	12	months	30	48	30	48		0	year	12	years		>330	umol/L	Kinetic Alk. Picrate
		1	year	5	years	31	52	31	52									
		6	years	10	years	46	63	36	60									
		11	years	14	years	46	72	46	69									
		15	years	20	years	54	92	51	80									
		21	years	130	years	64	111	50	98									
	EGFR					>90		>90										Calculated
Cardiac Enzymes (CE)	Aspartate Aminotransferase, AST	0	year	130	years	5	34	5	34								U/L	Enzymatic (NADH (without P5P))
	Lactate Dehydrogenase	0	year	130	years	125	220	125	220								U/L	Lactate to Pyruvate (L to P)
	Creatine Kinase	0	year	130	years	30	200	29	168								U/L	NAC (N-acetyl-L-cysteine)
CSF Biochemistry	CSF Glucose	0	year	18	years	3.3	4.5	3.3	4.5		0	year	12	years		<1.6	mmol/L	Enzymatic (Hexokinase/G-6-PDH)
		19	years	130	years	2.2	3.9	2.2	3.9									
	CSF Protein	0	day	1	day	400	1200	400	1200	Note: CSF protein has been changed from mg/dL to mg/L, effective 6 October 2020.	0	year	12	years	>1870		mg/L	Benzethonium Chloride
		2	days	29	days	200	800	200	800									
		1	month	130	years	150	400	150	400									
	CSF Chloride									*Disclaimer: Performance has not been established for cadaveric specimens or the use of bodily fluids other than human serum / plasma / urine / CSF (analyte dependant).							mmol/L	Ion-selective electrode diluted (ISE Indirect)

Routine Biochemistry continued

Panel	Test	Age Min		Age Max		Reference Interval Male Min	Male Max	Female Min	Female Max	Comment	Age Min		Age Max		Critical Interval Min	Critical Interval Max	Unit
	Troponin I (High Sensitive)	0	year	130	year		<34.2		<15.6	Note: Troponin I has been changed from pg/mL to ng/L, effective 4 March, 2021. (Conversion 1 pg/mL = 1 ng/L.)							ng/L
	Ammonia	0	year	130	years	18	72	18	72	Specimen condition - received in ice-slurry within 15 minutes	0	year	12	years	>100		umol/L
	Lactate	0	year	130	years	0.5	2.2	0.5	2.2	Specimen condition - received in ice-slurry	0	year	12	years		>3.0	mmol/L
	Bilirubin, Total	0	day	1	day		<102.6		<102.6		0	day	28	days		>300.0	umol/L
		2	day	2	days		<171.0		<171.0								
		3	days	5	days		<205.2		<205.2								
		6	days	7	days		<171.0		<171.0								
		8	days	130	years	3.4	20.5	3.4	20.5								
	Calcium	0	day	10	days	1.90	2.60	1.90	2.60		1	month	12	years	<1.7	>3.1	mmol/L
		11	days	24	months	2.25	2.75	2.25	2.75								
		2	years	12	years	2.20	2.70	2.20	2.70								
		13	years	130	years	2.10	2.55	2.10	2.55								
	Glucose, Fasting	0	year	130	years	3.9	6.0	3.9	6.0								mmol/L
	Glucose, Random	0	year	130	years	3.9	7.7	3.9	7.7								
	2HPP	0	year	130	years	3.9	7.7	3.9	7.7								

2) Therapeutic Drug Monitoring (TDM)

Test	Age Min		Age Max		Reference Interval Male Min	Male Max	Female Min	Female Max	Comment	Age Min	Age Max	Critical Interval Min	Critical Interval Max	Unit	Method
Acetaminophen	0	year	130	years	10	20	10	20	Therapeutic range					mg/L	Enzymatic
	0	year	130	years	>200		>200		Toxic 4hr post						
	0	year	130	years	>50		>50		Toxic 12hr post						
Salicylate	0	year	130	years	1.09	2.17	1.09	2.17	Therapeutic range					mmol/L	Enzymatic / Colorimetric
	0	year	130	years	>2.17		>2.17		Toxic level						
	0	year	130	years	>5.07		>5.07		Lethal						

3) Immunoassay

Panel	Test	Age Min		Age Max		Reference Interval Male Min	Male Max	Female Min	Female Max	Comment	Age Min	Age Max	Critical Interval Min	Critical Interval Max	Unit	Method
	β-hCG, Total	0	day	130	years		<5.0		<5.0	Non-pregnant					IU/L	CMIA
		1	week	10	weeks			202.0	231000.0	Post LMP						
		11	weeks	15	weeks			22536.0	234990.0	Post LMP						
		16	weeks	22	weeks			8007.0	50064.0	Post LMP						
		23	weeks	40	weeks			1600.0	49413.0	Post LMP						
Thyroid Function test (TFT)	T4, Free	0	day	12	months	11.86	23.82	10.96	20.57						pmol/L	CMIA
		1	year	5	years	11.04	20.84	11.69	18.61							
		6	years	10	years	10.86	18.96	10.86	18.96							
		11	years	14	years	10.04	16.91	10.04	16.91							
		15	years	17	years	10.16	17.29	10.16	17.29							
		18	years	130	years	9.01	19.05	9.01	19.05							
	TSH	0	day	12	months	0.88	5.42	0.88	5.42	Note: TSH has been changed from µlU/mL to mIU/L, effective 6 October 2020.					mIU/L	CMIA
		1	year	10	years	0.67	4.50	0.66	4.75							
		11	years	14	years	0.58	3.59	0.47	4.13							
		15	year	130	years	0.35	4.94	0.35	4.94							
		Reference Range for TSH in Pregnancy In the first trimester, the lower reference range of TSH can be reduced by approximately 0.4 ulU/mL, while the upper reference range is reduced by approximately 0.5 ulU/mL. This reference limit should generally be applied beginning with the late first trimester, weeks 7-12, with a gradual return towards the nonpregnant range in the second and third trimeters. (Reference: 2017 Guidelines of the American Thyroid Association for the Diagnosis and Management of Thyroid Disease During Pregnancy and the Postpartum)														

4) Full Blood Count

REFERENCE RANGES OF ADULT AND PAEDIATRIC

Haematological Values For Normal Infants:

Parameters/ unit	Birth	Day 3	Day 7	Day 14	1 Month	2 Months	3-6 Months
Red blood cell count (RBC) x 10^{12}/L	5.0-7.0	4.0-6.6	3.9-6.3	3.6-6.2	3.0-5.4	3.1-4.3	4.1-5.3
Haemoglobin / g/dL	14.0-22.0	18.0-21.0	17.1-17.9	16.1-16.9	11.5-16.5	9.4-13.0	11.1-14.1
Hematocrit / %	45-75	45-67	42-66	31-71	33-53	28-42	30-40
Mean cell volume (MCV) / fL	100-120	92-118	88-126	86-124	92-116	87-103	68-84
Mean cell Hb (MCH) / pg	31-37	31-37	31-37	31-37	31-37	27-33	24-30
Mean cell Hb conc (MCHC) / g/dL	30.0-36.0	29.0-37.0	27.0-38.0	27.0-38.0	29.0-37.0	28.5-35.5	30.0-36.0
Reticulocytes / x 10^9/L	120-400	50-350	50-100	50-100	20-60	30-50	40-100
White blood cell count (WBC) / x 10^9/L	18 ± 8 10-26	7-23	6-22	6-22	5-19	5-15	6-18
Neutrophils / x 10^9/L	4-14	3-5	3-6	3-7	3-9	1-5	1-6
Lymphocytes / x 10^9/L	3-8	2-8	3-9	3-9	3-16	4-10	4-12
Monocytes / x 10^9/L	0.5-2.0	0.5-1.0	0.1-1.7	0.1-1.7	0.3-1.0	0.4-1.2	0.2-1.2
Eosinophils / x 10^9/L	0.1-1.0	0.1-2.0	0.1-0.8	0.1-0.9	0.2-1.0	0.1-1.0	0.1-1.0
Platelets / x 10^9/L	100-450	210-500	160-500	170-500	200-500	210-650	200-550

(Adapted from Bain, B. J., Bates, I., & Laffan, M. A. (2012). *Dacie and Lewis Practical Haematology)*

REFERENCE RANGES OF ADULT AND PAEDIATRIC

Haematological Values For Normal Children:

Parameters/ unit	1 Year	2-6 Years	6-12 Years
Red blood cell count (RBC) / x 10^{12}/L	3.9-5.1	4.0-5.2	4.0-5.2
Haemoglobin / g/Dl	11.1-14.1	11.0-14.0	11.5-15.5
Hematocrit / %	30-38	34-40	35-45
Mean cell volume (MCV)/ fL	72-84	75-87	77-95
Mean cell Hb (MCH) / pg	25-29	24-30	25-33
Mean cell Hb conc (MCHC) / g/dL	32-36	31-37	31-37
Reticulocytes / x 10^9/L	30-100	30-100	30-100
White blood cell count (WBC) / x10^9/L	6-16	5-15	5-13
Neutrophils / x 10^9/L	1-7	1.5-8	2-8
Lymphocytes / x 10^9/L	3.5-11	6-9	1-5
Monocytes / x 10^9/L	0.2-1.0	0.2-1.0	0.2-1.0
Eosinophils / x 10^9/L	0.1-1.0	0.1-1.0	0.1-1.0
Platelets / x 10^9/L	200-550	200-490	170-450

(Adapted from Bain, B. J., Bates, I., & Laffan, M. A. (2012). *Dacie and Lewis Practical Haematology)*

REFERENCE RANGES OF ADULT AND PAEDIATRIC

Haematological Values For Normal Adult:

Parameters / unit	Reference Ranges	
	MEN	WOMEN
Red blood cell count (RBC) / x 10^{12}/L	4.5 - 5.5	3.8-4.8
Haemoglobin / g/dL	13.0-17.0	12.0-15.0
Hematocrit / %	40-50	36-46
Mean cell volume (MCV) / fL	80.0 - 97.0	
Mean cell Hb (MCH) / pg	27.0-32.0	
Mean cell Hb conc (MCHC)/ g/dL	31.5- 34.5	
Reticulocytes / x 10^9/L	0.2-2.0	
White blood cell count (WBC) / x10^9/L	4.0 - 11.0	
Neutrophils / x 10^9/L	2.0-7.0	
Lymphocytes / x 10^9LI	1.0-3.0	
Monocytes / x 10^9/L	0.2-1.0	
Eosinophils / x 10^9/L	0.02-0.5	
Platelets / x 10^9/L	150-410	
RDW (Red distribution with) / %	11.6 -14.0	
MPV (Mean platelet volume) / fL	7.4-10.4	

(Adapted from Bain, B. J., Bates, I., & Laffan, M. A. (2012). *Dacie and Lewis Practical Haematology)*

5) Coagulation Profile

PT REFERENCE RANGES

Prothrombin Time: 11.7 sec – 15.3 sec

INR:2.0 – 2.5 : Probable VT and Smoking

:2.0 – 3.0 : DVT, RIA, AF

:3.0 – 4.5 : Recurring DVT

APTT REFERENCE RANGES

Normal range 27.4 sec – 44.5 sec

FIBRINOGEN REFERENCE RANGES

Normal Range (Adult): 200-400mg/dL

(Each laboratory should determine its own normal Fibrinogen level)

D-DIMER REFERENCE RANGES

Normal Range (Adult): <0.50µg/mL

(Each laboratory should determine its own normal D-Dimer level)

DEPARTMENT OF PATHOLOGY
HOSPITAL TAIPING
JALAN TAMING SARI
34000 TAIPING
PERAK DARUL RIDZUAN
TEL 05-820 4000 FAX 05-807 9300