

1.0 INTRODUCTION

The Haematology Laboratory is situated in Room 1 in the main laboratory where it caters for both inpatient and outpatient samples. It provides a 24 hours service.

The tests done are quantitative and qualitative tests. Some of the results are available on the same day.

2.0 LIST OF TESTS PROVIDED

i. Haematology Lab

Tests done include:

- a. Full Blood Count, reticulocytes and NRBC.
- b. Full Blood Picture
- c. Erythrocyte sedimentation rate (ESR)
- d. G6PD fluorescent spot test
- e. PT/APTT
- f. Fibrinogen
- g. Mixing Test
- h. D – Dimers
- i. Bone marrow aspiration (BMA)
- j. Kleihauer test
- k. Urine eosinophil
- l. Urine antenatal check (ANC)
 - Protein
 - Glucose
- m. Urine/Stool for reducing sugars
- n. Stool pH
- o. Hb analysis – capillary electrophoresis (CE) method

ii. Outsource test

A. Jabatan Patologi, Hospital Pulau Pinang

- a. Hb analysis – High performance liquid chromatography (HPLC) method
- b. Flowcytometry (immunophenotyping)
- c. CD4/CD8 count
- d. Factor assays (Factor VIII & Factor IX)
- e. Factor Inhibitor (Bethesda assay)
- f. Ham's test
- g. Lupus anticoagulant (LA)
- h. Von Willebrand study
- i. Bone marrow aspiration (BMA) cytogenetic

B. Pusat Darah Negara

- a. Thrombophilia screening
 - anti phospholipid antibody (anticardiolipin, anti Beta2 GP1)
 - activated protein C resistant (APCR)
 - anti thrombin activity
 - Protein C and Protein S
 - FV Leiden mutation
 - Prothrombin 20210A
- b. Von Willebrand study
- c. Platelet Aggregation test
- d. Factor assays

C. Jabatan Patologi, Hospital Kuala Lumpur

- a. DNA analysis for α -thalassaemia

D. Kuala Lumpur Women and Children's Hospital

- a. Cytogenetic study (Chromosome Study) for paediatric

E. Institute of Medical Research (IMR)

- a. Bone Marrow for molecular study
- b. DNA analysis β Thalassemia
 - Multiplex ARMS
 - β Thalassemia strip assay
- c. Sequencing α -thalassaemia and β Thalassemia
- d. Confirmation of thalassaemia and haemoglobinopathies
- e. Leukaemia Testing -28 translocation
- f. Fluorescence in situ hybridization (FISH)
- g. Array comparative genomic hybridisation (CGH)
- h. Leukaemia mutation (AML & CML)

E. Jabatan Patologi, Hospital Ampang

- a. JAK 2
- b. BCR-ABL
- c. Factor assays (FII, FV, FVII, FX, FXI, FXII, FXIII)
- d. ADAMTS13
- e. Heparin induced thrombocytopenia
- f. Anti- Xa
- g. F1P1L1 – PDGFRA
- h. G6PD –Quantitative
- i. Serum Erythropoitein

3.0 REQUEST FORMS AND CONTAINERS

- Please refer to type of container and specimen tube (page 112).
- The patient's I.C, clinical data and diagnosis are essential.

4.0 SPECIMEN COLLECTION AND DESPATCHING

A correct amount of blood volume as stated on the tube is collected into the appropriate anticoagulant for the test requested. Please refer to page 16. The blood should be mixed gently and thoroughly for 5 seconds by a rotary wrist movement .inversion movement.

All specimens should ideally be sent to the laboratory immediately after collection. Urgent specimens requiring immediate results will be sent by the ward PPK to lab counter. If a delay is unavoidable, blood specimens collected in an EDTA tube should be stored in a refrigerator (4°C, not more than 8hours). A completely filled request form should accompany every specimen for the test requested and should reach the laboratory during office hours.

Some Examples of Certain Tests

- a. FBC
Container: EDTA tube
Venepuncture: 2.5 ml of blood, invert the tube gently 6-8 times, cap tightly & send to the lab
- b. ESR
Container: 0.4 ml 3.2% sodium citrate tube
Venepuncture: 1.6 ml of blood, invert the tube gently 6-8 times, cap tightly & send to the laboratory
- c. PT/APTT/Fib/INR
Container : Sodium citrate
Venepuncture: Fill up to the indicator line, gently invert the tube 3-4 times

5.0 REQUEST FOR FULL BLOOD COUNTS & FULL BLOOD PICTURE

- 5.1 For FBP, details of the clinical history, diagnosis and indication should be provided in the request form.
- 5.2 Where patients require close monitoring of blood counts, specimens should be sent on alternate days or based on pathologist advice / clinical indication.

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- 5.3 Repeat FBP should be at least after 7 days period or based on pathologist advice.

6.0 LIST OF TESTS AVAILABLE AFTER OFFICE HOUR

- i. Haematology
 - a. Full Blood Count
 - b. Glukosa - 6 - Fosfat Dehidrogenase (G6PD) Test
 - c. Prothrombin time (PT)
 - d. Activated partial thromboplastin time (APTT)
 - e. D – Dimer
 - f. Fibrinogen
 - g. Urine Reducing Sugar (Paediatric only)

Note: If results are needed urgently, please call the lab (Ext 162)

7.0 LIST OF TESTS THAT REQUIRES APPOINTMENT

- a. Bone Marrow Aspirate and Trepine (BMAT)
- b. Flowcytometry (immunophenotyping)

8.0 BONE MARROW ASPIRATE

- 8.1 Appointment required. Procedure shall be carried out before 11am.
- 8.2 MLT's will go to the ward to prepare bone marrow smears at bed site.
- 8.3 Marrow aspirate may be obtained from posterior iliac spine or sternum in adults, and from the tibia or ilium in children. Only the first 0.5 ml will contain substantial particles. Therefore, not advisable to aspirate more, as the particles may become diluted with blood.
- 8.4 Cytochemical investigations are also carried out in all cases of leukaemia. These include Myeloperoxidase, PAS, Non Specific Esterase and Acid Phosphatase.
- 8.5 Additional test
Cytogenetic or Molecular Studies, to inform lab first.
- 8.6 For all new cases, it is compulsory to send samples (in EDTA) for Immunophenotyping test (flowcytometry).

9 COAGULATION TEST

9.1 Guidelines for Coagulation Tests:

Indications	Test
Warfarin Therapy Control	PT (Prothrombin Time),INR
Heparin Therapy Control	APTT (Activated Partial Thromboplastin Time)
D.I.C Screen	PT, APTT, Platelet Count
Liver Biopsy	PT
Pre-operative cases	PT, APTT

9.2 Guidelines for specimen collection of PT & APTT

9.2.1 Blood sample collected in Sodium citrate tube (1 part of sodium citrate + 9 part of blood).

9.2.2 Ideally patient sample should be tested within 2 hours of blood collection.

9.2.3 Time of specimen taken should be stated on the request form.

9.3 Coagulation Screening Tests

- a. Where a patient is suspected of having a bleeding disorder, the following tests should be performed as a preliminary screen:
PT, APTT, Platelet Count and FBP
Isolated prolonged APTT, will be followed by mixing test
- b. If results are abnormal or if there are any doubts, the attending doctor should consult the Pathologist / Medical Officer. Full coagulation studies will then be arranged if indicated.

10 REPORTING OF RESULTS

- All results can be collected from the pigeon hole of Pathology Department, HSJ.
- Result also able to view and print through the Laboratory Information System (LIS) which are available at wards.

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11 COMMUNICATION

For any enquiry of the services or test provided by the Haematology/ Clinical Laboratory, kindly contact the following extension numbers:

- | | | |
|------|--|----------|
| i. | Head of Unit
Dr Tuan Hulwani Tuan Mohamad | Ext. 161 |
| ii. | Medical Officer | Ext. 420 |
| iii. | Senior MLT
En Mohd Yazid | Ext. 162 |

Enquiries about results or appointments for special tests can be made through Haematology / Clinical Lab ext 162

Please note that for Bone Marrow Aspiration appointments, the respective ward doctors will have to discuss and obtain the permission of the pathologist first before booking an appointment date. In the absence of the pathologist, the ward doctor will have to discuss with senior MLT of the Haematology Lab.

List of Haematology/Clinical Tests Available

NO.	TEST	CONTAINER	VOLUME	FORM	REF. RANGE	NOTE
1.	Full Blood Count a. Haemoglobin b. TRBC c. PCV/HCT d. MCV e. MCH f. MCHC g. Platelets h. TWBC Reticulocyte Count	EDTA	2.5 ml	PER – PAT 301	Please see reference range for FBC	
2.	Full Blood Picture	EDTA	2.5 ml	PPDK 11	Please see reference range for FBC	
3.	ESR	3.2% Na Citrate tube (Black cap)	1.6 ml	PER – PAT 301	2 – 10 mm/hr	
4.	G6PD	Whatman Filter Paper	Blot as 10 cent coin	G6PD Form		

NO.	TEST	CONTAINER	VOLUME	FORM	REF. RANGE	NOTE
5.	Hemosiderin, urine	10 ml Urine	Universal container	PER – PAT 301		
6.	Prothrombin Time	3.2% Na Citrate tube	2.25 ml	PER – PAT 301	10.5 – 14 seconds	Exact amount of blood is important, send to lab immediately
7.	APTT	3.2% Na Citrate tube	2.25 ml	PER – PAT 301	25 – 40 seconds	Send to lab immediately
8.	Fibrinogen	3.2% Na Citrate tube	2.25 ml	PER – PAT 301	180 – 350 µg/dL	Send to lab immediately
9.	FDP/ D – Dimer	3.2% Na Citrate tube	2.25 ml	PER – PAT 301	Plasma: < 5 µg/mL Serum:< 10 µg/mL	Send to lab immediately
10.	Hb analysis	EDTA	2.5 ml	PER – PAT 301	-	If Hb <11, requires iron studies
11.	Urine ANC	Sterile container	20 ml (urine)	PER – PAT 301	-	
12.	Urine / stool for reducing sugars	Sterile container	20 ml (urine) Any amount (stool)	PER – PAT 301	-	
13.	Bone Marrow		6 – 15 slides	PER – PAT 301		By appointment

REFERENCE RANGE FOR FULL BLOOD COUNT

Parameter	Infant/Children					Adult		
	0 day	3-6 month	1yr	2-6 yrs	6-12 yrs	Male	Female	Male & Female
1. WBC	10.0-26.0	6.0-18.0	6.0-16.0	5.0-15.0	5.0-13.0	-	-	4.0-10.0
2. Hb	14.0-22.0	11.1-14.1	11.1-14.1	11.0-14	11.5-15.5	13.0-17.0	12.0-15.0	-
3. Platelet	150-450	200-550	200-550	200-450	180-400	-	-	150-400
4. PCV	0.45-0.75	0.30-0.40	0.30-0.38	0.34-0.40	0.35-0.45	0.40-0.50	0.36-0.46	-
5. RBC	5.0-7.0	4.1-5.3	3.9-5.1	4.0-5.2	4.0-5.2	4.5-5.5	3.8-4.8	-
6. MCV	100-120	68-64	72-84	75-87	77-95	-	-	83-101
7. MCH	31-37	24-30	25-29	24-30	25-33	-	-	27-32
8. MCHC	30.0-36.0	30.0-36.0	32.0-36.0	31.0-37.0	31.0-37.0	-	-	31.5-34.5
9. RDW	-	-	-	-	-	-	-	11.6-14.0
10. NE #	4.0-14.0	1.0-6.0	1.0-7.0	1.5-8.0	2.0-8.0	-	-	2.0-7.0
11. NE %	-	-	-	-	-	-	-	40-80
12. LY #	3.0-8.0	4.0-12.0	3.5-11.0	6.0-9.0	1.0-5.0	-	-	1.0-3.0
13. LY %	-	-	-	-	-	-	-	20-40
14. MO #	0.5-2.0	0.2-1.2	0.2-1.0	0.2-1.0	0.2-1.0	-	-	0.2-1.0
15. MO %	-	-	-	-	-	-	-	2-10
16. EO #	0.1-1.0	0.1-1.0	0.1-1.0	0.1-1.0	0.1-1.0	-	-	0.02-0.5
17. EO %	-	-	-	-	-	-	-	1.0-6.0
18. BA #	-	-	-	-	-	-	-	0.02-0.1
19. BA %	-	-	-	-	-	-	-	< 1-2 %

Reference: Practical Haematology, Dacie & Lewis, 9th Edition, 2001