

Title: Haematology User Handbook

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Department Haematology

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1. Introduction

1.1 General Information

King's College Hospital was originally opened in 1840 and moved to the Denmark Hill site in 1909. It became part of the NHS in 1948 as a teaching hospital. Following the dissolution of South London Healthcare Trust, King's took over the Princess Royal University Hospital (PRUH) in October 2013.

King's College Hospital NHS Foundation Trust is a large provider of acute and specialist services that serves a population of over 1,000,000 in the economically diverse Greater London boroughs of Southwark, Lambeth, Bromley and Bexley. The trust operates from 5 sites; Denmark Hill (main) site, Princess Royal University Hospital (PRUH) Bromley, Beckenham Hospital, Queen Mary's Hospital Sidcup and Orpington Hospital. The PRUH is in Farnborough, near Orpington, Kent. Beckenham Hospital is about 6 miles to the north of the PRUH and provides outpatient services. Orpington Hospital is 3 miles south of PRUH and provides outpatient services and has 40 intermediate care beds.

The Trust has over 1300 beds including 1050 acute, 125 maternity and 144 critical care beds. The Denmark Hill site has approximately 836 beds including a major critical care service (122 beds) and maternity services (103 beds). Princess Royal University Hospital has 455 acute beds, 22 critical care and 22 maternity beds (plus a midwifery led birthing centre) whilst Orpington provides 29 acute beds. Emergency Department services are provided at both King's College Hospital Denmark Hill and Princess Royal University Hospital.

All core services are provided from King's College Hospital Denmark Hill and Princess Royal University Hospital while outpatient and surgical services are provided from Orpington Hospital.

Viapath King's College Hospital laboratories are accredited to ISO 15189:2012 Standard by the United Kingdom Accreditation Service (UKAS).

Each department undergoes regular assessments by UKAS to demonstrate that the quality system in place provides a service that meets recognised quality standards (ISO 15189:2012 Standard).

The Blood Sciences Laboratory (BSL) at King's Denmark Hill (DH) undertake routine Haematology & Haemostasis, as well as some Specialist Haemostasis investigations, which include full blood counts, clotting, malaria diagnosis, factors assays, thrombophilia tests.

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A list of BSL Haematology accredited tests can be found on our schedule of accreditation available on the UKAS website. Copy and paste the link below into your search engine for DH:

https://www.ukas.com/wp-content/uploads/schedule_uploads/00007/9092%20Medical%20Single.pdf

The list can also be found by entering the department's accreditation number (9092 - DH) in the search bar of the UKAS website <https://www.ukas.com/search-accredited-organisations>

This Handbook includes information on:

- Contact details for key staff
- Service levels and hours of operation
- Location of services
- Types of investigation offered
- Types of specimens required and collection conditions.
- Instructions for collecting specimens with a particular emphasis on safety and maintenance of sample validity

Should any service user have any queries in connection with any aspect of the BSL Haematology service, contact should be made with the relevant departmental senior staff, the Operations Manager, Service Delivery Manager or the Departments Quality Manager.

This Haematology User Handbook should be user-friendly and intuitive. Suggestions for improving the content for the next edition are welcome.

1.2 Pathology Laboratory

The Blood Sciences Laboratory department includes the following specialties: -

Blood Sciences:

- Biochemistry
- Haematology / Haemostasis
- Blood Transfusion

Access to all areas of the Blood Sciences department is restricted to authorised staff only. All entrances into the department are secured by digi-lock or proximity pass access.

The department operates in compliance with the standards laid out by ISO 15189:2012.

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The laboratories are registered for training with the Institute of Biomedical Sciences (IBMS).

- The qualified health professionals (Biomedical Scientists) employed in the department are registered with the Health Professions Council (HCPC) meeting the standards for their respective training, professional skills, behaviour and health.
- **Clinical advice** and interpretation of results is available during the laboratory routine opening hours.
- **Clinical advice (out of hours)** - contact details and access to clinical advice out-of-hours is listed.

1.3 Key personnel and contact details

For Denmark Hill switchboard dial 020 3299 9000 or direct dial 020 3299 extn

For OOH Clinical Advice Haematology Registrar is contactable via the main switch board number above or Lab Specialist Registrar ext 32435, bleep no. 737*KH3080.

Clinical Lead		
Professor R Arya		
Haematology BSL Laboratory – Denmark Hill site		
Name	Designation	Contact details
Ian Roney	Service Delivery Manager	31687 ian.roney@nhs.net
Vassan Thavarajah	BSL Haematology & Haemostasis Operations Manager	34477 vassan.thavarajah@nhs.net
Volha Klimovich	Quality Manager	34671 v.klimovich@nhs.net

Postal addresses:

BSL Haematology & Haemostasis Department
King's College Hospital NHS Foundation Trust
Ground Floor, Bessemer Wing
Denmark Hill
London
SE5 9RS

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2. Laboratory Service

The department provides a wide range of analytical services for diagnosis, monitoring, screening and follow-up of patients. Clinically qualified members of the laboratory are available on-site during normal working hours (and by air-call at other times).

Successful laboratory diagnosis depends greatly upon the selection, timing and method of collection of specimens.

Medical staff are urged to discuss with Senior Blood Science staff members any problem regarding the choice of investigation, the nature and method of specimen collection and interpretation of results.

2.1 Normal laboratory opening times

Monday - Friday: 09:00 – 17:30

The Central Specimen reception is open 24h and 7 days a week for specimen drop off.

2.2 Out of hours service (Including Bank Holidays)

The out of hours service runs outside of the routine lab hours listed above. At least one Biomedical Scientist (BMS) is on at all times and should be contacted on

0203 299 6216

Tests offered include those in section 3 below.

Clinical advice out of hours can be obtained from the Lab Specialist Registrar who can be contacted through the Hospital switchboard.

Specialist investigations may be available following discussions between the requesting clinician and a senior member of the laboratory team.

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3. Use of the Laboratory

3.1 Patient Identification and Specimen Labelling

Either an EPR-based or a paper-based request must accompany all specimens sent to the laboratory. It should clearly state the following information. Those in bold are a minimum requirement and without them the sample could be discarded or delayed:

- **Patient name**
- **Hospital number/NHS number**
- **Date of birth (age if DOB not known)**
- **Sex**
- **Ward or Address for report**
- **Requesting Medical Officer/GP name and number**
- **Date and time specimen taken**
- **Tests required**

Other useful data:

- Contact number for requesting clinician
- Patient address
- All relevant clinical details.

It is the responsibility of the person collecting the sample to ensure it is correctly labelled.

Under no circumstances is it possible to change the details once the sample has been sent to the laboratory.

The following will be rejected:

- Unlabelled specimens
- Inadequate patient information
- Mismatched samples and forms
- Grossly leaking specimens

Specimens are accepted only when they are correctly labelled and collected as per instructions provided within this Guide and other related policies to ensure validity of the results.

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The Haematology department will strictly enforce this policy. The requested analyses will **NOT** be performed on any samples where there is any discrepancy with patient identification.

3.2 Urgent tests

All urgent requests for routine blood tests that are performed in-house will be reported within 1 hour of receipt of the specimen into the laboratory. Other specialist assays may be prioritised if there is a valid clinical indication, please contact the Operations Manager for Haematology to discuss individual cases.

3.3 Transportation of Specimens

Samples must be delivered to the department in a way to protect the integrity of the sample. Samples must not be exposed to extreme temperature or prolonged transport. If samples are in danger of being exposed to conditions where sample integrity can be compromised, please contact the laboratory to discuss the most appropriate method of transport.

When receiving samples from an external institution or laboratory, it is the responsibility of the sender to ensure that the samples are packed in accordance with the current postal regulations, contain appropriate paper work and are labelled correctly. Courier / taxi / suitable transport should be arranged by the sending institution or laboratory.

All pathological samples must have:

3.3.1 Primary receptacle

Primary receptacle - a primary watertight leak-proof receptacle containing the specimen. The receptacle must be packaged with enough absorbent material to absorb all fluid in case of breakage.

3.3.2 Secondary packaging

- Secondary packaging - a second durable, watertight, leak-proof packaging to enclose and protect the primary receptacle(s) i.e. the specimen bag
- All samples must be placed in individual plastic 'kangaroo' type sample bags to avoid cross contamination. Any documentation e.g. request forms are to be placed in the separate pocket on the outside of the bag.
- Bags must not be sealed using staples, pins or paperclips.
- Several cushioned primary receptacles may be placed in one secondary packaging, but sufficient additional absorbent material shall be used to absorb all fluid in case of breakage.

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3.3.3 Outer packaging

The secondary packaging is placed in outer shipping packaging with suitable cushioning material. Outer packaging protects contents from outside influences, such as physical damage, while in transit.

- For postal specimens this will be a UN3373 box
- For cross-site or GP transport this will be a Daniels box

Any specimens that are received leaking or in a dangerous condition will not be processed but will be discarded. In this event the clinician will be informed via a report generated electronically on the pathology computer system.

3.4 Transport of specimens by road

The transport of most specimens from the General Practitioner's surgeries or outreach clinics to the hospital laboratory is provided by designated Courier service providers who will be familiar with their responsibilities.

If for any reason, pathological samples have to be transported via a contracted transport supplier, the following guidelines must be adhered to,

- The box must not be transported in the same compartment as passengers – but must be placed in the boot of any vehicle or the rear compartment of any van used and firmly secured.
- Mail must not be transported in the same carrier box as specimens.
- The container must be secured using appropriate means whilst being transported in the vehicle.
- Specimens must be transported in a secure transport box with a fastened leak proof lid. (Compliant with IATA Packaging Instruction 650 or 621 and UN3373 or UN3291)

It is the responsibility of those sending specimens from locations within the Trust but outside the laboratory site that the correct procedures are observed and that they obtain and utilise the approved and correctly labelled transport boxes.

Each box must display a biohazard warning sign and must also state that the box must not be tampered with or opened and a telephone contact number included for emergency purposes.

Carriage of pathological specimens between hospitals and/ or GP clinics and the hospital by road comes under the remit of 'The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009, as amended (CDG Regs)' – ADR regulations.

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4. List of examinations performed in BSL Haematology

Test	Sample type	Minimum Sample Volume	Requirements	Turnaround Time	Time Limit for adding extra tests	Reference Range	Notes
ANTI-XA	Tri-sodium citrate/blue top tube	3 mls X 2	Samples to be brought directly to the lab immediately after clean venepuncture	1 day -1 week	1 hour	0.1 - 1.0 IU/ml	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.
AT3	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	80-130 %	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.
CLAUS FIBRINOGEN	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	4 hours	Upto 12 years 1.7 – 4.0 >12 years 1.8 – 4.9	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.

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Test	Sample type	Minimum Sample Volume	Requirements	Turnaround Time	Time Limit for adding extra tests	Reference Range	Notes
COAGULATION SCREEN	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	4 hours	INR: 0.9-1.5 APTR: 0.80-1.14	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.
Cold Agglutinins	WHOLE BLOOD K3 EDTA	4ml EDTA	Must be taken AND kept at strict 37°C. Inform lab prior to testing	1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	N/A	N/A	If sample is not at strict 37°C then test cannot be performed.
Correction Studies INR & APTR	Tri-sodium citrate/blue top tube	3 x 3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	4 hours	N/A	Clots of any size, haemolysis, underfilling or overfilling will affect result.
Dabigatran	Tri-sodium citrate/blue top tube	3 x 3 mL	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	4 hours	N/A	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.

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D-DIMER	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	4 hours	Upto 12 yrs =<312 ng/ml FEU >12yrs =<500 ng/ml FEU	Clots of any size , haemolysis, underfilling or overfilling will affect result.
ESR	WHOLE BLOOD K3 EDTA	1 ml		1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	24 hours	Males = 1-10 mm/Hr Females = 1-15 mm/Hr	
FBC	WHOLE BLOOD K3 EDTA	1 ml		1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	24 HOURS	See Appendix 1	Any patient suspected to have cold agglutinins must have their sample kept at 37oC and brought to the laboratory (Blood Sciences Laboratory) immediately
FII	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	50-150 u/dl	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.

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Test	Sample type	Minimum Sample Volume	Requirements	Turnaround Time	Time Limit for adding extra tests	Reference Range	Notes
FILM	WHOLE BLOOD K3 EDTA	1 ml	Phone the laboratory on ext. 32426 for All film requests	48 Hours	24 HOURS	N/A	Any patient suspected to have cold agglutinins must have their sample kept at 37oC and brought to the laboratory immediately (Blood Sciences Laboratory-Analytical Haematology)
FIX	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	50-150 u/dl	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.
FV	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	50-150 u/dl	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.

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Test	Sample type	Minimum Sample Volume	Requirements	Turnaround Time	Time Limit for adding extra tests	Reference Range	Notes
FVII	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	50-150 u/dl	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected..
FVIII	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	50-150 u/dl	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.
FX	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	50-150 u/dl	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.
FXI	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	60-150 u/dl	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.

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FXII	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	40-150 u/dl	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected.
Glandular Fever (GF)	WHOLE BLOOD K3 EDTA	1 ml		24-48 hours	24 HOURS	N/A	Negative result cannot completely rule out the possibility of Infectious Mononucleosis, as antibodies may be absent or present at too low a level to be detected. Other conditions can cause a positive result. Test should only be used for symptomatic individuals suspected of having IM and should be used for diagnosis only in conjunction with other clinical findings

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Test	Sample type	Minimum Sample Volume	Requirements	Turnaround Time	Time Limit for adding extra tests	Reference Range	Notes
INR	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	4 hours	0.9-1.5	Clots of any size , haemolysis, underfilling or overfilling will affect result.
INR FOR WARFARIN CONTROL	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	4 hours	2.00 - 4.99	Clots of any size , haemolysis, underfilling or overfilling will affect result.
LUPUS ANTICOAGULANT SCREEN	Tri-sodium citrate/blue top tube	3 mls x 2	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	DRVV SCREEN RATIO: < 1.2	Clots of any size , haemolysis, underfilling or overfilling will affect result. Certain anticoagulants such as, warfarin, will affect interpretation of results.
MALARIA	WHOLE BLOOD K2/K3 EDTA	1 ml	Sample preferably taken at height of fever	1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	24 HOURS	N/A	Must state travel history, symptoms & any therapy when requesting this test. Analysed in Blood Sciences Laboratory-Analytical Haematology

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Test	Sample type	Minimum Sample Volume	Requirements	Turnaround Time	Time Limit for adding extra tests	Reference Range	Notes
PC:Activity	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	70-140 u/dl	Clots of any size , haemolysis, underfilling or overfilling will affect result.
PROTEIN S: FREE	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 WEEKS	N/A	60 -150 %	Clots of any size , haemolysis, underfilling or overfilling will affect result.
RETICULOCYTE	WHOLE BLOOD K2/K3 EDTA	1 ml		1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	24 HOURS	See Appendix 1	Test not informative immediately following red cell transfusion. Any patient suspected to have cold agglutinins must have their sample kept at 37oC and brought to the laboratory (Blood Sciences Laboratory-Analytical Haematology) immediately.

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Test	Sample type	Minimum Sample Volume	Requirements	Turnaround Time	Time Limit for adding extra tests	Reference Range	Notes
Rivaroxaban	Tri-sodium citrate/blue top tube	2 x 3mL	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	4 hours	N/A	Clots of any size, haemolysis, underfilling or overfilling will affect result. Such samples will be rejected
Thrombin Time	Tri-sodium citrate/blue top tube	3 mls	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	1hr ED 4 hours Inpatients 24hrs Outpatients / GPs	4 hrs	Upto 12yrs = 9.2-15.0 secs >12yrs = 14-18 secs	Clots of any size , haemolysis, underfilling or overfilling will affect result.
VWF: Ricof Activity	Tri-sodium citrate/blue top tube	3 mls X 2	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 weeks	N/A	50-150 u/dl	Clots of any size , haemolysis, underfilling or overfilling will affect result.
VWF: Antigen	Tri-sodium citrate/blue top tube	3 mls X 2	Adequately filled sample with no clots to be sent to lab within an hour of venepuncture	2 weeks	N/A	50-150 %	Clots of any size , haemolysis, underfilling or overfilling will affect result.

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4.1 Turnaround times

Urgent	Within 1 h of receipt.
Inpatient	Within 4h of receipt.
GP, outpatient and external locations	Within 24h of receipt.

All turnaround times stated are for tests performed on-site.

4.2 Minimum sample volumes

	Adult Samples	Paediatric samples
EDTA (plasma)	1 mL	1 mL
Citrate	3 mL	2 mL

4.3 Add ons

Add-ons are accepted within specified timeframes according to sample stability. Add ons are handled by the laboratory, who can advise if the add on is not appropriate.

Haematology 0203 299 9000 ext 32418 M-F 09:00 – 17:30

Haemostasis 0203 299 9000 ext 32434 M-F 09:00 – 17:30

For OOH phone the oncall number 0203 299 6216 for both sections

If an add-on is required urgently a separate sample is advised.

5. Referral Laboratories used by this Laboratory

- Malaria Reference Laboratory at The London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT (UKAS accredited) - Malaria confirmation
- Haemostasis Laboratory, GSTS Pathology, 5th floor, North Wing, St. Thomas Hospital, Westminster Bridge Road, SE1 7EH (UKAS accredited)

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6. Appendix 1

Haematology Reference Ranges

TEST / PARAMETER	AGE	NEW REFERENCE RANGE		UNITS	Decimal Places
		MALE	FEMALE		
Full Blood Count					
White Blood Cell Count (WBC)	Upto 1 day	10.00 - 26.00		x10 ⁹ /L	2
	Upto 3 days	7.00 - 23.00			
	Upto 1 month	5.00 - 19.00			
	Upto 2 months	5.00 - 15.00			
	Upto 6 months	6.00 - 18.00			
	Upto 1 year	6.00 - 17.00			
	Upto 6 years	5.00 - 15.00			
	Upto 12 years	5.00 - 13.00			
	Upto 150 years	4.00 - 11.00			
MALE FEMALE					
Red Blood Cell Count (RBC)	Upto 1 day	5.00 - 7.00		x10 ¹² /L	2
	Upto 3 days	4.00 - 6.60			
	Upto 1 month	3.00 - 5.40			
	Upto 2 months	3.10 - 4.30			
	Upto 6 months	4.10 - 5.30			
	Upto 1 year	3.90 - 5.10			
	Upto 6 years	4.00 - 5.20			

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	Upto 12 years			
	Upto 150 years	4.50 - 5.80	3.80 - 5.80	
		MALE	FEMALE	
Haemoglobin (HGB)	Upto 1 day	160 - 220		g/L
	Upto 3 days	150 - 210		
	Upto 1 month	115 - 165		
	Upto 2 months	94 - 130		
	Upto 6 months	111 - 141		
	Upto 1 year			
	Upto 6 years	110 - 140		
	Upto 12 years	115 - 155		
Upto 150 years	130 - 165	115 - 155		
		MALE	FEMALE	
Haematocrit / Packed Cell Volume (HCT / PCV)	Upto 1 day	0.450 - 0.750		L/L
	Upto 3 days	0.450 - 0.670		
	Upto 1 month	0.330 - 0.530		
	Upto 2 months	0.280 - 0.420		
	Upto 6 months	0.300 - 0.400		
	Upto 1 year	0.300 - 0.380		
	Upto 6 years	0.340 - 0.400		
	Upto 12 years	0.350 - 0.540		
	Upto 150 years	0.400 - 0.540	0.370 - 0.470	
		MALE	FEMALE	
Mean Cell Volume (MCV)	Upto 1 day	100 - 120		fL
	Upto 3 days	92 - 118		
	Upto 1 month	92 - 116		

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	Upto 2 months	87 - 103			
	Upto 6 months	68 - 84			
	Upto 1 year	72 - 84			
	Upto 6 years	75 - 87			
	Upto 12 years	77 - 95			
	Upto 150 years				
		MALE	FEMALE		
Mean Cell Haemoglobin (MCH)	Upto 1 day	31.0 - 37.0	pg	1	
	Upto 3 days	32.0 - 37.0			
	Upto 1 month	30.0 - 36.0			
	Upto 2 months	27.0 - 33.0			
	Upto 6 months	24.0 - 30.0			
	Upto 1 year	25.0 - 29.0			
	Upto 6 years	24.0 - 30.0			
	Upto 12 years	25.0 - 33.0			
	Upto 150 years	25.0 - 34.0			
		MALE	FEMALE		
Mean Cell Haemoglobin Concentration (MCHC)	Upto 1 day	300 - 360	g/L	0	
	Upto 3 days	290 - 370			
	Upto 1 month	291 - 370			
	Upto 2 months	285 - 355			
	Upto 6 months	300 - 360			
	Upto 1 year	320 - 360			
	Upto 6 years	310 - 370			
	Upto 12 years	311 - 370			

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	Upto 150 years	304 - 360		
		MALE	FEMALE	
Red Cell Density Width (RDW)	Birth - 150 years	11.0 - 15.0	%	1
		MALE	FEMALE	
Platelets (PLT)	Upto 1 day	150 - 450	x10 ⁹ /L	0
	Upto 3 days	210 - 500		
	Upto 1 month	210 - 650		
	Upto 2 months			
	Upto 6 months	200 - 550		
	Upto 1 year			
	Upto 6 years	200 - 450		
	Upto 12 years	180 - 400		
	Upto 150 years	150 - 450		
		MALE	FEMALE	
Mean Cell Packed Volume (MPV)	Birth - 150 years	9.1 - 12.8	fL	1
		MALE	FEMALE	
NEUTROPHILS (NEUT#)	Upto 1 day	4.00 - 14.00	x10 ⁹ /L	2
	Upto 3 days	3.00 - 5.00		
	Upto 1 month	3.00 - 9.00		
	Upto 2 months	1.00 - 5.00		
	Upto 6 months	1.00 - 6.00		
	Upto 1 year	1.00 - 7.00		
	Upto 6 years	1.50 - 8.00		
		2.00 - 8.00		

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	Upto 12 years			
	Upto 150 years	2.20 - 6.30		
		MALE	FEMALE	
LYMPHOCYTES (LYMPH#)	Upto 1 day	3.00 - 8.00	x10 ⁹ / L	2
	Upto 3 days	2.00 - 8.00		
	Upto 1 month	3.00 - 16.00		
	Upto 2 months	4.00 - 10.00		
	Upto 6 months	4.00 - 12.00		
	Upto 1 year	3.50 - 11.00		
	Upto 6 years	2.00 - 9.00		
	Upto 12 years	1.00 - 5.00		
	Upto 150 years	1.00 - 4.00		
		MALE	FEMALE	
MONOCYTES (MONO#)	Upto 1 day	0.50 - 2.00	x10 ⁹ / L	2
	Upto 3 days	0.50 - 1.00		
	Upto 1 month	0.30 - 1.00		
	Upto 2 months	0.40 - 1.20		
	Upto 6 months	0.20 - 1.20		
	Upto 1 year	0.20 - 1.00		
	Upto 6 years			

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	Upto 12 years			
	Upto 150 years			
		MALE	FEMALE	
EOSINOPHILS (EOS#)	Upto 1 day	0.10 - 1.00		x10 ⁹ / L
	Upto 3 days	0.10 - 2.00		
	Upto 1 month	0.20 - 1.00		
	Upto 2 months	0.10 - 1.00		
	Upto 6 months			
	Upto 1 year			
	Upto 6 years			
	Upto 12 years	0.00 - 0.40		
	Upto 150 years			
		MALE	FEMALE	
BASOPHILS (BASO#)	Upto 1 day	0.00 - 0.20		x10 ⁹ / L
	Upto 3 days			
	Upto 1 month			
	Upto 2 months			
	Upto 6 months			
	Upto 1 year			
	Upto 6 years			
	Upto 12 years			
	Upto 150 years	0.00 - 0.10		

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		MALE	FEMALE		
Absolute Reticulocyte Count (RETA)	Upto 1 day	100.0 - 250.0		x10 ⁹ /L	1
	Upto 3 days	50.0 - 350.0			
	Upto 1 month	20.0 - 60.0			
	Upto 2 months	30.0 - 50.0			
	Upto 6 months	40.0 - 100.0			
	Upto 1 year	30.0 - 100.0			
	Upto 6 years				
	Upto 12 years				
Upto 150 years	50.0 - 150.0				

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