Saolta
Grúpa Ollscoile Cúram Sláinte
University Health Care Group

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Letterkenny University Hospital
HAEMATOLOGY USER MANUAL

Change Description:

Reason for Change:

- Procedural and Document amendments:

(a) Updated information on requests for DDimer assay from General Practice

(b) Updated information on requests for urgent analysis from General Practice (GP) outside of routine hours (section 2.14).

- Effective Date: 30/12/2024
- Review Date: 30/12//2026

GUIDE TO USING THIS MANUAL

This User Manual has been prepared in conjunction with The Pathology Department User Manual (MP-GEN-0064) to inform the users of the Saolta University Health Care Group, Letterkenny University Hospital, Pathology Department of which services are available within the Pathology Department and how to obtain the services required.

PLEASE REFER TO DOCUMENT MP-GEN-0064, THE PATHOLOGY DEPARTMENT GENERAL USER MANUAL FOR GUIDANCE ON USING THESE DOCUMENTS.

Documents are available on Q-Pulse and also on the HSE Website **http://www.hse.ie/lulhPathology**

Contents

1. General Information

This laboratory provides diagnostic investigations in general haematology, coagulation, and specialised areas. Approximately 175,000 FBC samples and 60,000 coagulation samples are processed in the lab each year. In addition, the laboratory carries out daily ESRs, infectious mononucleosis screens, blood film reviews, warfarin monitoring tests, DDimers, malaria screening, sickle cell screening and Kleihauer studies. Some specialised investigations not performed at Letterkenny University Hospital are routed through the Haematology Lab to external laboratories

1.1 Haematology Staffing

The Haematology Laboratory is staffed by:
2 x Consultant Haematologists
Laboratory Manager: overall scientific responsibility of Laboratory
1 x Chief Medical Scientist
2 x Senior Medical Scientists
4.5 x Staff Grade Medical Scientists

1.1 Medical Advisory Services

Clinical laboratory advice is provided by a Consultant Haematologist (with 24/7 telephone cover), refer to MP-GEN-0064 (Laboratory General User Manual) section 6.1 for contact details.

1.2 Turnaround Times

Expected turnaround times for Haematology assays are identified in Table 1 below.
Turnaround time is defined as the time from specimen receipt in the Pathology Department to the time results are available.
The times stated are deliverable in 90% of instances in normal circumstances. There are times, due to factors outside the laboratories control, that the stated turnaround times may be exceeded. These events are infrequent and will be explained to users at the time.
If the laboratory fails to meet expected turnaround, times please contact Chief Medical Scientist or Laboratory Manager (see contact list).
NB: Turnaround times for assays referred to external laboratories for testing are NOT exact and may alter dependent on batch referral from LUH, courier availability and receipt of reports by mail.

1.3 Laboratory Accreditation

The Haematology Laboratory is currently accredited to ISO15189.
The scope of accreditation for the Pathology Laboratory at haematology Laboratory at Letterkenny University Hospital is controlled by the Irish National Accreditation Board

(INAB) and detailed in Scope Registration Number 210MT on the INAB website www.inab.ie.

2 Haematology Laboratory Tests

2.1 Laboratory Request Forms/ Specimen containers/ Sample Acceptance Policy

Please refer to the **General Information User Guide, MP-GEN-0064, Section 9 for sample** and request form labeling requirements. This manual is available on Q-Pulse and the HSE website **http://www.hse.ie/luhPathology**

Haematology Tests, sample containers, and expected turnaround times

2.2 Table 1: Haematology Tests, sample containers, and expected turnaround times

Test	Container	Routine	Urgent	Note
FBC	EDTA (purple top)	≤ 2 days	60 min	
Blood Film examination	EDTA (purple top)	1-2 days (excl weekends)	Urgent films requested by Consultant Haematologist/Clinician: same day	See section 2.6
Blood Film referred for Consultant Haematologist review		5-7 days (excl weekends)	8-24 hours for critical/urgent blood films	See section 2.6
Rapid Diagnostic Malaria Screen	EDTA (purple top)	1 day (excluding weekends)	2 hours	Rapid Diagnostic Tests are screening assays and should be interpreted with caution pending Thick and Thin film examination reports
Malaria Thick + Thin Film	EDTA (purple top)	1 day (excluding weekends)	4 hours	Samples should preferably be received within 2 hours

Test	Container	Routine	Urgent	Note
Confirmatory Malaria Screen, (Malaria Reference Laboratory)	As per lab	1-2 working days for diagnosis by blood film and/or immunochromato graphic technique. 1-4 days for PCR confirmation	Urgent telephoned requests can be available within 2 hours of sample receipt at reference laboratory	
Reticulocyte	EDTA (purple top)	48 hours	90 min	
Infectious Mononucleosis Screen	EDTA (purple top) or clotted (gold top)	2 day	Not applicable. For 'urgent' requests Clinician must contact Laboratory	Infectious Mononucleosis screen results should be interpreted in conjunction with clinical information. A negative result does not preclude the possibility of IM infection.
ESR	EDTA (purple top)	≤ 2 days	Not applicable. For 'urgent' requests Clinician must contact Laboratory	
Sickle cell screen	EDTA (purple top)	1 day	Not applicable. For 'urgent' requests Clinician must contact Laboratory.	Sickledex is a qualitative screening procedure and does not differentiate between Sickle Cell Disease (S/S) and Sickle Cell Trait (A/S). All samples are sent to referral laboratory for

Test	Container	Routine	Urgent	Note
				confirmatory testing
Kleihauer Test (FMH)	EDTA (purple top)	1 day	4 hours	See section 2.13
Urinary Haemosiderin	Urine vacutainer	1 day	Not done	This test is outside the scope of accreditation of this laboratory. This does not affect the validity of the result.

Blood Coagulation

Test	Container	Routine	Urgent	Note
Coagulation screen	Citrate (blue top)	4 hours	90 min	Samples for APTT testing have a limited stability period. For optimum testing samples must be received and reported within 4-5 hours of collect time.
D-Dimer	Citrate (blue top)	4 hours	90 min	Samples for this assay have a limited stability period. For optimum testing samples must be received and reported within 4-5 hours of collect time A restricted service for DDimers is available to General Practice, see section 2.10
INR	Citrate (blue top)	1 day	90 min	see section 2.9 for dosing information
Fibrinogen	Citrate (blue top)	4 hours	90 min	
50:50 Mixing studies	Citrate (blue top)	4-24 hrs, dependant on assay testing.	Not done	50:50 Mixing assays carried out only if PT >2 seconds and/or APTT >5 seconds above reference

Test	Container	Routine	Urgent	Note
				range
Factor Assays FVIII, FIX, FX,	2 x Citrate (blue top)	2 working days	4 hours	Samples for Factor assays have a limited stability period. For optimum testing samples must be received and reported within 4-5 hours of collect time
Anti F10a Assay	2 x Citrate (blue top)	2 working days	2-4 Hours	Samples for Anti Xa assay MUST be collected 4 hours post administration of Low Molecular Weight Heparin (LMWH) as per British Society for Haematology Guidelines (Guidelines on the Use and Monitoring of Heparin,2006 BSH,133,19-34)

2.3 Referred Tests to External Laboratories

NB: Turnaround times for assays referred to external laboratories for testing are NOT exact and may alter dependent on batch referral from LUH, courier availability and receipt of reports by mail.

Contact the Haematology Laboratory to request any further information on the following tests.

Test	Container	Routine	Urgent	Note
Paediatric Factor Assays	2-4 Green capped paediatric coagulation	2-4 weeks	Contact Laboratory/Referral Laboratory (CHI Crumlin)	
Paediatric Von Willebrand screen	4 Green capped paediatric coagulation	8 weeks	Not Done	
EMA (Hereditary Spherocytosis) Screen	2 x EDTA (purple top) must be FRESH and in Lab by 10.30am. Do not send Fridays. Do not refrigerate	2-4weeks	Not Done	
PNH Screen	2 x EDTA (purple top) must be FRESH and in Lab by 10.30am. Do not send Fridays	2-4weeks	Not Done	
Immuno-phenotyping	EDTA, Bone marrow, CSF. Contact Laboratory	2-4weeks	1-2 days, must be pre-arranged with Laboratory at LUH	Currently, requests for Immuno-phenotyping are sent to MLL at Munich testing *https://www.mll.com/en.html*

Test	Container	Routine	Urgent	Note
Cytogenetic analysis	Contact Haematology team or laboratory Do not refrigerate	Dependant on assay required	Not Done	Currently, requests for Cytogenetics sent to MLL at Munich testing, *https://www.mll.com/en.html*
Cancer Molecular Diagnostic Tests (BCRABL,MPN Panel etc)	Bone marrow, EDTA (x 2) or Lithium Heparin	3-4 weeks	Not Done	
Inherited Bone Marrow Failure Syndrome	10mls EDTA Contact Haematology Team to arrange	12+ months	Not Done	
Soluble CD25	1 x clotted (gold top)	8 weeks	Not Done	
Thrombophilia screen	6 x Citrate (blue top) + 1 x clotted (gold top)+ 1 EDTA (purple top)	8 weeks	Not Done	See section 2.11
Lupus anticoagulant	4 x Citrate (blue top)	4weeks	Not Done	See section 2.11
von Willebrand Factor	4 x Citrate (blue top)	8 weeks	Not Done	
Heparin induced thrombocyte-penia (HIT)	2 x clotted (gold top)	2- 5 working days post receipt at referral laboratory	48 hours post receipt in referral laboratory(SJH)	See section 2.12
Factor Assays (Adult)	2 x Citrate (blue top)	2-4 weeks	Contact Laboratory/Referral Laboratory (NCC St James)	
Factor V Leiden	1 x EDTA (purple top)	8 weeks	Not Done	

Test	Container	Routine	Urgent	Note
Prothrombin Gene Mutation	1 x EDTA (purple top)	8 weeks	Not Done	
Lymphocyte Subsets	1 x EDTA (purple top)	2 weeks	Not Done	Samples must be FRESH and received in Lab by 10.30am. Do not send Fridays. Do not refrigerate
Haemoglobin Electrophoresis	2 x EDTA (purple top) 1 x clotted (gold top)	4 weeks	Not Done	Requests for Hb Electrophoresis should be accompanied by a sample suitable for Ferritin assay

2.4 Sample Requirements

Please refer to the **General Information User Guide, MP-GEN-0064, Section 8 for sample** and request form labeling requirements. This manual is available on Q-Pulse and the HSE website **http://www.hse.ie/luhPathology**

Adult Sample
Sample requirements for EDTA (purple top) samples are 3ml
Sample requirements for Citrate (blue top) samples are 2.7ml
Sample requirements for clotted (gold top) samples are 3 ml

Paediatric Specimens
FBC – 0.5ml in purple EDTA Paediatric container
ESR – 0.5ml in purple EDTA Paediatric container x3 (Minimum 1.5 mL required)
Coagulation screen - minimum volume 1.3ml in green Sodium Citrate paediatric container
Specialist Coagulation testing: Contact Haematology Laboratory for instructions.

2.5 Blood Films

If abnormalities are detected in the full blood count profile, laboratory staff will examine a blood film. The protocol as to which an abnormal FBC receives blood film examination, and the frequency, is decided by the Consultant Haematologist. If required, a blood film examination may be requested on a FBC sample, by requesting Physician. NB: Please indicate on the request form the clinical reason for the blood film or contact the Haematology Laboratory. Requests outside this criteria will not be accepted.
Blood films that are notified to the laboratory as urgent by Clinical team/Consultant Haematologist will be reviewed and reported immediately, during routine working hours. Outside routine hours, the timing of blood film review will be at discretion of Laboratory staff and/or Consultant Haematologist.
A blood film and differential white cell count may be analysed by digital morphology methods. This will be indicated on the final report with a relevant comment.

2.6 Blood Film for Urgent Review by Consultant Haematologist

The following categories of Blood film and findings are referred for Urgent attention to the Consultant Haematologist

- Newly presented indications of Haemolytic Uraemic Syndrome (HUS) or Thrombotic Thrombocytopenia (TTP), (features of Microangiopathic haemolytic anaemia on blood film, i.e. red cell fragments (schistocytes), polychromasia and platelet consumption).
- Newly presented /transformed Leukaemia
- New /Unexpected presentation of Neutropenia <0.5 x10^9/L
- New/Unexpected presentation of Blast cells on blood film.
- New /Unexpected presentation of Platelet count <20 x 10^9/L or >1000 x 10^9/L
- Newborn + platelet count <50x10^9/L

Paediatric Blood Film for Review by Consultant Haematologist

Paediatric blood films for review by Consultant Haematologist are referred to the Children's Hospital Crumlin (CHI).

Blood films may be referred to CHI at the request of Consultant Haematologist (LUH), Consultant Paediatrician (LUH) or Consultant at CHI.

2.7 Platelet Clumping

Occasionally platelet clumping occurs in EDTA samples for FBC testing. In this case it is difficult to provide an accurate platelet count with the FBC. Platelet testing on a Sodium Citrate sample (blue top) may help alleviate the problem. If a patient persistently presents with platelet clumps send Sodium citrate sample with FBC REQUESTS. Request form must be clearly marked that 'Sodium Citrate is for Platelet testing'.

2.8 Coagulation Testing

It is essential that all tubes be filled accurately to the marked line on the bottle. They should not be taken from heparin containing IV lines

Samples for special coagulation are separated, frozen, and done in batch analysis.

If required urgently in a particular clinical case please discuss with the laboratory..

Please contact the laboratory for advice if any other clotting assay is required which is not listed.

Samples for APTT and DDimer assays have a limited stability period. For optimum testing samples must be received and reported within 4-5 hours of collect time.

2.9 Warfarin /INR dosing

For information and guidance on INR dosing, refer to

BCSH 1998,101,374-387 Guidelines on oral anticoagulation.

2.10 DDimer Requests from General Practice (GP)

A restricted service is available for requests for DDimer assays from General Practice.

Requests will be accepted under the following conditions:

- Prior approval has been agreed with the Consultant Haematologist.
- The sample is received at Laboratory by 12 midday and is less than 4 hours since sample collection.
- A mobile number for the requesting Clinician is supplied with the request.

The laboratory will phone all DDimer results to the requesting Clinician at the mobile number supplied.

Requests that do not fulfil the criteria listed above will be rejected for testing.

2.11 Thrombophilia Testing

Requests for Thrombophilia Testing and/or Lupus Anticoagulant screen are sent for testing at the National Coagulation Centre, St James Hospital.
Requests must meet 'Thrombophila Testing Guidelines', see:
http://www.stjames.ie/GPsHealthcareProfessionals/LaboratoryPolicesGuidelines/Thrombophilia%20Testing%20Guidelines%20October%202016.pdf

Requests for these assays must be accompanied by dedicated St James request form, plus indication MUST be confirmed on the request form that patient consent has been agreed. A copy of the patient consent form must be stored in patient chart.
Copies of request form, consent forms and Patient information leaflets are available by contacting the Haematology laboratory or at the following link:
http://www.stjames.ie/GPsHealthcareProfessionals/Referral/ReferralForms/

2.12 Heparin Induced Thrombocytopenia (HIT) Screen

Requests for HIT screen are sent for testing at the National Coagulation Centre, St James Hospital.
Requests for this assay must be accompanied by dedicated St James request form.
Copies of request form are available by contacting the Haematology laboratory or at the following link:
https://www.stjames.ie/media/HIT%20request%20form%20(1).pdf

2.13 Foetal Maternal Haemorrhage (FMH) by Kleihauer Test

- Kleihauer testing is NOT indicated in Rhesus Positive antenatal patients <20 weeks gestation.
- In pregnancies<12 weeks gestation, a test for foetomaternal haemorrhage (FMH) is not required.
- For potentially sensitising events between 12 and 20weeks in **Rhesus negative** patients, a dose of anti D should be administered within 72 h of the event. A test for FMH is **NOT** required.
- For potentially sensitising events after 20weeks gestation, in **Rhesus negative** patients, anti-D should be administered within 72 h of the event. A test for FMH **IS** required.
- It may be helpful to estimate FMH in **Rhesus positive** women who have had an intrauterine death or stillbirth particularly if the cause of death is unknown or foetal haemorrhage is suspected. Severe anaemia at birth may also warrant FMH if the anaemia is otherwise unexplained.

If the FMH is less than or equal to 12ml it is covered by the standard anti-D Ig dose given (1500 IU covers a 12mls bleed), additional Anti-D Ig is not required. However, an FMH of greater than or equal to 12mls is considered to be “significant” and there should be a follow-up maternal sample to check for clearance of foetal cells.
If the FMH volume exceeds 12mls an appropriate supplementary dose of Anti-D Immunoglobulin will be required and, follow up- maternal samples for Kleihauer are required to check for clearance of foetal cells, 48 hours following administration of anti-D.

2.14 Urgent Samples

If urgent analysis is required, please contact the Laboratory on 5033 during routine hours. Outside of routine hours, contact the Medical Scientist on call.

For Urgent requests from General Practice (GP) outside of routine hours, including bank holidays and weekends, the ‘on call’ Medical Scientist can be contacted through LUH switchboard (0749125888) to discuss.

2.15 On Call Tests

During 'on call' periods the following tests are routinely available:

- FBC
- Coagulation Screen/ INR
- Fibrinogen Assay
- DDimers

The following tests can be performed on-call under predefined circumstances. Please contact the Medical Scientist on call if requesting any of these tests:

- Malarial Parasites
- Sickle Test
- ESR (Specifically for Temporal Arteritis and Osteomyelitis only)
- Infectious Mononucleosis Screen
- Thrombin Time

Requests for 'on call' tests are carried out at 40 minute intervals between 5pm and 12 midnight. Outside these hours the Medical Scientist must be contacted prior to sending samples.
To arrange tests outside this profile contact the laboratory or medical scientist on call for further information.

2.16 Outsourcing of requests from General Practice (GP)

Currently, a proportion of Haematology requests for FBC and ESR from GPs are being referred to an external laboratory for testing. Samples are sent to Eurofins Biomnis.
Results from Eurofins are available to Users via Healthlink.
Eurofins sample turnaround times are comparable to those analysed at Letterkenny University Hospital.
Any queries can be directed to the Client Services Department, Eurofins Biomnis through the freephone number (1800 252 966) or via email (client.services@eurofins-biomnis.ie)
NB: Samples that are deemed urgent or require testing at Letterkenny Hospital Pathology Department may be sent to the LUH in a separate envelope marked "Urgent" to allow easier identification of the sample.

2.17 Reference Ranges

For samples processed at the Haematology Lab, LUH, all age and sex related ranges are available on LIS and are also printed on all hard copy and electronic reports issued from the Laboratory. All reference ranges quoted have been verified to reflect the patient cohort served by the Laboratory.
The reference ranges for all tests referral to external laboratories are printed on reports. All original reports issued from referral laboratories are returned to ordering Physician by the Pathology reception at LUH.
Sex related Reference Ranges are not provided on reports issued for patients who are registered as Gender 'Unknown'.
Appendix 1 details the reference ranges for commonly ordered assays, contact the Haematology laboratory for any further details on reference ranges or in the event of LIS being unavailable.

Note 1: Coagulation Assays: Normal Ranges for these assays are dependent on patient anticoagulant status. Ranges may change with variations in reagents in use, but will appear as part of the hardcopy or electronically available report.
Please contact the Haematology department for details of current ranges if required.
Note 2: DDimer: Quoted reference ranges do not apply during pregnancy.

2.18 Source of Reference Range (Guidance Documents)

1.International Consensus Group for Hematology Review: Suggested Criteria for Action following Automated CBC and WBC Differential Analysis. *International Society for Laboratory Hematology 2005.*
2.Lewis, Bain & Bates 'Practical Haematology' (9th ed.) 2001. Churchill Livingstone
3.Bain, B.J. 'Blood Cells-A practical Guide' (5th ed.) Blackwell Science
4.Our Lady's Hospital for Sick Children, Crumlin
5.Guidelines on the laboratory aspects of assays used in haemostasis and thrombosis: BJH https://onlinelibrary.wiley.com/toc/13652141/2020/191/3
https://b-s-h.org.uk/guidelines/guidelines/guideline-on-laboratory-aspects-of-assays-used-in-haemostasis-and-thrombosis/
NOTE: In the event of changes to the reference range a message shall be displayed to all reports to highlight these changes to users, for a minimum period of 4 weeks.

2.19 Measurement of Uncertainty

Measurement of Uncertainty has been estimated for all in house investigations where a numerical result is reported. The estimate of measurement uncertainty provides a quantitative indication of the quality of a measurement result and the dispersion of values in which the true result could reasonably be expected to lie.
Measurement of Uncertainty calculations are annually based on precision and bias data from the analysis of quality control and internal quality assurance data over a period of time where available. Estimates for measurement uncertainty for each investigation are available on request. For further information, please contact the Chief/deputy Medical scientist at the Haematology Laboratory.
Please note: Requests for information on Uncertainty of Measurement data should take account of other sources of uncertainty that may exist, for example biological or diurnal variations.

3. Delivery, packaging and transport requirements

Specimens should be transported to the laboratory immediately to ensure optimal results.
Please see Policy on Transport of Specimens to the Laboratory MP-GEN-0060
Please refer to Pathology Department User Manual MP-GEN-0064.

4. Storage of Samples

Sample are retained post Analysis as per Table 4
Table 4:

Specimen Description	Storage Requirement	Storage Location	Retention Period
EDTA Samples: Including FBC/Reticulocyte counts/ESR/Infectious Mononucleosis screen	Room Temp/2-8°C	Haematology Laboratory	24-48 hours
Sodium Citrate: Coagulation Samples	Room Temp	Haematology Laboratory	24 hours
Plasma/Serum (Excluding Coagulation Samples)	Room Temperature/2-8°C	Haematology Laboratory	48 hours
Routine Blood Films	Room Temp	Haematology Laboratory	3 months
Stained smears for Kleihauer Screens	Room Temp	Haematology Laboratory	3 months
Stained Thick and Thin films for Malaria and or Parasite identification	Room Temp	Haematology Laboratory	3 months
Blood Films Referred to Consultant Haematologist	Room Temp	Haematology Laboratory	Permanently
Bone marrow Smears	Room Temperature	Haematology Laboratory	Permanently
Urine Samples	Room Temperature/2-8°C	Haematology Laboratory	48 hours

5. Appendices

Appendix 1: Haematology (LUH) Reference Ranges

NB: See section 2.17 for additional information on reference ranges (including the source of ranges)
(D =days, M=months, Y=years)

Test	Sex (Male/Female)	Age	Lower Normal Range	Upper Normal Range	Units
WBC	*M+F*	*0-7D*	***10***	***26***	10^9/L
	M+F	*7D-1Y*	***6***	***18***	
	M+F	*1Y-8Y*	***5***	***15***	
	M+F	*8Y-13Y*	***4.5***	***13.5***	
	M+F	*13Y-150Y*	***4***	***11***	
RBC	*M+F*	*0-1D*	***3.9***	***5.3***	10^12/L
	M+F	*1-3D*	***4***	***6.6***	
	M+F	*3D-7D*	***3.9***	***6.3***	
	M+F	*7D-14D*	***3.6***	***6.2***	
	M+F	*14D-28D*	***3***	***5.4***	
	M+F	*28D-56D*	***2.7***	***4.9***	
	M+F	*56D-91D*	***3.1***	***4.5***	
	M+F	*91D-2Y*	***3.7***	***5.3***	
	M+F	*2Y-6Y*	***3.9***	***5.3***	
	M+F	*6Y-12Y*	***4***	***5.2***	
	M	*12Y-18Y*	***4.5***	***5.3***	
	F	*12Y-18Y*	***4.1***	***5.1***	
	M	*18Y-150Y*	***4.5***	***5.9***	
	F	*18Y-150Y*	***4***	***5.2***	
Haemoglobin	*M+F*	*0-2D*	***13.5***	***19.5***	g/dL
	M+F	*2D-4D*	***14.5***	***22.5***	
	M+F	*4D-8D*	***13.5***	***21.5***	

Test	Sex (Male/Female)	Age	Lower Normal Range	Upper Normal Range	Units
	M+F	8D-21D	12.5	20.5	
	M+F	21D-35D	10	18	
	M+F	35D-63D	9	14	
	M+F	63D-18M	10.5	13.5	
	M+F	18M-3Y	10.5	13.5	
	M+F	3Y-7Y	11.5	14.5	
	M+F	7Y-13Y	11.5	15.5	
	M	13Y-19Y	13	16	
	F	13Y-19Y	12	16	
	M	19Y-150Y	13.5	16.5	
	F	19Y-150Y	12	16	
HCT	M+F	0-2D	0.42	0.6	ratio
	M+F	2D-4D	0.45	0.67	
	M+F	4D-8D	0.42	0.66	
	M+F	8D-21D	0.39	0.63	
	M+F	21D-35D	0.31	0.55	
	M+F	35D-49D	0.34	0.4	
	M+F	49D-63D	0.28	0.42	
	M+F	63D-98D	0.29	0.41	
	M+F	98D-3Y	0.33	0.39	
	M+F	3Y-13Y	0.35	0.45	
	M	13Y-19Y	0.37	0.49	
	F	13Y-19Y	0.36	0.46	
	M	19Y-150Y	0.36	0.46	
	F	19Y-150Y	0.36	0.46	
MCV	M+F	0-2D	98	118	fL
	M+F	2D-4D	95	121	
	M+F	4D-8D	88	126	
	M+F	8D-21D	86	124	

Test	Sex (Male/Female)	Age	Lower Normal Range	Upper Normal Range	Units
	M+F	21D-35D	85	123	
	M+F	35D-63D	77	115	
	M+F	63D-98D	74	118	
	M+F	98D-3Y	70	86	
	M+F	3Y-6Y	75	87	
	M+F	6YRS-13Y	77	96	
	M+F	13Y-19Y	78	97	
	M+F	19Y-150Y	78	97	
MCH	M+F	0-4D	31	37	pg
	M+F	4D-35D	28	40	
	M+F	35D-63D	26	34	
	M+F	63D-98D	25	35	
	M+F	98D-3Y	23	31	
	M+F	3Y-7Y	24	30	
	M+F	7Y-13Y	25	33	
	M+F	13Y-19Y	25	35	
	M+F	19Y-150Y	26	34	
MCHC	M+F	0-1D	30	33	g/dL
	M+F	1D-2D	29	34	
	M+F	2D-14D	28	35	
	M+F	14D-56D	29	34	
	M+F	56D-2Y	30	33	
	M+F	2YRS-150Y	31.5	37	
RDW	M+F	0-10Y	11.5	15	%
	M+F	10-150Y	11.5	14.5	
Platelets	M+F	0-150Y	140	450	10^9/L
Absolute Neutrophil Count	M+F	0-1D	5	13	10^9/L
	M+F	1D-3D	1.5	7	

Test	Sex (Male/Female)	Age	Lower Normal Range	Upper Normal Range	Units
	M+F	3D-2YRS	1	8.5	
	M+F	2YRS-6YRS	1.5	8.5	
	M+F	6YRS-12YRS	1.5	8	
	M+F	12Y-16Y	1.8	8	
	M+F	16Y-150Y	2	7	
Abs Lymphocyte Count	M+F	0-1D	3.5	8.5	10^9/L
	M+F	1D-3D	2	5	
	M+F	3D-2Y	3	13.5	
	M+F	2Y-6Y	2	9.5	
	M+F	6Y-12Y	1.5	7	
	M+F	12Y-16Y	1.2	5	
	M+F	16-150Y	1	3	
Abs Monocyte Count	M+F	0-1D	0.5	1.5	10^9/L
	M+F	1D-3D	0.3	1.1	
	M+F	3D-6YRS	0.3	1.5	
	M+F	6Y-16Y	0.1	0.8	
	M+F	16Y-150Y	0.2	1	
Absolute Eosinophil Count	M+F	0-1D	0.1	2.5	10^9/L
	M+F	1D-3D	0.2	2	
	M+F	3D-2YRS	0.1	0.3	
	M+F	2Y-6Y	0.3	0.8	
	M+F	6Y-16Y	0.1	0.8	
	M+F	16Y-150Y	0.02	0.5	
Absolute Basophil Count	M+F	0-150Y	0	0.1	10^9/L
Absolute Reticulocyte Count	M+F	0-1D	324	617	10^12/L
	M+F	1d-5d	85	400	
	M+F	5D-30D	34.2	724	

Test	Sex (Male/Female)	Age	Lower Normal Range	Upper Normal Range	Units
	M+F	1M-3M	21	205	
	M+F	3M-12M	8	171	
	M+F	1Y-3Y	56	120	
	M+F	3Y-7Y	16	121	
	M+F	7Y-150Y	35	123	
ESR	M	0 -51Y	0	12	mm/hr
		51Y-61Y	0	14	
		61Y-70Y	0	17	
		70Y-150Y	0	30	
	F	0 -51Y	0	14	
		51Y-61Y	0	22	
		61Y-70Y	0	22	
		70Y-150Y	0	35	
DDIMER	M+F	All	0	0.55	mg/L FEU
Fibrinogen	M+F	All	1.5	3.5	g/L
Factor VIII assay	M+F	0-1D	0.22	1.78	iu/mL
		1D-5D	0.22	1.54	
		5D-1M	0.25	1.57	
		1M-6M	0.33	1.25	
		6M-150Y	0.50	1.50	
Factor IX assay	M+F	0-5D	0.15	0.91	iu/mL
		5D-1M	0.21	0.81	
		1M-3M	0.21	1.13	
		3M-150Y	0.40	1.60	
Factor X assay	M+F	0 -1D	0.12	0.68	iu/mL
		1D-5D	0.19	0.79	
		5D -3M	0.31	0.87	
		3M -6M	0.38	1.18	

Test	Sex (Male/Female)	Age	Lower Normal Range	Upper Normal Range	Units
		6M-5Y	***0.58***	***1.16***	
		5Y-150Y	***0.50***	***1.50***	
Anti Factor 10a assay	*M+F*	Clinical implications of results are dependent on individual patient circumstances. Contact Haematology team for advice on therapeutic ranges			iu/mL

Prothrombin Time/ APTT
Normal Ranges for these assays are dependent on patient anticoagulant status. Ranges may change with variations in reagents in use. Please contact the Haematology laboratory for details of current reference ranges if required.
DDimer
Please note quoted reference ranges are not applicable during pregnancy.

Guidelines on the laboratory aspects of assays used in haemostasis and thrombosis:
BJH https://onlinelibrary.wiley.com/toc/13652141/2020/191/3
https://b-s-h.org.uk/guidelines/guidelines/guideline-on-laboratory-aspects-of-assays-used-in-haemostasis-and-thrombosis/

Appendix 2: Pregnancy Related Reference Ranges

Parameter	First Trimester	Second Trimester	Third Trimester*
RBC ($x10^{12}$/l)	3.52-4.52	3.20-4.41	3.10-4.44
Hb (g/dl)	11.0-14.3	10.0-13.7	9.8-13.7
HCT (l/l)	0.31-0.41	0.30-0.38	0.28-0.39
MCV (fl)	81-96	82-97	91-99
WBC ($x10^9$/l)	5.7-13.6	6.2-14.8	5.9-16.9
Neutrophils ($x10^9$/l)	3.6-10.1	3.8-12.3	3.9-13.1
Lymphocytes ($x10^9$/l)	1.1-3.5	0.9-3.9	1.0-3.6
Monocytes ($x10^9$/l)	0.0-1.0	0.1-1.1	0.1-1.1
Eosinophils ($x10^9$/l)	0.0-0.6	0.0-0.6	0.0-0.6
Basophils ($x10^9$/l)	0.0-0.1	0.0-0.1	0.0-0.1
Platelets ($x10^9$/l)	174-391	171-409	155-429

* Third trimester reference range is applicable for 6 weeks post delivery

Source of Ranges: Blood Cells. A Practical Guide. Barbara J. Bain; 4th Edition

Appendix 3: WBC in Africans and Caribbeans of African Lineage

Origin	Male		Female	
	WBC	Neut	WBC	Neut
African	2.8-7.2	0.9-4.2	3.0-7.4	1.3-3.7
Carribean	3.1-9.4	1.2-5.6	3.2-10.6	1.3-7.1

Source of Ranges: Blood Cells. A Practical Guide. Barbara J. Bain; 4th Edition