



— BELMATT —
HEALTHCARE TRAINING

FBC

HB- Female 120-155 g/l

Male- 130-170 g/l

CRP

0-10mg/dL

MCV 82-99 fl

MCHC 32-36 g/dl

WCC - $3-11 \times 10^9/L$

Lymphocytes $1.0-3.0 \times 10^9/L$

Neutrophils $16 \times 10^9/L$

Platelets $\{150-450 \times 10^9/L\}$

LFTS

ALT/AST $\{< 35 \text{ U/L}\}$

Alkaline phosphatase $\{30-130 \text{ IU/L}\}$

GGT - male < 50

Female $< 35 \text{ IU/L}$

Lactate

less than 2

Bilirubin (2-17 mmol/L)

Albumin $\{34-45 \text{ G/L}\}$

Prothrombin $\{10-14 \text{ seconds}\}$

U&ES

Sodium 133-146 mmol/L

Potassium 3.5-5.3 mmol/L

Bicarbonate 22-29

Urea 2.5- 7.8 mmol/L

Creatinine M 58-110 μ mol/L

F- 46- 92 μ mol/L

Blood gases

PH 7.35-7.45

PCO₂ - 4-6 Kpa

PO₂ - > 10-14 kpa

HCO₃-22-26

BE-2 or+ 2

Full Blood Count Information

Please remember that the 'Normal ranges' are offered as a guide only -

Test	Description	Normal Range	
WBC White Blood Count	<p>White blood cells are produced by the immune system to help defend the body against infection. They and their precursors are formed in the bone marrow and then travel through the blood to various parts of the body. There are several different types of white blood cells, the major ones being neutrophils (also called granulocytes), T-cells and B-cells.</p> <p>Your FBC report gives the number of white blood cells in the peripheral blood, but it fails to capture the vast majority of them hiding out in the lymph nodes, spleen, bone marrow etc. Only roughly about 5-10% of the total number of WBC are seen in the peripheral blood. FBC numbers are useful, but they do not give the whole picture.</p>	<p>3.8-10.8</p> <p>$10^9/L$</p>	
RBC Red Blood Cells	<p>Red Blood count, sometimes referred to as erythrocytes, are responsible for delivering oxygen throughout the body. There are several million of them in a single drop of blood. A low red blood cell count indicates anaemia, which can lead to fatigue, one of the B-symptoms of progressing CLL.</p> <p>In CLL, low numbers of red blood cells can be due to a variety of causes, one of them being that the bone marrow is so heavily infiltrated with CLL cells that it is no longer able to make the other necessary cell lines, such as red blood cells, platelets. The bone marrow is the only location where red blood cells are made.</p> <p>Another cause is AIHA, an auto-immune disease where the red blood cells are attacked and destroyed before their time by the body's own immune system gone awry.</p>	<p>adult F</p> <p>$3.8-5.8 \times 10^{12}/L$</p> <p>adult M</p> <p>$4.5-6.5 \times 10^{12}/L$</p>	
Hb Haemoglobin	<p>Haemoglobin is a protein used by red blood cells to distribute oxygen to other tissues and cells in the body. Low haemoglobin levels means the red cells cannot carry out the vital oxygen transport efficiently.</p> <p>Low haemoglobin levels cause anaemia, and therefore fatigue. These days there are options other than blood transfusions to handle chronic anaemia. One of them is called erythropoietin.</p>	<p>adult F</p> <p>11.5-16.5 g/dL</p> <p>adult M</p> <p>13.0-18.0 g/dL</p>	
HCT Haematocrit PCV Packed Cell Volume	<p>Haematocrit (sometimes called packed cell volume, PCV) measures the amount of volume red blood cells occupy in the blood. The value is given as a percentage of red blood cells in a volume of blood. For example, a haematocrit of .38 means that 38% of the blood's volume is composed of red cells.</p>	<p>adult F</p> <p>0.36-0.47</p> <p>adult M</p> <p>0.40-0.52</p>	
PLT Platelets	<p>Platelets (Thrombocytes) are tiny cells produced by the bone marrow to help your blood clot in the event of a cut or scrape. A decreased platelet count is called thrombocytopenia. There are a number of</p>	<p>$150-400 \times 10^9/L$</p>	

Test	Description	Normal Range	
	<p>possible causes of thrombocytopenia. These include a disorder of the immune system in which antibodies kill platelets (known as idiopathic thrombocytopenia purpura, or ITP), hypersplenism, in which an enlarged spleen destroys more platelets than normal, and suppression of the bone marrow (the only site where platelet precursors are made), because it is heavily infiltrated with CLL.</p> <p>Platelets tend to be the first to start dropping precipitously when CLL progresses. Haematologists see platelets below 100 as the criteria for upgrading the CLL to Binet stage C (or Rai Stage-4) and a cause for starting treatment.</p>		
Percentage Lymphocytes	<p>Remember, WBC or white blood cells are many different kinds of cells, the major groups being neutrophils (also called granulocytes) and lymphocytes (which are both B-cells and T-cells).</p> <p>In CLL, we are interested in following the numbers of lymphocytes. The FBC report typically gives the percentage of the WBC that are lymphocytes. In healthy individuals, there are many more neutrophils than there are lymphocytes (B-cells plus T-cells). As CLL progresses, the absolute numbers of neutrophils may stay the same or even decrease, but the absolute numbers of lymphocytes (B-cells) increase alarmingly. The percentage of the WBC that is lymphocytes therefore also increases as CLL progresses. CLL patients with advanced disease can have WBC and absolute lymphocyte counts as high as 500K or even higher, and their percent lymphocytes can be almost 100%, suggesting that almost all of the WBC are lymphocytes. The absolute number is much more important than the percentage.</p>	28-55%	
LYMPHOCYTES or ALC Absolute Lymphocytes	<p>In the UK a blood tests is likely to include a 'Lymphocytes' total equivalent to ALC in other parts of the World. This is a key measure when monitored cll progression and more reliable that WBC.</p> <p>If you need to calculate the Absolute lymphocytes Count and have the percentage lymphocytes, then simply multiply the WBC by the percent lymphocytes. For example, if the WBC is 30.0, and the lymphocyte percent is 65%, the absolute lymphocyte number is $30.0 \times 0.65 = 19.5$.</p>	1.3-3.5 $10^9/L$	
Percentage Neutrophils	<p>In normal individuals, there are many more neutrophils than there are lymphocytes in the white blood cells: roughly, there are 3 neutrophils for every one lymphocyte. This ratio changes sharply in CLL patients, where an ever increasing percentage of the WBC are lymphocytes, because of the proliferating CLL B-cells. Several of the chemotherapy drugs used in CLL also are known to cause decrease in neutrophil counts.</p>	25-70%	1.8–7.5

Test	Description	Normal Range	
	<p>Neutrophils are important for preventing and fighting infections. When their numbers drop below healthy levels, the individual is at more risk for developing infections. When their numbers decrease too much, the patient is declared to be "neutropenic" and carefully managed to avoid infections.</p> <p>More recently, drugs such as Lenograstim, Filgrastim and Pegfilgrastim have made it easier to control neutropenia.</p>		
Absolute Neutrophils	<p>To get the Absolute Neutrophils count, multiply the WBC by the percent neutrophils. For example, if the WBC is 30.0K, and the percent neutrophils is 15%, the absolute neutrophil number is $30.0 \times 0.15 = 4.5$. The absolute number is much more important. Neutrophil levels of less than 0.5 are dangerous and are a reason for special precautions.</p>	2-7.5 10 ⁹ /L	
B2M Beta 2 Microglobulin	<p>Beta 2 microglobulin is a protein that is sometimes shed from cell surfaces into blood serum. It has been observed that CLL patients have a higher level of this protein in the blood, and higher amounts suggest poorer prognosis. Patients with B2M levels of 2 or lower are expected to have a slower progression of the disease. Many labs now test for B2M routinely, when screening blood samples from CLL patients, though this test is much more popular in America than in the UK.</p>	1.0-2.2 mg/L	

Other Frequently Used Terms

Test	Description	Normal Range
MCV Mean Cell Volume	"Mean Cell Volume" measures the average volume (size) of individual red blood cells. A low MCV means that the cells are smaller than normal. This is usually caused by an iron deficiency or chronic disease or thalassaemia.	77-95 fL
MCH Mean Cell Haemoglobin	"Mean Cell Haemoglobin" measures the amount of Haemoglobin in the average cell. It is calculated by dividing total Haemoglobin by the total number of red blood cells.	27.0-32.0 pg
MCHC Mean Cell Haemoglobin Concentration	"Mean Cell Haemoglobin Concentration" measures the amount of Haemoglobin in red blood cells. Low levels indicate anaemia. It is calculated by dividing Haemoglobin by haematocrit.	32.0-36.0 g/dL
RDW Red blood cell Distribution Width.	<p>Red blood cells can come in different sizes. RDW looks at the range of these sizes in a blood sample. This test is used if anaemia is suspected to identify the cause. The results can be reported in two ways Coefficient of Variation (CV) or Standard Deviation (SD)</p> <p>For more information about RDW see http://www.med-health.net/Rdw-Cv-And-Rdw-Sd.html</p>	<p>RDW CV 11.5-14.6% (adults)</p> <p>RDW SD 29-46 fL</p>
MPV	MPV measures the average size of your platelets. A higher-than-normal MPV has been shown to be associated with a	7.5-10.4 fL

Mean Platelet Volume	greater risk of heart attacks and stroke.	
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Blood Electrolytes

Test	Description	Normal Range
Na Sodium	level indicates your balance of salt and water. It is also a sign of the functioning of your kidneys and adrenal glands. Abnormal blood sodium level often indicates that blood volume is too low and dehydration is the major cause of such abnormality. It can also occur when the heart is not pumping blood normally, or when the kidneys are not working properly.	135-147 mmol/L
K Potassium	affects several major organs including the heart. Potassium levels rise in kidney failure, and may be abnormal due to vomiting or diarrhoea.	adult 3.5-5.3 mmol/L
Cl Chloride	levels often go up and down along with sodium levels. This is because sodium chloride, or common salt, is a major component of blood.	adult 95-108 mmol/L
BIC Bicarbonate	Carbon Dioxide (CO ₂) blood test which checks or monitors the patient's acidity (pH) balance; part of a routine exam that includes an electrolyte panel. A normal CO ₂ level keeps the blood acidity (pH) at the correct level. Contrary to popular urban myth, cancer does not make blood more acidic, and cancer cannot be eradicated by making blood less acidic.	adult 22-29 mmol/L
Ca Calcium	Increased levels of plasma calcium may indicate the presence of malignant disease or hyperparathyroidism. Less commonly, it could reflect thyrotoxicosis, excessive vitamin D intake, the use of thiazide diuretics, and other disorders. Reduced levels of calcium may reflect vitamin D deficiency, renal disease, hypoparathyroidism, magnesium deficiency and other disorders.	2.25-2.5 mmol/l
ALT Alanine aminotransferase	is an enzyme found primarily in the liver but also to a lesser degree, the heart and other tissues. ALT results are usually assessed alongside the results of other blood tests such as alkaline phosphatase (ALP) , gamma-glutamyl transferase (GGT) and aspartate aminotransferase (AST) , to help determine which form of liver disease is present. We also see increased levels in mononucleosis, alcoholism, liver damage kidney infection, chemical pollutants or myocardial infarction. Also known as: Serum glutamic-pyruvic transaminase (SGPT)	0-40 iu/L
LDH Lactate Dehydrogenase	is an intracellular enzyme from particularly the kidneys, heart, skeletal muscle, brain, liver and lungs. Increases are usually found when large number of cells die, or in some cases it can be useful in confirming myocardial or pulmonary infarction (only in relation to other tests). Decreased levels of the enzyme may be seen in cases of malnutrition, hypoglycemia, adrenal exhaustion or low tissue or organ activity.	200-450 iu/L
ALP	are a family of enzymes that are present throughout the	adult

Test	Description	Normal Range
Alkaline phosphatase	body. Elevated levels of ALP are associated with liver and bile duct disorders, and bone diseases.	30-130 iu/L
TBIL Bilirubin Total	is the breakdown product of haemoglobin. Raised levels mean either excessive breakdown as in haemolytic anaemia, liver cell damage, or obstruction to excretion of bile.	<21 umol/L
Creatinine	is a waste product of protein digestion and a measure of kidney function. High levels are usually due to kidney problems. Doctors use the creatinine level as most direct sign of how well the kidneys are removing waste products from the body.	adult F 58-96 umol/L M 74-110 umol/L
Blood Urea	is a waste product that is normally removed by the kidneys in the urine. High Blood Urea levels can be due to dehydration, or kidney or heart failure.	adult 2.5-7.8 umol/L
Albumin 24 hr urine	is the most abundant protein found in blood plasma, representing 40 to 60% of the total protein. Reduced levels of albumin may reflect a variety of conditions, including primary liver disease, increased breakdown of macromolecules resulting from tissue damage or inflammation, malabsorption syndromes, malnutrition, and renal diseases. Test based on all urine collected in 24hr.	<30 mg/24hr
Globulin	Globulins are a diverse group of proteins in the blood, and together represent the second most common proteins (after albumin) in the bloodstream. An elevation in the level of serum globulin can indicate the presence of cirrhosis of the liver.	adult 18-36 g/L
Total Protein	Measurement of the total protein concentration in plasma. Elevated concentrations reflect dehydration, which might be attributable to vomiting, diarrhoea, Addison's disease, diabetic acidosis, and other conditions.	60-80 g/L

Immunoglobulins

Test Name	Description	Normal Range
IgM	Usually, Immunoglobulin M IgM combines into star-shaped clusters, that tend to remain in the bloodstream, where it is highly effective in killing bacteria. IgM functions in much the same way as IgG, but is formed earlier in the immune response.	adult 0.40-2.00 g/L
IgA	Immunoglobulin A IgA is found in blood, tears, saliva, and on the mucous membranes of the respiratory and intestinal tracts where it helps prevent the entrance of bacteria and viruses into body.	adult 0.5-4.00 g/L
IgG	IgG is able to enter tissue space; it coats microorganisms, speeding their uptake by other cells in the immune system. IgG functions mainly against bacteria and some viruses.	adult 5.5-16.5 g/l

