Airwave Health Monitoring Study
Tissue Bank

Imperial College
London

Airwave Health Monitoring Study
Health Screening

A guide to understanding your results

In association with:

LAB TESTS ONLINE UK

Your Trusted Guide

Peer Reviewed • Non-Commercial • Patient Centred

Dear Airwave Study Participant,

Thank you for taking part in the Airwave Health Monitoring health screening protocol. We greatly appreciate your participation.

This brochure has two sections; the first provides some background information on the lifestyle and physical measurements we have taken. The second section is a description of the blood tests that we may have performed on your samples.

All blood test results are given with a 'reference range', which is a way of comparing your results with that of the normal range found in a healthy population.

> ***Whether your test result is within the laboratory reference range or not, it must be considered within the context of your personal circumstances, and with the benefit of your doctor's knowledge of your past medical history and the results of any other investigations performed.***
>
> ***A test result outside the reference range may or may not indicate a problem - only that your doctor should investigate it further. You can have an abnormal value and have nothing wrong - but your doctor should try to determine the cause. Typically, 5% of healthy people will fall outside the reference range.***

Incidental circumstances may give an out-of-range or ambiguous result without it indicating a major problem. For example, a high blood sugar could be diet-related rather than caused by diabetes. If your doctor is unsure about the test result, they may wish to repeat it. Some abnormal results may disappear on their own, especially if they are on the border of the reference range.

We want you to be informed, but we cannot take the place of your doctor. We want you to understand what the test is, and how it can be used, but because we cannot be aware of all the factors that could affect your test results, we cannot interpret the results and give you specific advice. If you need further explanation of your results, you should talk to your doctor.

For more details on the background to these measurements, please visit:

- Lab Tests Online: https://labtestsonline.org.uk/
- Patient Information: http://patient.info/
- NHS Choices: http://www.nhs.uk/

ACKNOWLEDGEMENT

Much of the information in this booklet is based upon content originally reproduced with the permission of editor of Lab Tests Online.

Body Measurements and Lifestyle

This section explains the results of the physical measurements we have taken, and addresses some lifestyle questions.

Smoking

Background: Smoking dramatically increases the risk of heart disease, stroke, lung disease, cancer, many other diseases, and death. There is no safe level of smoking. Even just a few cigarettes a day is a major hazard to your health and the health of those around you.

Action: If you smoke, you should stop. There are many methods to assist people to stop smoking, and your GP will be able to give you advice.

Resources

- https://www.nhs.uk/smokefree
- NHS Smoking helpline 0800 1690169

Alcohol Intake

Background: Drinking alcohol is best when you don't overdo it. A small amount of alcohol does you no harm and may actually be good for you. Large amounts of alcohol can contribute to high blood pressure, liver disease and can make you gain weight.

Alcohol is measured in units. One unit is equivalent to 1 small glass of wine, 1 single pub measure of spirits, or half a pint of beer/lager. Recommended safe limits are up to 21 units per week for men and up to 14 units per week for women.

Action: If your alcohol intake is high, you should cut down.

Weight

Background: Being overweight should be taken seriously. As your weight increases, the heart has to work harder and the risk of heart disease increases. Being overweight also increases the risk of other diseases such as diabetes and high blood pressure.

The correct weight for a tall person is greater than for a shorter person. You therefore need to know whether you are the correct weight for your height. Your Body Mass Index (BMI) gives you this information. If your BMI is between 18.5 and 25, you are the correct weight for your height.

Action: If you are overweight, you may want to discuss weight reduction strategies with your GP.

Waist-Hip Ratio (WHR)

Background: WHR is the ratio of the circumference of the waist to that of the hips. The measurement determines how weight is distributed in the centre of the body. A WHR of 0.8 or less for women and 0.9 or less for men have been shown to confer health benefits, with less susceptibility to major diseases such as diabetes and cardiovascular disorders.

Action: If your WHR is greater than the cut-off value, you may want to discuss your results with your GP.

Fat Percentage

Background: Body fat percentage is the proportion of total fat in a person's body. For example, if you weigh 100Kg and have a recording of 10% fat, this means that your body consists of 10 Kg fat and 90 Kg of lean body mass (including bone, muscle, organ tissue, blood and water). A certain amount of fat is essential for bodily functions. Fat regulates body temperature, cushions, insulates organs and tissues, and is the main form in which energy is stored in the body.

Action: If your fat percentage is more than the range indicated, you may want to discuss weight reduction activities and your dietary habits with your GP.

Blood Pressure

Background: Your blood pressure is constantly changing depending upon, for example, whether you are resting, exercised, or stressed. There is, therefore, a normal range for blood pressure and not just a single value. In a healthy adult, the blood pressure reading should be less than 140/90 mm Hg (but should be less than 130/80 mm Hg if you have diabetes).

As your blood pressure can become high at any time in life, the only way of making sure that it remains within the normal range is to have it checked regularly. Many factors are known to contribute to developing high blood pressure. The most important are being overweight, unfit, or adding a lot of salt to food. High blood pressure is dangerous, and if untreated can increase the risk of heart disease and strokes.

Action: If the blood pressure we measured was over 140/90 mm Hg, you should have it re-checked by your GP.

Electrocardiogram (ECG)

Background: The electrocardiogram (ECG) is a non-invasive test that is used to reflect underlying heart conditions by measuring the electrical activity of the heart. By positioning electrodes (electrical sensing devices) on the body in standardised locations, information about many heart conditions can be learned by looking for characteristic patterns on the ECG. For instance, the ECG can show the heart's rate and rhythm, detect decreased blood flow, enlargement of the heart, or the presence of either current or past heart attacks.

Action: Your feedback letter may advise you to speak to your GP about your result. Your GP is best placed to advise you on the significance of any findings in the light of your own personal history.

Blood Tests

Creatinine

Why be tested?
To determine if your kidneys work normally and to monitor treatment for kidney disease.

What is being tested?
Creatinine is produced in your muscles when a compound called creatinine spontaneously breaks down. Creatinine is used in a process in body cells to produce the energy needed to contract muscles and it is produced at a relatively constant rate. Almost all creatinine is excreted by the kidneys, so blood levels are a good measure of how well your kidneys are working.

What does the test result mean?
Increased creatinine levels in the blood suggest diseases that affect kidney function. These can include:

- Glomerulonephritis (swelling of the kidney's blood vessels);
- Pyelonephritis (pus-forming infection of the kidneys);
- Acute tubular necrosis (death of cells in the kidneys' small tubes);
- Urinary tract obstruction; or
- Reduced blood flow to the kidney due to shock, dehydration, congestive heart failure, atherosclerosis, or complications of diabetes.

Creatinine can also increase because of muscle injury. Low levels of creatinine are not common and are not usually a cause for concern. As creatinine levels are related to the amount of muscle the person has, low levels may be a consequence of decreased muscle mass (such as in the elderly), but may also be occasionally found in advanced liver disease.

Triglycerides

Why be tested?
As part of a full lipid profile to assess the risk of developing cardiovascular disease or to look for an underlying cause for a condition called pancreatitis

What is being tested?
This test measures the amount of triglycerides in your blood. Triglycerides are the body's storage form of fat. Most triglycerides are found in fat (adipose) tissue, but some circulate in the blood to provide fuel for muscles to work. Extra triglycerides are found in the blood after eating a meal - when fat is being sent from the gut to fat tissue for storage.

What's the difference between triglycerides and cholesterol?
Triglycerides and cholesterol are separate types of lipids that circulate in your blood. Triglycerides store unused calories and provide your body with energy, and cholesterol is used to build cells and certain hormones. Because triglycerides and cholesterol can't dissolve in blood, they circulate throughout your body with the help of proteins that transport the lipids (lipoproteins).

What does the test result mean?
Having high triglycerides is thought to put you at higher risk of developing cardiovascular disease. It isn't totally clear whether it is the triglycerides themselves which are harmful, or an underlying condition, such as

diabetes or obesity, which is the problem. Conditions such as these are known to increase cardiovascular risk directly, as well as cause high triglycerides. Trying to work out whether triglycerides cause cardiovascular disease, or are just associated with it, has been the subject of many scientific studies but the answer is not clear at present.

If your triglyceride concentration is very high (e.g. 5.6 mmol/L or above), this indicates you are at risk of pancreatitis. In these circumstances, it is important to lower your triglyceride levels, which might involve either drugs or lifestyle changes, depending on the cause.

Many factors can cause high triglycerides. Examples include a high fat or high sugar diet, high intake of alcohol, obesity, and diabetes.

Is there anything else I should know?

If you are diabetic and your blood glucose concentrations are out of control, triglyceride concentrations will be very high.

Because your sample was non-fasting, triglyceride levels in the blood may be variable (they change dramatically after a meal). Even fasting levels vary considerably from day to day. Lipid profiles at most change minimally in response to normal food intake in individuals in the general population. Because of the day-to-day variation, modest changes in fasting/non-fasting triglycerides measured on different days are not considered unusual or abnormal.

Total Cholesterol

Why be tested?

To screen for risk of developing heart disease.

Cholesterol is different from most tests in that it is not always used to diagnose or monitor a disease but is used to estimate risk of developing a disease - specifically heart disease. Because high blood cholesterol has been associated with hardening of the arteries, heart disease and a raised risk of death from heart attacks, cholesterol testing is considered a routine part of preventive health care.

What is being tested?

Cholesterol is a substance that is essential for life. It forms the membranes for cells in all organs and tissues in your body. It is used to make hormones that are essential for development, growth, and reproduction. It forms bile acids that are needed to absorb nutrients from food. A small amount of your body's cholesterol circulates in the blood in complex particles called lipoproteins. These lipoproteins include some particles that carry excess cholesterol away for disposal (see HDL, good cholesterol) and some particles that deposit cholesterol in tissues and organs (LDL, bad cholesterol). The test for cholesterol measures all cholesterol (good and bad) that is carried in the blood by lipoproteins. Cholesterol comes from your diet, and is made in your liver.

What does the test result mean?

The cholesterol level measured in your blood will be considered along with other risk factors (i.e. high blood pressure, smoking etc.) when assessing your overall risk of developing heart disease. This overall assessment is what will be used to decide whether you require further treatment in the form of dietary changes or drugs to lower your cholesterol level.

If you are taking treatment to lower your cholesterol, the target is to get your total cholesterol to less than 5 mmol/L.

HDL (High Density Lipoprotein)

Why be tested?

To determine the risk of developing heart disease. The test of HDL cholesterol is used to determine your risk of heart disease. If a high cholesterol value is due to high HDL, a person is probably at low risk and further testing or treatment for high cholesterol is not advised.

What is being tested?

HDL is one of the classes of lipoproteins that carry cholesterol in the blood. HDL is considered beneficial because it removes excess cholesterol and disposes of it, hence HDL cholesterol is often termed "good" cholesterol. The test for HDL measures the amount of HDL-cholesterol in blood.

What does the test result mean?

High HDL is better than low HDL.

- If HDL is less than 0.9 mmol/L, there is an increased risk of heart disease.
- A level of HDL between 0.9 mmol/L and 1.5 mmol/L is associated with average risk of heart disease.
- HDL exceeding 1.5 mmol/L is associated with a less than average risk of heart disease.

HDL should be interpreted in the context of the overall findings from the lipid profile and in consultation with your doctor about other risk factors for heart disease.

Apolipoprotein A1 (Apo A1)

Why be tested?

To determine whether you have adequate levels of Apo A1, and to help determine your risk of developing coronary heart disease.

What is being tested?

Apolipoproteins are the protein component of lipoproteins - complexes that transport lipids throughout the bloodstream. Apolipoproteins provide structural integrity to lipoproteins and shield the hydrophobic (water repellent) lipids at their centre.

Most lipoproteins are cholesterol or triglyceride-rich and carry lipids throughout the body, for uptake by cells. High-density lipoprotein (HDL - the "good" cholesterol), however, is like an empty taxi. It goes out to the tissues and picks up excess cholesterol, then transports it back to the liver. In the liver, the cholesterol is either recycled for future use or excreted into bile. HDL's reverse transport is the only way that cells can get rid of excess cholesterol. It helps protect the arteries and if there is enough HDL present, it can even reverse the build-up of fatty plaques in the arteries (deposits that lead to atherosclerosis and coronary artery disease).

Deficiencies in Apo A1 appear to correlate well with an increased risk of developing coronary artery disease and peripheral vascular disease.

What does the test result mean?

An increase of Apo A1 is usually not a problem, but decreased levels are associated with low levels of HDL and decreased clearance of excess cholesterol from the body. Decreased levels of Apo A1, along with increased concentrations of Apo B-100 (Apo B), are associated with an increased risk of coronary artery disease.

There are some genetic disorders that lead to deficiencies in Apo A1 (and therefore to low levels of HDL). People with these disorders tend to have hyperlipidaemia and higher levels of low-density lipoprotein (LDL - the "bad" cholesterol). Frequently, they have accelerated rates of atherosclerosis (the build-up of fat plaques and hardened tissue in the arteries that can lead to heart attacks, heart disease, and strokes).

Apolipoprotein B (Apo B)

Why be tested?

To help evaluate your risk of developing atherosclerotic heart disease.

Apo B levels are used along with other lipid tests to help determine an individual's risk of developing atherosclerotic heart disease and coronary artery disease (CAD).

What is being tested?

Apolipoproteins are an essential part of lipid metabolism. They are component parts of lipoproteins - molecules that the body uses to transport lipids from ingested food in the intestines, throughout the bloodstream, to the liver, and to the body's cells. Apolipoproteins provide structural integrity to lipoproteins and protect the hydrophobic lipids (non-water absorbing lipids) at their centre. They are recognized by receptors found on the surface of many of the body's cells and help bind lipoproteins to those cells to allow the transfer (uptake) of cholesterol and triglyceride from the lipoprotein into the cells.

What does the test result mean?

Elevated levels of Apo B correspond to elevated levels of LDL and are associated with an increased risk of CAD. Elevations may be due to a high fat diet and/or decreased clearing of LDL from the blood. Increased levels of Apo B are seen with hyperlipidaemia and in those patients with:

- Biliary obstruction;
- Diabetes;
- Drugs such as: androgens, beta blockers, diuretics, progestin;
- Hypothyroidism;
- Nephrotic syndrome;
- Pregnancy.

Apo B levels may be decreased with any condition that affects lipoprotein production, or affects its synthesis and packaging in the liver. Lower levels are seen with the following conditions:

- Chronic anaemia;
- Chronic pulmonary disease;
- Drugs such as: oestrogen (in post-menopausal women), lovastatin, simvastatin, niacin, and thyroxine;
- Hyperthyroidism;
- Malnutrition;
- Reye syndrome;
- Weight reduction;
- Severe illness.

GGT (Gamma GT)

Why be tested?

To screen for liver disease or alcohol abuse; and to help your doctor tell whether a raised level of alkaline phosphatase (ALP) is due to liver or bone disease.

What is being tested?

GGT is an enzyme found mainly in the liver and is normally present in low levels in the blood. When the liver is injured or the flow of bile is obstructed, the GGT level rises. It is therefore a useful marker for detecting bile duct problems.

What does the test result mean?

Your doctor is not usually concerned with low or normal levels, but they do tell him/her that it is unlikely that you have liver disease.

Raised GGT levels indicate that something is going on with your liver but not specifically what. In general, the higher the level of GGT, the greater is the damage to your liver. Elevated levels may be due to liver disease, but they may also be due to congestive heart failure, drinking alcohol, and use of many prescription and non-prescription drugs including non-steroidal anti-inflammatory drugs (NSAIDs), lipid-lowering drugs, antibiotics, histamine blockers (used to treat excess stomach acid production), antifungal agents, anticonvulsants (seizure control medications), antidepressants and hormones such as testosterone. Oral contraceptives (birth control pills) and clofibrate can decrease GGT levels.

Is there anything else I should know?

Even small amounts of alcohol within 24 hours of your GGT test may cause a temporary increase in the GGT. If this occurs, your doctor may want to repeat the test to verify that it is normal.

Smoking can also increase GGT.

Levels of GGT increase with age in women, but not in men, and are always somewhat higher in men than in women.

GGT is about twice as high in persons of African ancestry as in those of European ancestry. Several drugs increase (induce) the concentration of GGT in the blood; these increases do not indicate damage to the liver and can be considered interference.

Glycated Haemoglobin (HbA1c)

Why be tested?

To monitor a person's blood sugar levels.

What is being tested?

As glucose circulates in your blood, some of it spontaneously binds to haemoglobin (the protein that carries oxygen in your red blood cells). This combination is called haemoglobin A1c (HbA1c). The amount of HbA1c formed is directly related to the amount of glucose in your blood. HbA1c levels do not change quickly since red blood cells live for 2–3 months. Because of this, the amount of HbA1c in your blood reflects the average amount of glucose in your blood during the last few months.

What does the test result mean?

A healthy person without diabetes will have HBA1c below 48mmol/mol.

If you have diabetes and your HbA1c is below the target of 48 mmol/mol, it is likely that your diabetes is well controlled. If your HbA1c rises above 48 mmol/mol, you are at increased risk of developing long term complications such as eye disease, kidney disease or nerve damage.

High Sensitivity C-reactive Protein (CRP)

Why be tested?

CRP has been proposed as a method for predicting a healthy person's risk of heart attack or other heart conditions

What is being tested?

CRP is a protein in the blood that increases when inflammation is present. CRP has been used for many years as an indicator of infection and inflammation associated with disease. Doctors now believe that atherosclerosis (fatty build-up in artery walls, also called 'hardening of the arteries') is also an inflammatory process.

What does the test result mean?

The results are generally interpreted on a relative scale. People with the highest values have the highest risk of heart disease and those with the lowest values have the lowest risk. If your CRP level is on the high end of the normal range (more than 3.0mg/L), it may be a sign that you are at risk for cardiovascular (heart and blood vessel) disease and other heart conditions.

Is there anything else I should know?

Because CRP tests measure a marker for inflammation, doctors need to know about recent medical events that may also have increased CRP levels, such as tissue injury, infections, or general inflammation from conditions like arthritis.

RBC (Red Blood Cells)

Why be tested?

To evaluate any change in the number of red blood cells in your blood.

What is being tested?

This test counts the number of red blood cells (RBC) in a litre of blood. Red blood cells, which are made in the bone marrow, carry oxygen from the lungs to the cells and transport carbon dioxide from the cells to the lungs. Women tend to have lower RBC counts than men do. Levels generally tend to decrease with age. When the value decreases by more than 10% of the expected normal value, the patient is said to be anaemic.

What does the test result mean?

A high RBC count may indicate congenital heart disease, dehydration, obstructive lung disease, or bone marrow over-production. A low RBC count may indicate anaemia, bleeding, kidney disease, bone marrow failure (for instance, from radiation or a tumour), malnutrition, or other causes. A low count may also indicate nutritional deficiencies of iron, folate, vitamin B12, and vitamin B6.

WBC (White Blood Cells)

Why be tested?

If your doctor thinks that you might have an infection or allergy, and to monitor treatment.

What is being tested?

The white blood cell (WBC) count indicates the number of white blood cells in a sample of blood. This count provides a clue to the presence of illness. White blood cells are made in the bone marrow, protect

the body against infection, and aid in the immune response. If an infection develops, white blood cells attack and destroy the bacteria causing the infection.

What does the test result mean?

An elevated number of white blood cells is called leukocytosis. This can result from bacterial infections, inflammation, leukaemia, trauma, or stress. A WBC count of 11.0 - 17.0 x 10^9 cells / L would be considered mild to moderate leukocytosis.

A decreased WBC count is called leukopenia. It can result from many different situations, such as chemotherapy, radiation therapy, or diseases of the immune system. A count of 3.0–4.0 x10^9 cells / L cells would be considered mild leukopenia.

HCT (Haematocrit)

Why be tested?

This test is used to evaluate:

- Anaemia (decrease of red blood cells);
- Polycythaemia (increase in red blood cells);
- Dehydration.

What is being tested?

Haematocrit is a measurement of the proportion of blood that is made up of red blood cells. The value is expressed as a percentage or fraction of cells in blood. For example, a haematocrit value of 40% means that there are 40 millilitres of red blood cells in 100 millilitres of blood.

What does the test result mean?

Decreased haematocrit indicates anaemia, such as that caused by iron deficiency. Further testing may be necessary to determine the exact cause of the anaemia.

Other conditions that can result in a low haematocrit include vitamin or mineral deficiencies, recent bleeding, cirrhosis of the liver, and malignancies.

The most common cause of increased haematocrit is dehydration, and with adequate fluid intake, the haematocrit returns to normal. However, it may reflect a condition called *polycythemia vera* - that is, when a person has more than the normal number of red blood cells. This can be due to a problem with the bone marrow or, more commonly, as compensation for inadequate lung function (the bone marrow manufacturers more red blood cells in order to carry enough oxygen throughout your body). Anytime a haematocrit is persistently high, the cause should be determined in consultation with a doctor.

Haemoglobin

Why be tested?

If you have anaemia (too few red blood cells) or polycythaemia (too many red blood cells), to assess its severity, and to monitor response to treatment

What is being tested?

This test measures the amount of haemoglobin (a protein found in red blood cells) in your blood and is a good indication of your blood's ability to carry oxygen throughout your body. Haemoglobin carries oxygen to cells from the lungs. If your haemoglobin levels are low, you have anaemia, a condition in which your body is not getting enough oxygen, causing fatigue and weakness

What does the test result mean?

Normal values in an adult are approximately 120 to 180 grams per litre (12 to 18 g/dL) of blood but are influenced by the age, sex, and ethnic origin in the person. Above-normal haemoglobin levels may be the result of:

- Dehydration;
- Excess production of red blood cells in the bone marrow;
- Severe lung disease; or,
- Several other conditions.

Below-normal haemoglobin levels may be the result of:

- Iron deficiency;
- Inherited haemoglobin defects;
- Bone marrow failure;
- Cirrhosis of the liver (during which the liver becomes scarred);
- Bleeding;
- Vitamin and mineral deficiencies;
- Kidney disease;
- Other chronic illnesses; or,
- Cancers that affect the bone marrow

Mean Cell Volume (MCV)

Why be tested?

MCV is a good indicator of anaemia, and can help doctors narrow down what might be causing the anaemia.

What is being tested?

The MCV is a measurement of the average size of your red blood cells (RBC).

What does the test result mean?

The MCV is elevated when your RBCs are larger than normal (macrocytic), for example in anaemia caused by vitamin B12 deficiency. When the MCV is decreased, your RBCs are smaller than normal (microcytic), such as is seen in iron deficiency anaemia.

Mean Cell Haemoglobin (MCH) and Mean Cell Haemoglobin Concentration (MCHC)

What is being tested?

Mean cell haemoglobin (MCH) is a calculation of the amount of oxygen-carrying haemoglobin inside your RBCs. Mean cell haemoglobin concentration (MCHC) is a calculation of the percentage of haemoglobin in the RBCs.

What does the test result mean?

Decreased values point to hypochromasia, decreased oxygen- carrying capacity because of decreased haemoglobin inside the cell. Hypochromasia is seen in iron deficiency anaemia and in thalassemia.

Platelets

Why be tested?
To diagnose a bleeding disorder or a bone marrow disease.

What is being tested?
Platelets are tiny fragments of cells made in the bone marrow and circulate in the blood. Because they are very sticky, they are the first components to be activated when there has been an injury to a blood vessel and begin the formation of a "blood clot". The platelet count is a test that determines the number of platelets in your blood.

What does the test result mean?
In an adult, a normal count is about 150,000 to 400,000 platelets per microlitre of blood.

Patients who have a bone marrow disease, such as leukaemia or other cancer in the bone marrow, often experience excessive bleeding, which is generally due to a significantly decreased number of platelets (thrombocytopenia). Low number of platelets may occur in some patients with long-term bleeding problems thus reducing the supply of platelets. Individuals with an autoimmune disorder (such as lupus, where the body's immune system attacks its own organs) can cause the destruction of platelets. Patients undergoing chemotherapy may also have a decreased platelet count.

More commonly (up to 1% of the population), easy bruising or bleeding may be due to an inherited disease called von Willibrand's disease. While the platelets may be normal in number, their ability to stick together is impaired. Many cases go undiagnosed due to the mild nature of the disease; however, the more severe form can be very harmful.

Increased platelet counts (thrombocytosis) may be seen in individuals who show no significant medical problems, while others may have a more significant blood disorder problem called myeloproliferative disorder (abnormal growth of blood cell elements). Some may have a tendency to bleed due to the lack of stickiness of the platelets, yet in others, the platelets retain their stickiness but, because they are increased in number, tend to stick to each other, forming a clump that can get stuck within a blood vessel and cause damage.

Differential White Cell Count

Why be tested?
To diagnose an illness affecting your immune system, such as an infection.

What is being tested?
There are five types of white blood cells, each with different functions: neutrophils, lymphocytes, monocytes, eosinophils and basophils. The differential reveals if these cells are present in normal proportion to one another, if one cell type is increased or decreased, or if immature or abnormal cells are present. This information is helpful in diagnosing specific types of illnesses that affect the immune system.

White blood cells are made in your bone marrow or lymphoid system. They protect your body against infection and aid your immune system. If an infection develops, white blood cells attack and destroy the bacteria or virus causing the infection.

What does the test result mean?

The results indicate the percentage of each type of white blood cell that is present:

Neutrophils can increase in response to bacterial infection, inflammatory disease, steroid medication, or more rarely leukaemia. Decreased neutrophil levels may be the result of severe infection or other conditions, such as responses to various medications or chemotherapy.

Eosinophils can increase in response to allergic disorders, inflammation of the skin, and parasitic infections. They can also occur in response to some infections or to various bone marrow malignancies.

Basophils can increase in cases of leukaemia, long- standing inflammation, the presence of a hypersensitivity reaction to food, or radiation therapy.

Lymphocytes can increase in cases of bacterial or viral infection, leukaemia, lymphoma, or radiation therapy. Decreased lymphocyte levels are common in later life but can also indicate steroid mediation, stress, and lupus.

Monocyte levels can increase in certain leukaemias, in response to infection of all kinds as well as to inflammatory disorders. Decreased monocyte levels can indicate bone marrow injury or failure and some forms of leukaemia.