

Aha!

Clinical

Tests

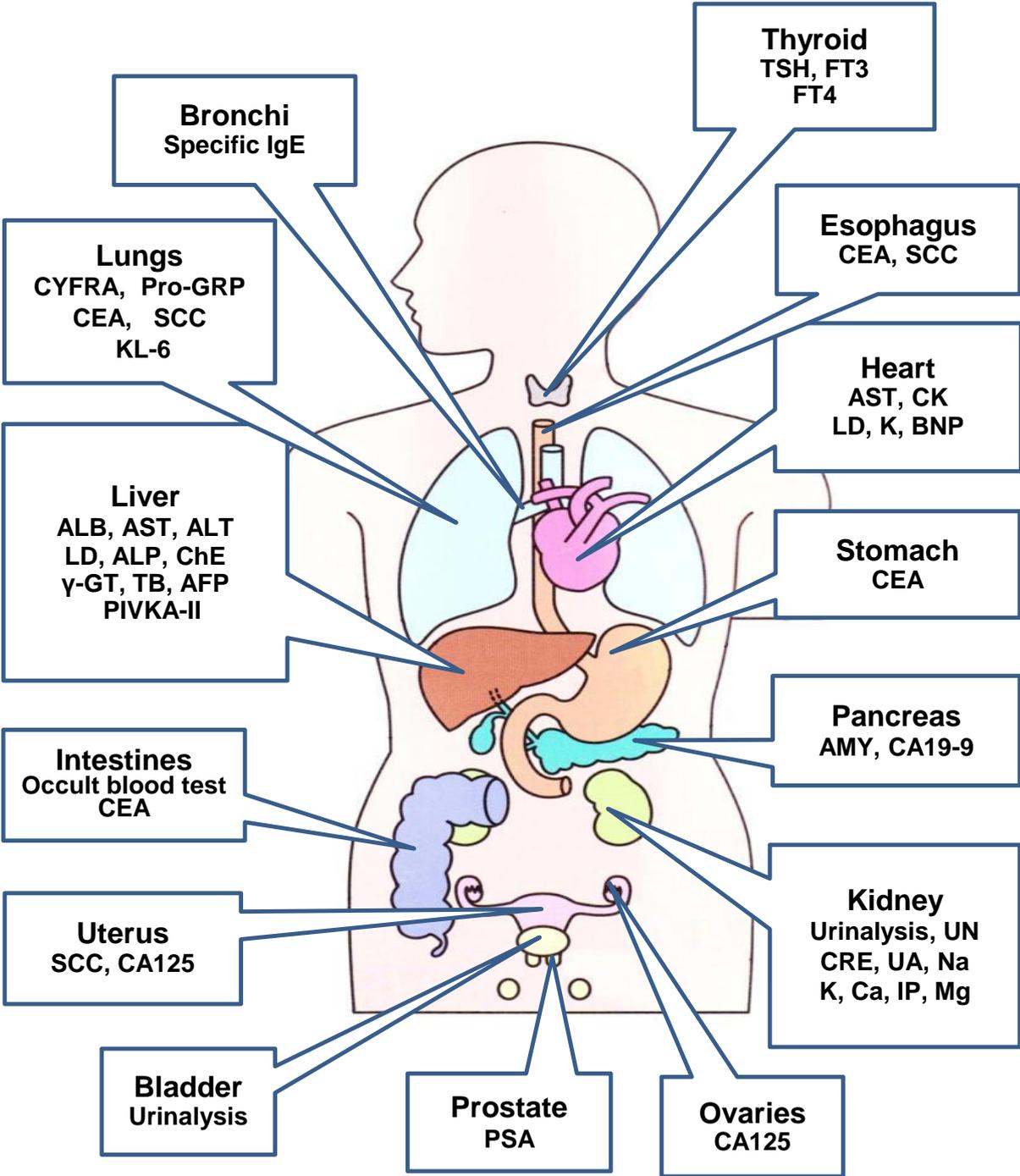
# Basic information 2nd edition

What are AST,  
ALT, LD, UN,  
WBC and  
RBC?



National Hospital Organization \_\_\_\_\_ Medical Center

# Major Test Items by



**Blood**  
WBC, RBC, Ht, Hb, PLT

**Blood vessels**  
TC, TG, HDL-C, LDL-C

# Laboratory Test

A laboratory test is an investigation of a specimen (e.g. blood, urine, stool, and sputum) collected from patients.

It indicates the state of the organs, therapeutic course, etc.



Please ask your doctor for the details of each test, since the following descriptions provide only general information.

**Laboratory test (Urinalysis, stool analysis, blood test, bacteriological tests)**

|                | Test name <Medical fee term>  | Description  |
|----------------|---|--|
| Urinalysis     | Chemical screening of urine: Substances including protein, sugar and occult blood in the urine are assessed with a dip stick test. (Urine qualitative/semi-qualitative tests) |  |
|                | Urine protein   | Renal dysfunction causes difficulty to reuse protein, leading to leaking of protein into the urine. Your test result will be positive if you have such a condition. A positive result may also be present due to other factors such as exercise or stress.               |
|                | Sugar in urine  | Hyperglycemia, obesity, pancreatitis, liver cirrhosis and renal dysfunction cause a positive test result. Difficulty in reusing sugar results in leaking of sugar into the urine. A positive result may also be present due to other factors such as exercise or stress. |
|                | Occult blood in urine   | A state of hematuria that is too slight to be visible with the naked eye is called "occult blood". This test reveals bleeding from the kidney through the urethra.   |
|                | Urinary sediment (In-urine physical components): Physical components in urine are observed with a microscope.   |  |
|                | Red blood cells   | Physical components in urine are observed with a microscope to check for the presence and increase in the number of elements including red blood cells and white blood cells. This test is essential for a diagnosis of renal and urinary tract diseases.                |
|                | White blood cells   |  |
| Casts          |   |  |
| Others         |   |  |
| Stool analysis | Fecal occult blood (Hemoglobin and transferrin in stool)  | This is a test to investigate the presence of bleeding from the gastrointestinal tract. A positive result may indicate colorectal polyps, ulcerative colitis, colon cancer, or bleeding from hemorrhoids.  |

|   | Test name <Medical fee term>  | Description  |
|---|---|--|
| Blood test                              | Complete blood count: Blood cell count and hemoglobin content are measured. (General analysis of peripheral blood)  |  |
|   | WBC<br>(White blood cell count)   | White blood cells, one group of blood components, have a protective function in the body against invasion by foreign matter. A low WBC count indicates a decrease in the defense reaction of the body, which means that a person is susceptible to disease. Knowing if there has been an increase or decrease in the WBC count helps to grasp the body state and guess which disease you have. |
|   | RBC<br>(Red blood cell count)   | Red blood cells carry oxygen to various cells of the body and convey carbon dioxide from organs to the lung. Hemoglobin plays a leading role in this mechanism. Hematocrit is the percentage of red blood cells in blood. Low levels of these items indicate dilute blood, which means that anemia is suspected.   |
|   | Hb (Hemoglobin)   |  |
|   | Ht (Hematocrit)   |  |
|   | MCV<br>(Mean corpuscular volume)  | These indices, calculated from the RBC count, Hb content and Ht level, represent the volume and color density of RBCs. They give us information to determine the cause of anemia.  |
|   | MCH<br>(Mean corpuscular hemoglobin)  |  |
|   | MCHC<br>(Mean cell hemoglobin concentration)  |  |
|   | PLT (Platelet count)  | Platelets, which are also blood components, are involved in the process of stopping bleeding by quickly closing vessel injuries. A decrease in PLT count or hypoactivity of platelets leads to clotting problems.  |
|   | RET (Reticulocyte count)  | Reticulocytes are newborn immature RBCs. The hematopoietic capacity of RBCs in the bone marrow can be grasped based on the results of this test.   |
| ESR<br>(Erythrocyte sedimentation rate) | This is a test to measure the speed at which RBCs sink down through a test tube. Diseases such as infection and other inflammatory conditions cause acceleration of the rate. |  |

|                  | Test name <Medical fee term>  | Description   |  |
|------------------|---|---|--|
| Blood test       | Peripheral hemogram: Cells in blood are differentiated  |   |  |
|                  | Neut (Neutrophils)  | There are 5 types of WBC: neutrophils, lymphocytes, monocytes, eosinophils and basophils. Using the microscope, these cells are observed for morphology and to count their relative presence. As the types of WBC that are increased/decreased vary depending on different kinds of diseases, investigation of the type provides a clue to identify certain diseases or symptoms. |  |
|                  | Ly (Lymphocytes)  |   |  |
|                  | Mono (Monocytes)  |   |  |
|                  | Eos (Eosinophils)   |   |  |
|                  | Baso (Basophils)  |   |  |
| Coagulation test | BT (Bleeding time)  | This is a comprehensive analysis of the hemostatic function of blood by measuring the time until bleeding stops.  |  |
|                  | PT<br>(Prothrombin time)  | Time  | This test investigates coagulation disorders of blood. PT is also measured to adjust the dose of people who are treated with warfarin. |
|                  |   | Activity  |  |
|                  |   | INR   |  |
|                  | APTT<br>(Activated partial thromboplastin time)   | This test investigates coagulation disorders of blood. It is also used for a diagnosis of hemorrhagic diseases such as hemophilia and for follow-up during heparin therapy.   |  |
| Fib (Fibrinogen) | Fibrinogen is one of the blood coagulation factors associated with hemostasis. The level decreases due to diseases that lead to a defect in the mechanism of blood coagulation (i.e. blood spontaneously changes to a solid state when bleeding occurs). A high level indicates inflammation. |   |  |
| Protein          | TP (Total protein)  | This value represents the total amount of protein in the blood, which indicates your nutritional status and the functions of the liver and kidneys.   |  |
|                  | ALB (Albumin)   | Albumin, a protein produced in the liver, indicates the nutritional status of the entire body. The level decreases due to liver disease or hypoactivity of the kidney.  |  |

|                | Test name <Medical fee term>              | Description   |
|----------------|---|---|
| Protein        | CRP (C-reactive protein)                  | The level increases during inflammation in the body, and decreases when recovered. Other diseases such as myocardial infarction also cause an increase.   |
|                | AST (GOT)<br>(Aspartate aminotransferase) | AST is an enzyme contained at a high concentration in cells of the liver, heart and muscle. The level increases due to hepatic disorder, myocardial infarction, etc.  |
| Liver function | ALT (GPT)<br>(Alanine aminotransferase)   | ALT is an enzyme contained at a high concentration in the liver. The level increases due to diseases of the liver and biliary tract, and sensitively reflects disorders of liver cells.   |
|                | LD<br>(Lactate dehydrogenase)             | LD is an enzyme that is widely present in all organs of the body. Testing the amount of LD is important as a primary test to know the degree of organ injury. The level increases due to diseases, especially those of the liver and blood. |
|                | γ-GT<br>(γ-glutamyl transferase)          | An abnormal level of this enzyme if found in case of liver and biliary tract diseases. Alcoholic liver injury also causes an increase in it.  |
|                | ALP<br>(Alkaline phosphatase)             | The state of the liver, bile and bones can be judged based on the ALP value. The levels are higher in growing children than in adults.  |
|                | ChE<br>(Cholinesterase)                   | The value decreases due to liver disease as well as poisoning caused by organophosphorus agents. On the other hand, it increases in case of fatty liver.  |
|                | TB (T-Bil)<br>(Total bilirubin)           | Bilirubin is a bile pigment. The value increases mainly due to disorders of the liver and biliary tract, and it acts as an indicator of jaundice.   |
|                |   |   |

|                  | Test name <Medical fee term>       | Description   |
|------------------|------------------------------------|---|
| Pancreas         | AMY (Amylase)                      | Amylase is a digestive enzyme secreted by the pancreas and salivary glands. The level increases due to diseases of the pancreas and salivary glands.  |
|                  | CK<br>(Creatine kinase)            | The CK level reflects the degree of damage in the heart, skeletal muscle, etc. It increases due to heart diseases including myocardial infarction and muscle disease.                                       |
| Cardiac function | BNP<br>(Brain natriuretic peptide) | The aim of this test is to assess the state of your heart. The level increases mainly due to heart failure.   |
|                  | UN (Urea nitrogen)                 | Urea nitrogen is a protein degradation product, and the level increases due to a decline in renal function.   |
| Renal function   | CRE (Creatinine)                   | Creatinine is a substance that is excreted by the kidney. It is generated through the metabolism of amino acids, an energy source during exercise. The level indicates renal function.                      |
|                  | UA (Uric acid)                     | Uric acid is a waste product excreted by the kidney. It is generated by the degradation of purine bodies, which are involved in cell production. Abnormal UA values may indicate gout or renal dysfunction. |
|                  | Na (Sodium)                        | The control of the hydration state in your body is checked based on the values of these substances. Kidney disease, hormone abnormalities, dehydration, etc. increase/decrease the values.                  |
| K (Potassium)    |                                    |   |
| Cl (Chloride)    |                                    |   |
| Electrolyte      | Ca (Calcium)                       | The level changes due to bone disease and various endocrine diseases. Ca plays an important role in the functions of the heart and blood vessels.   |

|                    | Test name <Medical fee term> | Description   |
|--------------------|------------------------------|---|
| Electrolyte        | Mg (Magnesium)               | Magnesium is essential for enzyme activity and energy metabolism. Like calcium, it is a key substance that controls the functions of the heart and blood vessels.   |
|                    | IP (Inorganic phosphorus)    | Inside the body, inorganic phosphorus exists in bones, bonded to calcium. In combination with Ca tests, this test provides information when investigating the possible presence of endocrine or bone metabolism disorders.      |
| Iron               | Fe (Iron)                    | Iron is a component of hemoglobin that carries oxygen. The level decreases due to bleeding and iron-deficiency anemia, and increases when hepatic dysfunction develops.   |
|                    | Ferritin                     | The level of ferritin, a protein that stores iron, represents iron reserves. It is an indicator of such diseases as iron-deficiency anemia. It is also used as a marker of malignant tumors, an inflammatory response, etc.     |
| Glucose metabolism | GLU<br>(Glucose/blood sugar) | This value indicates the concentration of blood glucose, an essential nutrient as energy for the body. It is an important indicator of diabetes mellitus. The test is conducted during fasting because it is affected by meals. |
|                    | HbA1c<br>(Hemoglobin A1c)    | The value reflects the average blood glucose of the past 1-2 months, and increases when a state of hyperglycemia has continued. It is useful for the control of blood glucose in patients with diabetes mellitus.               |
| Lipid              | TC (Total cholesterol)       | Cholesterol, a fat component of the body, plays an important role as a substance to strengthen blood vessels. Too much cholesterol causes lifestyle-related disease including arteriosclerosis.                                 |

|          | Test name <Medical fee term> | Description  |
|----------|------------------------------|--|
| Lipid    | HDL-C<br>(HDL cholesterol)   | HDL-C, which is also called beneficial cholesterol, removes cholesterol attached to blood vessels to prevent arteriosclerosis.   |
|          | LDL-C<br>(LDL cholesterol)   | When the level of LDL-C, which is called bad cholesterol, increases, cholesterol accumulates on the vascular walls, facilitating arteriosclerosis. It is a direct risk factor of arteriosclerosis. |
|          | TG (Triglyceride)            | Triglyceride, a fat component of the body, causes arteriosclerosis when the amount is too much. The level increases after a meal.  |
| Immunity | RF (Rheumatoid factor)       | The level of the positive result is higher in patients with chronic rheumatoid arthritis or connective tissue disease.   |
|          | IgG (Immunoglobulin G)       | IgG is the most abundant immunoglobulin in the blood, and the level increases in case of chronic inflammatory disease.   |
|          | IgA (Immunoglobulin A)       | IgA is the second-most abundant immunoglobulin in the blood and secretory fluids after IgG. It plays an important role in immunity against mucosal infections of the throat, nose, etc.            |
|          | IgM (Immunoglobulin M)       | IgM is the biggest immunoglobulin. When you have infection, the level quickly increases to protect your body.  |
|          | Specific IgE                 | The aim of this test is to detect the causal substance of allergic disease (allergen), including hay fever and bronchial asthma. Cedar pollen and house dust are typical allergens.                |

|              | Test name <Medical fee term>   | Description  |
|--------------|--|--|
| Immunity     | Nonspecific IgE  | Nonspecific IgE is an immunoglobulin associated with allergy. This test shows the overall extent of allergy.   |
| Tumor marker | <p>[What is a tumor marker?]</p> <p>Test results of tumor markers indicate the presence of cancer. Since the value may get higher due to other factors besides cancer, a clear conclusion cannot be made only based on the result of a high or low value. However, a high value leads to further tests.</p> <p>For the interpretation of test results, it is important to receive an explanation by your doctor instead of trying to interpret it by yourself.</p> |  |
|              | CYFRA<br>(Cytokeratin 19 fragment)   | The higher level of CYFRA is mainly in patients with lung cancer. Other chronic lung diseases, hepatitis and liver cirrhosis may cause an increase in the level too.             |
|              | Pro-GRP<br>(Gastrin-releasing peptide precursor)   | The level increases mainly in patients with lung cancer, and changes according to the recurrence or progression of cancer. Other diseases may also cause an increase.            |
|              | AFP<br>( $\alpha$ fetoprotein)   | The level increases in patients with liver cancer. Hepatitis and liver cirrhosis also increases it slightly.   |
|              | PIVKA-II<br>(Protein induced by the absence of Vitamin K or by antagonists-II)   | The level increases mainly in patients with cancer of the liver. Combination test with other items such as AFP provides more detailed information on the condition of the liver. |
|              | CEA<br>(Carcinoembryonic antigen)  | The level increases due to gastrointestinal cancer including colon cancer as well as lung cancer. Aging and smoking also increase it slightly.                                   |

|               | Test name <Medical fee term>                     | Description   |
|---------------|--|---|
| Tumor markers | CA 19-9  | The level increases mainly in patients with tumors of the pancreas and biliary tract. Diabetes mellitus and gallstones also increase it slightly.   |
|               | CA125  | The level increases due to ovarian tumor or uterine body tumor. It also increases transiently in early pregnancy, menstruation, premenopausal period, etc.  |
|               | SCC<br>(Squamous cell carcinoma related antigen) | The level increases mainly due to cervical cancer, as well as lung cancer and esophageal cancer. Other diseases than cancer may also cause an increase in it.   |
|               | PSA<br>(Prostate-specific antigen)               | The level increases in patients with prostate neoplasms even at an early stage. A differential diagnosis is required since prostatic hyperplasia and prostatitis also cause an increase in it.  |
|               | KL-6<br>(Sialylated carbohydrate antigen KL-6)   | The level increases due to interstitial pneumonia, etc., which provides a clue to know the state or degree of the disease. Other lung diseases including pulmonary tuberculosis may cause an increase in the level.   |
| Hormone       | TSH<br>(Thyroid-stimulating hormone)             | TSH is a hormone discharged from the brain, which controls the secretion of thyroid hormone. The aim of this test is to diagnose thyroid disease.   |
|               | FT3<br>(Free triiodothyronine)                   | FT3 and FT4, types of thyroid hormones, control energy metabolism and the activity of the autonomic nerves. The facilitation or reduction of thyroid function may cause difficulties in daily living. The test results indicate the degree of disease and therapeutic efficacy. |
|               | FT4 (Free thyroxine)                             |   |

|             | Test name <Medical fee term>  | Description   |
|-------------|---|---|
| Infection   | RPR<br>(Serologic test for syphilis)                                      | The presence of syphilitic infection is examined.   |
|             | TP antibody<br>(Fluorescent treponemal antibody)                          |   |
|             | HBs antigen<br>(Hepatitis B virus surface antigen)                        | This test reveals whether you have hepatitis B or not. No symptoms may be present, even if you have been infected.  |
|             | HCV antibody<br>(Hepatitis C virus antibody)                              | This test reveals that you have hepatitis C or have been infected with the virus.   |
|             | HIV antibody<br>(Human acquired immunodeficiency virus antibody)          | This test shows whether you have been infected with the acquired immunodeficiency virus. A positive result requires further tests to confirm it.  |
|             | Influenza virus antigen<br>(Influenza virus antigen rapid detection test) | The aim of this test is to know whether you have been infected with influenza virus. As the amount of virus is small at early phase of infection, the test result may be negative.  |
| Blood group | ABO<br>(ABO blood-group system)   | Blood is divided into 4 major groups of A, B, O and AB. Blood grouping is conducted when you receive a blood transfusion for bleeding during surgery or for anemia, or when you become pregnant. Requiring sensitiveness, the test is performed twice with blood collected on different days (or under different situations). Children may receive the second test from an age of 1 to 3 years, when their blood starts to react almost like the blood of adults. |
|             | Rh (Rh (D) blood group)   | Rh typing is as important as the ABO system. The blood of Japanese is mostly categorized as Rh positive.  |

|                                 | Test name <Medical fee term>  | Description  |
|---------------------------------|---|--|
| Bacteriological examination     | Bacteriological smear test (Bacteriological microscopy)   | A sample including sputum, urine or other secretions is spread thinly and stained on a glass plate to detect bacteria with a microscope. The aim of this test is to get information quickly to presume the type of pathogenic bacteria and to note infection.  |
|                                 | Culture-based bacterial detection test  | A sample including sputum, urine and secretion is cultured to investigate the presence and type of bacteria causing infection.   |
|                                 | Antimicrobial sensitivity test  | The aim of this test is to select the most effective drug (antibiotic) against the bacteria causing infection.   |
| Mycobacterium tuberculosis test | Acid-fast bacteria isolation culture test   | The aim of this test is to detect the presence of Mycobacterium tuberculosis by culturing samples including sputum. Acid-fast bacillus falls into 2 types, namely, Mycobacterium tuberculosis and non-Mycobacterium tuberculosis. The slow development of these bacteria requires several weeks to obtain the test result. |
|                                 | Mycobacterium tuberculosis-specific IFN- $\gamma$ (Mycobacterium tuberculosis-specific interferon- $\gamma$ productivity) | This is a test to investigate whether you have been infected with Mycobacterium tuberculosis or not. The test has been used instead of the tuberculin test recently, because it is not influenced by BCG vaccination, etc. The test method includes QuantiFERON (QFT) and T-SPOT.  |

# **Precautions for Blood Collection**

## **Tips on Collecting Samples Including Urine and Stool**

### **1. Precautions for blood collection**

- Concerning taking meals or drugs before blood collection, please ask your doctor beforehand.
- When you want to drink something before blood collection, please choose fluid without sugar (e.g. tap water, plain hot water or mineral water).
- Please wear clothes with sleeves that can easily be pushed or rolled up above the forearms and not tight-sleeved clothes.

### **2. Caution after blood collection**

- Please press down on the injection site firmly without kneading the area for a few minutes after blood collection.
- Insufficient pressure may lead to bleeding under the skin or pain later.
- You may have a bruise due to internal bleeding. However, you do not have to worry because it will clear in 1-2 weeks.
- One may bath on the day after blood collection. Please do not rub the site of blood collection strongly.

### **3. Please tell your doctor/staff if you;**

- have an allergy to antiseptics (mainly rubbing alcohol),
- use drugs including anticoagulants (warfarin),
- have undergone mastectomy, or
- have any other concerns.

### **4. How to collect urine**

- Please pass urine a little at first without collecting, and then pour the mid-stream part into a urine sample container.
- Concerning the amount of urine to be collected, please pour it at least to the bottom scale of the container.
- When you have a menstrual period, please inform your doctor during the consultation. You ought to refrain from collecting a urine sample because the result may not be accurate.
- Those who have difficulty to urinate can take the container home to collect urine at home and bring it to the medical institution.

## **5. How to collect stool**

- There are various aims of stool analysis. The way to collect stool samples differs according to the aim.

- For an occult blood test, which is relatively frequently conducted among stool analyses, please refer to the booklet that explains how to collect stool samples provided with the container.

- Meals rarely affect the test.

- Please consult your doctor if you have difficulty to produce stool samples.

- In general, drinking lots of water helps to produce bowel movements. However, it is recommended that you ask your doctor before making a decision by yourself.

## **6. How to collect sputum**

- Before collecting sputum, gargle to clean your mouth and drink a glass of water.

- Put your sputum in a container by hawking strongly a couple of times. At this time, please be careful not to include saliva or nasal discharge.

# Physiological test

Physiological test analyzes biological function based on waveforms or figures obtained from the body.

Major tests include electrocardiography, pulmonary function test, electroencephalography and ultrasonography (echo).

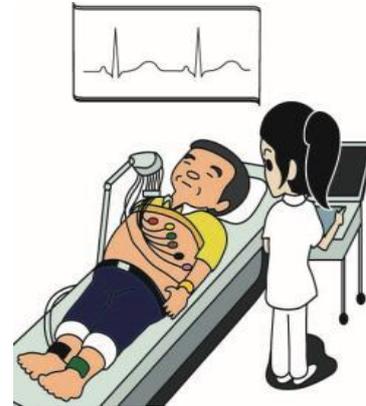


## 1. Electrocardiography

### (i) Electrocardiogram/exercise electrocardiogram

Electrocardiography records the waveform of weak electricity produced while the heart is beating, which is caught from electrodes attached to the chest and limbs. The aim of this test is to detect the cause of diseases including disturbed pulse (arrhythmia) and chest pain (angina) or to make a diagnosis.

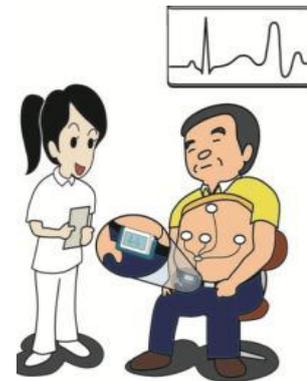
In exercise electrocardiogram, your electrocardiogram is recorded under resting condition at first, and then you are asked to step up and down a stool in rhythm for a given length of time in order to observe the change in electrocardiographic waveform between before and after the exercise. The result indicates the presence of angina and the therapeutic effect of drug, etc. (It takes around 5-15 minutes.)



### (ii) Holter electrocardiogram

The electrocardiogram of 24 hours is recorded using a compact recorder with its seal-form electrodes attached to the chest. It shows the type of arrhythmia developing in daily lives, and the pattern of change in electrocardiogram at the onset of chest pain. You have to record (note) your major activities (including sleeping, wake-up, meals, having a wash, work and symptoms) while receiving the test.

(It takes about 15 minutes to attach the recorder and receive explanation.)



## 2. Pulmonary (respiratory) function test

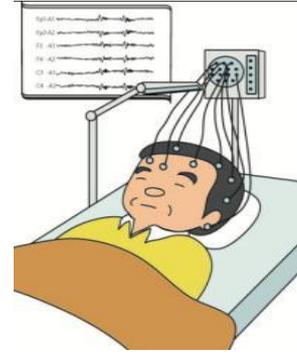
This test reveals the state or function of the lung, bronchus, etc. are asked to take a big breath in and out. As the test needs the of your best effort, you may receive it several times.

(It takes around 10-30 minutes, which differs depending on test type.)



### 3. Electroencephalography

In this test, many small electrodes are attached to the scalp. Change in weak electricity discharged from the brain is recorded as waveform, which helps in the diagnosis of epilepsy, and the assessment of brain performance and therapeutic efficacy. (It takes about 1 hour.)



### 4. Ultrasonography (echo)

Ultrasonography presents an image obtained by shedding ultrasounds on the surface of the body, providing various detailed information. This test has low impact on your body. (It takes around 20-40 minutes, which differs depending on what is tested.)

#### (i) Heart

Heart movement, the states of valve and blood flow, and heart function are assessed. The test reveals various defects of the heart, which are hardly noted only from electrocardiogram.

#### (ii) Abdomen

The state of internal organs including the liver, gallbladder, pancreas, spleen and kidney is observed. You are asked to reposition yourself and take a breath in and out for close observation. The test is conducted during fasting in principle.



#### (iii) Others

Ultrasonography is also conducted to see the state of the breast, thyroid, carotid artery, vein of lower limbs, etc.

### 5. Urea breath test (UBT)

The aim of this test is to detect *Helicobacter pylori* in the stomach using your breath collected. It is generally conducted 4 weeks after eradication to see whether the treatment succeed or not. Please refrain from drinking and eating until the test is completed on the day. (It takes about 30 minutes.)

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