Blood tests

infoKID
Information for parents and carers about children's kidney conditions

This infoKID topic is for parents and carers about children's kidney conditions. Visit www.infoKID.org.uk to find more topics about conditions, tests & diagnosis, treatments and supporting information.

Each topic starts with an overview followed by several sections with more information.

» Links to sections in topic | Other topics available on website

Your child may need some tests at the clinic or hospital. These tests help find out whether your child has a health condition, and the best treatment. For children with a kidney condition, the tests can find out how well a treatment is working. They can also see whether there is damage to their kidneys or other parts of their body.

One very common test is a blood test. A small sample of your child's blood will be taken from the body, using a needle. This sample will be looked at by specialists in a laboratory.

This topic gives you information about:

- **what a blood test is**
- **why your child may need a blood test**
- **how blood samples are collected**
- **complications and risks**
- **what the blood tests are looking for**
- **a special blood test to measure how well the kidneys are working – called glomerular filtration rate.**

Overview

Why does my child need a blood test?

Your nurse or doctor will tell you why your child is having a blood test, and when you will get the results. Common reasons for testing blood in children include:

- to find out more about their general health
- to find out whether they have a condition, including any that affect the urinary system and kidneys
- to find out whether they have an infection
- to check how well their kidneys are working
- for children who have a kidney disease, to find out whether their kidney function is getting worse
- to check whether treatment is working
- before an operation
- before a **blood transfusion** (receiving blood from someone else who has given some of their own blood to be used as a medical treatment – a blood donor)
- to check the blood levels of some medicines.

Getting blood samples

A doctor, nurse or another healthcare professional specially trained to take blood will take the blood sample(s) from your child.

A thin needle is inserted through the skin and into a blood vessel, and a small amount of blood is drawn up into a syringe or special container.

For most children, taking blood is quick, does not hurt much and is very safe. Your child may feel a sharp scratch from the needle. A spray or cream can be put on the skin before the test, to help stop him or her feeling any pain.

Occasionally, there is some swelling, bruising or pain around the site where the blood was taken.

» More about getting blood samples

What are the blood tests looking for?

These tests can help find out:

- whether your child has the right amount of important chemicals in his or her body – including minerals called **electrolytes** and the waste products **urea** and **creatinine**
- whether your child has an infection
- the number of different types of blood cells, the living parts of your child's blood – a **full blood count**
- your child's **blood group** – this is important if he or she needs an operation or blood transfusion

» More about what the blood tests are looking for

Testing kidney function with glomerular filtration rate

The blood test can also find out how well your child's kidneys are working – this is called the **kidney function**. This is done by estimating or measuring the **glomerular filtration rate (GFR)**, which is the amount of fluid (liquid) that the kidneys filter each minute.

There are two main methods of measuring GFR in children: a simple blood test or a radioactive tracer.

» More about glomerular filtration rate

About blood

Blood is pumped by the heart around the body in tubes called **blood vessels**. It carries oxygen and nutrients around the body and takes away waste so that we stay healthy.

Blood is made up of liquid, called plasma, and living parts, called blood cells.

Overview: Read more about blood

Plasma and serum

Plasma is the liquid part of blood. It is made up of water, proteins, nutrients, hormones and waste products.

Serum is plasma but with some of the proteins removed.

Blood cells

There are three types of **blood cells**, the living parts of blood. Bloods cells are made in the bone marrow, which is found in the long bones in the body, like the leg bones.

- **Red blood cells** carry oxygen round the body. They do this in a substance called haemoglobin. Red blood cells are often called **RBCs** or **erythrocytes** ("erythro" means red and "cyte" means cell).
- **White blood cells** help fight infection. They are part of the immune system, which is the body's way of defending itself against disease and germs – bacteria and viruses. White blood cells are often called **WBCs** or **leucocytes** ("leuco" means white).
- **Platelets** help blood to clot, or form clumps. This helps the body to heal – for example, when you cut yourself.

Blood vessels

Two types of blood vessels carry blood around the body.

- **Arteries** carry blood from the heart to the rest of the body.
- **Veins** carry blood from the body back to the heart.

Getting blood samples

Most of the time, blood is taken from a vein, one type of blood vessel. A doctor, nurse or another health professional specially trained to take blood, will insert a thin needle through your child's skin and into a vein. They will draw up a small amount of blood into a syringe or special container.

Preparing for the test

It is important that your child is as comfortable and relaxed as possible. Talk to your child about what will happen during the test, and why it is needed.

Dealing with pain

Your child may feel a sharp scratch from the needle during the blood test. A spray or cream can be put on the skin before the test, to help stop him or her feeling any pain. This spray or cream is called a **local anaesthetic**. The cream is put on about 30–60 minutes before the test, to give time for it to work.

Play specialist

A play specialist may be able to meet with your child. They will use dolls and other toys to help your child prepare for the blood test.

Other tips to help

- You can stay with your child during the blood test. Ask the person taking the blood whether there is anything you can do to make your child more comfortable.
- Some children like to count to five before the needle goes in, or tell a story or sing a rhyme during the test.
- Find out whether your child would like to watch the blood being taken, or whether he or she prefers to look away.
- Staying calm and confident while distracting your child will help.

Blood samples

Getting a blood sample

Blood is usually taken from areas of the body where the veins are close to the skin – this makes it easier to get a blood sample. These are often in the inside of the elbow or on the back of the hand.

- A band is tightly wrapped above where blood will be taken, usually around the arm. This allows the vein to swell with blood.
- The skin is cleaned with an antiseptic wipe.
- If anaesthetic is being used to make the area numb, it will be put on the skin before the test.
- A needle is inserted – your child may feel a sharp scratch.
- The blood sample is drawn up into the container(s) and the needle is removed.
- A cotton wool pad is often used to stop bleeding and prevent bruising – you or your child may be asked to hold it in place. Sometimes a plaster is put over the site.

Getting a small blood sample

When only a small sample of blood is needed, some hospitals will get it from the capillaries, very tiny blood vessels under the skin. This is usually on the finger, thumb or heel.

- The skin is cleaned with an antiseptic wipe.
- A small needle is used to pierce the fleshy part of the finger, thumb or heel. It is removed straight away.
- The finger, thumb or heel is squeezed and the blood collected in a small container.
- A cotton wool pad is usually used to stop bleeding and prevent bruising – you or your child may be asked to hold it in place. Sometimes a plaster is put over the site.

Complications and risks

When it is difficult to take blood

For most children, taking blood is quick, does not hurt much and is very safe.

Some children have small veins that are difficult to find and take blood from. The person taking your child's blood will work with you and your child to find the best place to take blood.

Occasionally, he or she will bring a second healthcare professional to help. Sometimes they will need to take blood more than once to make sure they have enough blood for the tests.

Swelling, bruising and pain

Occasionally after a blood test, the site has swelling, bruising or pain.

- Put ice on the site. Cover the ice in a bag or a cloth – do not put ice directly on the skin.
- Speak with your doctor, nurse or pharmacist before giving a painkiller such as paracetamol.

➔ **If your child has, or might have, a problem with his or her kidneys, do *not* give ibuprofen (such as Brufen).**

What happens to the blood?

The container(s) with your child's blood is/are labelled with his or her name, and sent to a laboratory. Hospital staff can look at the blood under a microscope or test it with chemicals.

Your doctor or nurse will tell you when and how you will get the results.

What the blood tests are looking for

These tests look at samples of blood. They can help find out:

- **whether your child has the right amount of important chemicals in his or her body**
- **whether your child has an infection**
- **the number of different types of blood cells, the living parts of your child's blood**
- **your child's blood group – this is important if he or she needs an operation or blood transfusion**
- **how well your child's kidneys are working (kidney function and glomerular filtration rate – these are described in the next section).**

Important chemicals

We need the right balance of chemicals to stay healthy. Your child's blood will be checked to find out whether he or she has too much or too little of any of these chemicals.

Urea and creatinine

The body makes some chemicals after it uses energy. Urea is made from the food we eat, and creatinine is made when we use our muscles. These are waste products (not needed by the body) and the kidneys remove them from the body into urine.

If there is too much urea or creatinine in the blood, this may be a sign that the kidneys are not working as well as they should.

Electrolytes

Electrolytes are important chemicals in the body. They help make sure that the muscles, including the heart muscle, bones, teeth and blood, are healthy. If we have too much or too little, this can cause problems.

Some important electrolytes include sodium, potassium, bicarbonate, phosphate and calcium.

Other substances

Blood tests can be used to look at other substances.

» Read more about important chemicals on the next page

Infection and immune system

Different blood tests can check whether your child has or has had an infection, which is caused by germs, such as **bacteria**, **viruses** and **yeasts** (a type of fungus).

Tests can also show whether there are any problems with the **immune system**, the body's way of defending itself against infection and disease.

Full blood count

The body has different types of blood cells. It is important that we have the right amounts of these cells. A **full blood count (FBC)** or a **complete blood count (CBC)** counts the number of blood cells.

An FBC can help check for problems in your child's body, such as infections or inflammation (swelling). It can also help find out whether your child has **anaemia**, a condition that causes people to feel very tired or have low energy.

Blood group

Each of us belongs to one of eight blood groups. If your child is going to receive blood from a donor (someone who gives blood), it is important to find out his or her blood group. This is because the blood groups need to match.

» Read more about full bloud counts and blood groups on the next page

Blood tests: Read more about infection and the immune system

Infection and immune system

Blood cultures check whether the blood sample has germs, such as bacteria and yeasts (a type of fungus). It can take up to 48 hours for these results to be available.

Immunology tests look for antibodies. When germs come into the body, the body makes these chemicals to kill them. The body now has immunity to this type of infection.

These tests help find out whether your child has or has had an infection – such as chicken pox. They can also show whether there are problems with the immune system. A few people have **autoimmune conditions** in which antibodies attack the body's own tissues and organs. It may take some days for these results to be available.

Blood tests: Read more about electrolytes and other substances

Electrolytes

The kidneys control the amounts of some important electrolytes. If we have too much or too little, this can cause problems, and may mean there is a problem with the kidneys or another part of the body.

- **Sodium** helps balance the amount of water in the body. Hypernatraemia is too much sodium.
- **Potassium** is needed for the muscles, including the heart muscle, to work properly. Hyperkalaemia is too much potassium ("hyper" means too much) and hypokalaemia is too little potassium ("hypo means too little) – either of these may mean there is a problem with the kidneys.
- **Bicarbonate** balances the amount of acid in our body, or the pH balance (also called the acid–base balance). If there is not enough bicarbonate then the blood is acidic – this is called acidosis.
- **Phosphate** is important for bones, teeth and muscles. Hyperphosphataemia is too much phosphate.
- **Calcium** is important for bones and teeth, helps blood to clot, and also helps the muscles, including the heart muscle, to work.

Other substances

- **Vitamin D** helps the body take in calcium, which it needs to grow. We can get vitamin D from food and sunlight. The kidneys change the vitamin D to an active form that our bodies can use.
- **Serum albumin** is the main protein in blood. It helps control the amount of water inside blood vessels.
- **Parathyroid hormone (PTH)** is a **hormone** – a chemical that is carried in the blood to send a message to other parts of the body. PTH controls the amount of calcium, phosphorus and vitamin D levels in the blood and bone.
- **Glucose** is a form of sugar.
- **Cholesterol** is a type of fat.

Blood tests: Read more about full blood counts and blood groups

Full blood count

In a full blood count (FBC), blood is examined under a microscope. The amounts of different blood cells are measured.

This test can give clues about possible problems with your child's health. It measures the following:

- **haemoglobin** – a protein in the **red blood cells** which carries oxygen round the body and removes carbon dioxide. If the amount of haemoglobin is below the normal level, or if there are fewer red blood cells than normal, this is called anaemia. There are many types of anaemia, with different causes. Anaemia is a common complication of some kidney conditions, including **chronic kidney disease**.
- **white blood cells** – help the body fight infections, as part of the body's immune system. If there is a higher than normal number of white blood cells, there may be an infection. If there is a lower than normal number, this may mean that the body is not able fight infection normally
- **platelets** – help blood to clot (thicken) and prevent excessive bleeding, when we damage ourselves, for example, when we graze our skin.

Occasionally, because of medicines, the bone marrow does not make as many blood cells as it should. Measuring the FBC helps check whether this is happening.

Blood groups

Your blood group is based on whether or not you have certain substances on your red blood cells. It is inherited from your mother and father.

Blood groups are defined by two systems:

- ABO system – identified by the letters, A, B, O and AB
- Rhesus system – identified as either positive (+) or negative (–).

This means there are eight blood groups:

- A+
- A–
- B+
- B–
- O+
- O–
- AB+
- AB-

Glomerular filtration rate

The glomerular filtration rate (GFR) is the amount of fluid (liquid) that the kidneys filter each minute. Your doctor may measure your child's GFR. This will give more information about his or her kidney function, or how well his or her kidneys are working.

The GFR is measured by finding out how quickly the kidneys remove a substance from the blood into urine. There are two main methods of measuring GFR in children: blood test and a radioactive tracer.

Blood test to estimate GFR

Most of the time doctors can use a simple test to estimate the GFR. It is not an accurate measurement, but it is very close and is fine for many children.

In children, the substance that is usually measured is **creatinine**. This is a natural chemical that is made by the body as we use our muscles. Creatinine goes into the blood at a constant rate, and the kidneys remove most of it into the urine. If there is too much creatinine in the blood, this may be a sign that the kidneys are not working as well as they should.

What happens?

- A small amount of your child's blood is taken.
- Your child's blood sample is sent to a laboratory to measure the amount of creatinine.
- A formula is used to compare the amount of creatinine in your child's blood sample to his or her age, sex, height and ethnicity – these affect the normal amount of creatinine. This gives the estimated GFR (eGFR).

Finding out the results

Your doctor will usually be able to get the result on the same day as the blood sample is collected.

Radioactive tracer to measure GFR

Some children need a more accurate way to have their GFR measured.

One way is to use a **radioactive tracer**. A small amount of the tracer is injected into the blood and the test finds out how quickly it is removed from the body.

Why is this test needed?

Your doctor will explain why your child needs a more accurate test to measure his or her kidney function. Some common reasons are:

- to help your doctor decide how often your child needs other tests
- to help your doctor give you more accurate information about the outlook for your child
- to allow your doctor to adjust the amount (dose) of medicines that your child may need – if his or her kidneys are not working normally, he or she may need a smaller dose
- if your child has other problems that make the estimating method less accurate, for example abnormal muscles.

Are there any risks?

If your child's doctor recommends this test, he or she will have considered that the benefits far outweigh any risks. A small amount of the radioactive substance is used and it will not be in your child's body for long. The radiation exposure from this test is similar to the natural background radiation that your child receives in one week.

Are there any other options?

The alternative to this test is to continue use the estimating method – the simple blood test to measure creatinine.

Preparing for the test

You and your child do not need any special preparation for this test. He or she can eat and drink as usual, unless your doctor tells you otherwise.

You can be with your child during the whole test.

- A **play specialist** may be able to meet with your child. They will use dolls and other toys to help your child prepare for the test.
- A **local anaesthetic** spray or cream can be put on the skin before the test, to help stop your child feeling any pain. This is put on about 30–60 minutes before the test, to give time for it to work.

What happens?

- A small amount of the liquid radioactive tracer is injected into a vein in your child's arm.
- Your child will then have several small samples of his or her blood taken – this is often at 2, 3 and 4 hours after the injection.

After the test

There may be a small amount of radioactive substance in your child's urine for 24 hours after the test.

Your child should sit on the toilet when urinating (having a wee) the day after the test.

If your child uses nappies, put used nappies in a separate bag for 24 hours, then throw them away in your normal rubbish.

If your child accidentally wets his or her clothes or bedding, put these in a separate bag for 24 hours and then wash them as normal.

Finding out the results

You will not get the results on the day of the test. They will be given to your doctor, usually within one to two weeks, and your doctor will explain to you what the results mean.

About GFR results

The GFR tells your doctor the kidney function. Your doctor will tell you and your child what the results mean. He or she may also tell you what your child's GFR is as a percentage of normal – comparing to healthy kidneys.

Measurements

The GFR measures the volume in millilitres (mL) that the kidneys filter each minute (min). This is then adjusted for your child against a standard body size (body surface area of 1.73m2).

- The GFR for kidneys that are working at 100% (healthy kidneys) is **90 mL/min/1.73m2** or higher.
- The GFR for kidneys that are working at 50% (half as well as healthy kidneys) is 45 mL/min/1.73m2.

Your notes and contact information

www.infoKID.org.uk

BAPN British Association for Paediatric Nephrology

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For details on any sources of information used in this topic, please contact us through our website www.infoKID.org.uk.

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