TEST

Chromatography

Chromatography separates substances in a sample so a laboratory can identify or measure them.

WHAT IT MEASURES
Specific chemicals separated for identification or measurement

SAMPLE
Usually blood or urine; sometimes saliva, stool, or tissue

FASTING NEEDED?
Sometimes, for the specific substance being measured

HOW LONG IT TAKES
Usually only minutes to collect the sample

RESULTS IN
Hours to several days, varying by laboratory

USED FOR
Screening, diagnosis, monitoring, and drug or toxin testing

MAIN LIMITATION
Results depend on the specific method and substances targeted

Overview

Chromatography is a laboratory method that separates the substances in a sample. It is not one single test. Laboratories use several types of chromatography to look for or measure particular chemicals, medicines, drugs, hormones, proteins, or other compounds.

During chromatography, the sample moves through or across a material called the stationary phase. Different substances travel at different speeds. This separates them so they can be identified or measured.

Common methods include liquid chromatography, gas chromatography, and high-performance liquid chromatography, often shortened to HPLC. Chromatography may be combined with mass spectrometry, a method that identifies substances by their molecular mass and pattern.

The laboratory report usually names the substance tested rather than simply reporting "chromatography." Examples include a medicine level, a drug or toxin test, an amino acid profile, or an HbA1c test used to assess average blood sugar.

Why the test is ordered

The reason for chromatography depends on what the laboratory is trying to find. A healthcare professional may order a chromatography-based test to:

For drug testing, chromatography may be used to confirm which substance is present after an initial screening test. For HbA1c, certain HPLC methods separate forms of haemoglobin before measuring the amount carrying attached glucose.

- Identify or measure a medicine, drug, toxin, hormone, or metabolic chemical
- Confirm a result from a less specific screening test
- Investigate an unexpected laboratory result
- Monitor treatment or exposure to a substance
- Separate different forms of a protein, such as types of haemoglobin
- Look for unusual patterns linked with an inherited metabolic condition

Who should have the test

There is no routine need to "have chromatography" by itself. It is chosen when a specific clinical question requires a laboratory method that can separate similar substances.

You may have a chromatography-based test if a clinician needs a more precise measurement than a basic screening method can provide. It may also be used when a result could affect treatment, workplace or legal decisions, or the investigation of a possible poisoning.

Newborn screening and testing for inherited metabolic conditions can also use chromatography. These tests follow specific programmes and are not general screening for everyone.

How to prepare

Preparation is based on the substance being tested and the sample required. Follow the instructions on your request form or collection kit.

Some tests require fasting because food or drinks can change the substance being measured. Others can be collected at any time. Water is often allowed during a fast, but coffee, tea, juice, and chewing gum may not be.

Tell the healthcare professional or laboratory about prescription medicines, over-the-counter

products, vitamins, supplements, and recreational substances. Do not stop a medicine unless you have been specifically told to do so.

A test may need to be collected at a particular time, such as before the next medicine dose or after a known exposure. Urine tests may require a single sample or everything passed over a set period.

What happens during the test

Chromatography happens in the laboratory. Your part is usually limited to providing a sample.

For a blood sample, a needle is placed into a vein, usually in your arm, and blood is collected into a tube. This generally takes a few minutes.

For a urine test, you may be asked to collect urine in a sterile container. Some collections require you to clean the genital area first and collect urine after you have started passing it. This helps reduce contamination.

Saliva, stool, or tissue may be used for particular tests. If tissue is needed, the procedure used to collect it should be explained separately because its risks depend on the biopsy or operation involved.

In the laboratory, the sample is prepared and placed into the chromatography equipment. The separated substances produce a pattern called a chromatogram. A detector records when each substance appears and, for quantitative tests, how much is present.

Understanding your results

Your report may give a number with units, a range, or a result such as "detected" or "not detected." It may also list several substances and their breakdown products, called metabolites.

A chromatogram contains peaks. The position of a peak helps identify a substance, while its size can help estimate the amount. Laboratory staff interpret these peaks using reference materials and quality checks.

A detected substance does not always show when it was taken, how much was taken, or whether it caused impairment or symptoms. A negative result means the substance was not found above that method's reporting limit. It does not always exclude an earlier exposure or a substance that was not included in the test.

Reference ranges and decision limits are specific to the substance and method. They can vary

by laboratory, age, sex, pregnancy status, medicines, and clinical context. Use the range and comments printed on your own report.

What affects the results

Results can change even when the equipment and laboratory process are working correctly.

Important influences include:

For HbA1c measured by chromatography, iron deficiency, a recent transfusion, blood loss, and conditions that shorten or lengthen red blood cell survival can make the result misleading. Some haemoglobin variants can also interfere with particular methods.

Chemicals with similar properties can occasionally travel together through the chromatography system. This is called co-elution and can make a peak difficult to identify. A laboratory may repeat the test or use another method if interference is suspected.

- Eating, drinking coffee, alcohol use, smoking, or the time since your last meal
- The time of day or timing in relation to a medicine dose
- Recent exercise, depending on the hormone, medicine, or metabolic chemical measured
- Prescription medicines, supplements, recreational drugs, and their metabolites
- Kidney or liver function, which can change how quickly substances are removed
- Age, pregnancy, hydration, and recent illness
- A recent blood transfusion when blood cells or haemoglobin are being assessed
- Delayed processing, incorrect storage temperature, light exposure, or contamination

Accuracy and limitations

Chromatography can separate substances that other tests cannot distinguish. Combining it with mass spectrometry often improves identification. However, accuracy is specific to the method, sample, and substance being measured.

A result may say a substance is present when it is not if another compound produces a similar pattern, the sample is contaminated, or identification criteria are too broad. Confirmation with a more specific method can reduce this risk.

A test may miss a substance if:

Targeted tests only look for listed substances. A negative targeted drug panel, for example,

does not rule out every possible drug or toxin.

Chromatography also does not always answer the wider clinical question. Finding a medicine confirms its presence but may not show whether it caused symptoms. Genetic testing, an immunoassay, microscopy, or another chemical method may be more suitable in some situations.

- Its concentration is below the method's detection limit
- The sample was collected outside the detection window
- The substance broke down during storage
- The laboratory was not asked to include it
- An unusual chemical form or metabolite was not recognised

Risks and complications

Chromatography itself takes place in the laboratory and does not expose you to equipment or radiation.

A blood draw can cause brief pain, bruising, or light-headedness. Urine, saliva, and stool collection do not usually cause physical harm, although collecting the sample may be inconvenient.

If tissue is needed, the risks come from the biopsy or operation used to obtain it. These should be discussed before the procedure.

What happens next

Routine follow-up depends on the substance tested and why the test was ordered. A result may be reviewed with your symptoms, medicines, medical history, and other laboratory findings.

An unexpected result may be repeated using a fresh sample. The laboratory may also confirm it with mass spectrometry or another method. Do not change a prescribed medicine based only on a laboratory number without discussing the result with the clinician responsible for your care.

Seek urgent medical help if testing was arranged because of a possible poisoning or overdose and you develop severe drowsiness, confusion, difficulty breathing, collapse, a seizure, or chest pain. Do not wait for chromatography results in an emergency.

Common questions

Can I drink coffee before the test?

Sometimes. Coffee can affect certain hormones, metabolites, and fasting measurements. Follow the instructions for the specific substance being tested. If fasting is required, plain water is generally the safest choice unless told otherwise.

Does the time of day matter?

It can. Some hormones and metabolic chemicals follow daily rhythms. Medicine levels may need to be collected just before or after a dose. The collection instructions should give the required timing.

Can I exercise beforehand?

Light activity is unlikely to matter for many tests, but strenuous exercise can temporarily change some hormones and metabolic products. Ask whether you should avoid hard exercise when the appointment is arranged.

Will my medicines affect the result?

They may. A medicine can be the substance being measured, produce a related metabolite, or interfere with another measurement. Provide a complete medicine and supplement list, but do not stop treatment unless instructed.

How long can chromatography detect a drug?

There is no single detection window. It depends on the drug, dose, pattern of use, sample type, metabolism, kidney and liver function, and the laboratory's reporting limit.

Why is my result taking several days?

Some laboratories run specialised tests in batches or send samples to a reference laboratory. Complex results may also require repeat analysis or confirmation before they are released.

Sources

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