TEST

Cholinesterase - blood

A blood test that measures enzymes affected by certain pesticides and anesthetic medicines.

WHAT IT MEASURES
Enzymes that break down acetylcholine-like chemicals

SAMPLE
Blood

FASTING NEEDED?
No

HOW LONG IT TAKES
About five minutes

RESULTS IN
Same day to several days, laboratory-specific

USED FOR
Diagnosing poisoning, monitoring exposure, assessing anesthetic sensitivity

MAIN LIMITATION
Natural baseline differences can make one result misleading

Overview

A cholinesterase blood test measures enzymes that break down acetylcholine and similar chemicals. Acetylcholine carries messages between nerves, muscles, and other parts of the body.

The two main enzymes are:

"Serum cholinesterase," "plasma cholinesterase," or "pseudocholinesterase" usually refers to butyrylcholinesterase. A red blood cell cholinesterase test measures acetylcholinesterase. The results are not interchangeable, so check which enzyme was tested.

Organophosphate and carbamate insecticides can block these enzymes. Inherited changes in butyrylcholinesterase can also affect how the body handles certain anesthetic medicines.

- Acetylcholinesterase , found mainly in red blood cells and nerve tissue
- Butyrylcholinesterase , made by the liver and found in plasma

Why the test is ordered

The test may be ordered after possible exposure to an organophosphate or carbamate pesticide. Cholinesterase testing can support the assessment, but treatment must not wait for results when poisoning is suspected.

People who regularly work with these chemicals may be tested before an exposure season and during work. Comparing results with a personal baseline is often more useful than using a broad laboratory reference range.

Testing may also be recommended if you or a close relative had unusually long muscle paralysis after receiving succinylcholine or mivacurium during anesthesia. These medicines can last much longer when butyrylcholinesterase activity is low.

Serum cholinesterase may sometimes provide information about the liver's protein production, but it is not usually the main test of liver function.

Who should have the test

Testing may be appropriate if you:

Symptoms after pesticide exposure can include heavy sweating, excessive saliva or tears, vomiting, diarrhea, pinpoint pupils, muscle twitching, weakness, confusion, or breathing difficulty. Seek urgent help by calling emergency services or a poison information service rather than waiting for a blood test.

- May have been exposed to an organophosphate or carbamate
- Work with cholinesterase-inhibiting pesticides in a monitoring program
- Had prolonged weakness or breathing support after certain anesthetics
- Have a family history of inherited butyrylcholinesterase deficiency
- Need assessment of unexpectedly low cholinesterase activity

How to prepare

Fasting is not usually needed. You can generally eat, drink water, and take your usual medicines unless instructed otherwise.

Tell the testing service about:

Do not stop prescribed medicines to change the result. Preparation must never delay care

during a suspected poisoning emergency.

- The chemical involved and when exposure occurred
- Protective equipment you used
- Previous results, especially a pre-exposure baseline
- Recent surgery or an unusual reaction to anesthesia
- Pregnancy, liver or kidney disease, or recent serious illness
- All medicines and pesticide-related products
- A recent blood or plasma transfusion

What happens during the test

A healthcare professional cleans your skin, inserts a small needle into a vein, and collects blood into a tube. The draw usually takes about five minutes.

Red blood cell cholinesterase samples are handled differently from serum or plasma samples. You can usually leave immediately unless you are being assessed for an exposure or another medical concern.

Understanding your results

Results are reported as enzyme activity. Units and reference ranges vary between laboratories. Interpretation also depends on the enzyme measured, age, sex, pregnancy, medicines, liver and kidney function, genetic background, and clinical circumstances.

A low result may be caused by pesticide exposure, an inherited butyrylcholinesterase variant, pregnancy, reduced liver protein production, serious illness, or certain medicines. It does not identify the cause by itself.

In occupational monitoring, the change from your baseline may matter more than whether the result remains within the laboratory range. Your workplace program may specify repeat testing and exposure review.

After an anesthesia-related problem, additional testing may include a dibucaine number , which helps identify unusual forms of butyrylcholinesterase. Genetic or specialized enzyme testing may also be recommended.

A high result is usually less useful on its own and should be interpreted in the context of why testing was performed.

What affects the results

Cholinesterase activity varies naturally. Without a personal baseline, a meaningful decrease may still fall within the laboratory range. Someone with naturally low activity may also have an abnormal result without pesticide poisoning.

The enzyme tested matters. Plasma butyrylcholinesterase often changes quickly after exposure. Red blood cell acetylcholinesterase may better reflect effects at nerve and muscle connections but can remain altered longer.

Other influences include:

Exercise, coffee, and time of day are not usually major influences. Follow workplace program instructions so repeated results can be compared consistently.

- Timing: Carbamate effects may reverse quickly, so delayed sampling can miss them
- Pregnancy: Butyrylcholinesterase commonly falls during and after pregnancy
- Liver or kidney function: Disease may reduce or alter enzyme activity
- Age and sex: Baseline activity can differ
- Medicines: Anticholinesterase medicines, some cancer treatments, metoclopramide, and estrogen-containing medicines may affect results
- Recent transfusion: Donated red cells or plasma can temporarily change activity
- Red cell turnover: Blood loss, anemia, or altered red cell lifespan may affect red blood cell cholinesterase
- Serious illness or poor nutrition: These may reduce butyrylcholinesterase production

Accuracy and limitations

No single accuracy percentage applies to cholinesterase testing. Performance depends on the chemical, exposure level, enzyme tested, sampling time, and whether a baseline is available.

A normal result can miss a mild exposure, delayed testing, or a short-lived carbamate effect. A low result may be due to pregnancy, liver disease, medicines, serious illness, or an inherited enzyme variant rather than poisoning.

The test does not identify the exact pesticide or prove where exposure occurred. In some cases, testing for the chemical or its breakdown products may be more useful.

For suspected inherited butyrylcholinesterase deficiency, enzyme activity alone may not identify the variant. A dibucaine number, other inhibitor studies, or BCHE gene testing may

provide more information.

Risks and complications

Possible effects include brief discomfort, a small bruise, or feeling faint. Serious complications from routine blood collection are uncommon.

What happens next

For workplace monitoring, follow-up may include repeat testing, comparison with your baseline, or review of protective equipment and possible exposure.

If low activity may be related to pregnancy, illness, nutrition, medicines, or liver or kidney function, your care team may review other tests and repeat the measurement later.

After an anesthesia reaction, have the result recorded in your medical record and tell future anesthesia teams. Specialized testing may be advised, and close biological relatives may sometimes be offered testing because inherited variants can run in families.

Breathing difficulty, marked weakness, confusion, collapse, heavy secretions, or muscle twitching after possible pesticide exposure requires emergency assessment. Do not wait for a laboratory result or routine appointment.

Common questions

Can I drink coffee before the test?

Usually, yes. Fasting is not normally required, but follow any instructions for other blood tests collected at the same time.

Does the time of day matter?

Usually not. Monitoring programs may use consistent collection times to make results easier to compare.

Can I exercise beforehand?

Ordinary exercise is unlikely to meaningfully affect cholinesterase activity unless you have been told otherwise.

How long after pesticide exposure should I be tested?

Arrange testing promptly, but seek treatment first if you feel unwell. The useful window varies

by chemical and by whether plasma or red blood cell cholinesterase is tested.

Can this test tell whether anesthesia is safe for me?

It can identify low butyrylcholinesterase activity but does not assess every anesthesia risk. After prolonged paralysis, a specialist may request a dibucaine number or genetic testing.

Will a normal result rule out pesticide poisoning?

Not always. Mild exposure, delayed testing, or rapidly reversible carbamate exposure can produce a normal result. Symptoms, exposure history, enzyme type, and baseline all matter.

Sources

- MedlinePlus Medical Encyclopedia: Serum cholinesterase , U.S. National Library of Medicine
- Recognition and Management of Pesticide Poisonings, Sixth Edition , U.S. Environmental Protection Agency, 2013
- Medical Management Guidelines for Cholinesterase Inhibitors , Agency for Toxic Substances and Disease Registry
- Worek F, Koller M, Thiermann H, Szinicz L. "Diagnostic aspects of organophosphate poisoning." Toxicology . 2005;214(3):182-189
- Lockridge O. "Review of human butyrylcholinesterase structure, function, genetic variants, history of use in the clinic, and potential therapeutic uses." Pharmacology & Therapeutics . 2015;148:34-46
- Succinylcholine Chloride Injection prescribing information , U.S. National Library of Medicine DailyMed