TEST

Growth hormone stimulation test

A growth hormone stimulation test measures how well your body releases growth hormone after receiving a stimulating medicine.

WHAT IT MEASURES
Peak blood growth hormone response after a stimulating medicine

SAMPLE
Blood

FASTING NEEDED?
Yes, usually overnight with water allowed

HOW LONG IT TAKES
About two to four hours

RESULTS IN
Several days, with timing varying by laboratory

USED FOR
Diagnosis of suspected growth hormone deficiency

MAIN LIMITATION
Cutoffs shift with medicine, assay, age, and body size

Overview

A growth hormone stimulation test checks whether your pituitary gland can release enough growth hormone when prompted. The pituitary is a small gland at the base of the brain that controls several hormones.

Growth hormone is released in short bursts, often during sleep. Its level can be very low between bursts, even in someone who produces enough. For this reason, a single random growth hormone blood test cannot reliably diagnose growth hormone deficiency.

During a stimulation test, you receive a medicine that should trigger growth hormone release. Several blood samples are then taken to find the highest level, called the peak response.

The test is used alongside other information. This may include growth records, symptoms, insulin-like growth factor 1 (IGF-1) levels, other pituitary hormone tests, and imaging. It does not confirm or rule out growth hormone deficiency by itself.

Why the test is ordered

In children, the test may be considered when growth is slower than expected and the growth pattern raises concern about growth hormone production. Short height alone is not enough reason for the test. Family height, nutrition, puberty, long-term illness, and other hormone conditions can all affect growth.

In adults, testing is usually considered when there is a clear reason to suspect pituitary disease. Examples include a pituitary tumour, surgery or radiation near the pituitary, a serious head injury, or deficiencies of other pituitary hormones.

The test is not usually used to investigate tiredness or changes in body composition without other evidence of pituitary disease. These concerns have many more common causes.

A different test is used when excess growth hormone is suspected. A growth hormone stimulation test is not the standard test for acromegaly, a condition caused by too much growth hormone.

Who should have the test

Your endocrinology team may recommend this test if your medical history, examination, growth pattern, or earlier blood tests suggest possible growth hormone deficiency.

Some people may not need stimulation testing. For example, a person with a clearly established genetic or structural pituitary condition, several other pituitary hormone deficiencies, and strongly supportive test results may be assessed differently.

The choice of stimulating medicine matters. An insulin tolerance test deliberately lowers blood sugar and may not be suitable for some people, including those with certain seizure or heart conditions. Another test may be selected instead.

Tell the testing team if you are pregnant or could be pregnant, have diabetes, have seizures, have heart disease, or have had a previous reaction during hormone testing. This helps them choose an appropriate protocol.

How to prepare

Follow the instructions from your testing centre because preparation differs by medicine and age. Most centres ask you to fast overnight. Plain water is often allowed, but coffee, tea, milk, juice, chewing gum, and food usually are not.

Ask which medicines to take on the morning of the test. Growth hormone, steroid medicines,

estrogen, diabetes medicines, and other hormone treatments can affect preparation or interpretation. Do not stop a prescribed medicine unless your healthcare team specifically tells you to.

Avoid vigorous exercise before the appointment unless told otherwise. Exercise can temporarily increase growth hormone. Tell the centre if you have a fever, vomiting, poor food intake, or another recent illness; the test may need to be rearranged.

Bring something to eat after the test, particularly if fasting is required. Children may also benefit from a book, game, or other quiet activity because the appointment takes several hours.

What happens during the test

A clinician places a small intravenous line, or IV, into a vein. This allows repeated blood samples to be collected without inserting a new needle each time.

A baseline blood sample is taken. You then receive a stimulating medicine. Depending on the protocol, this may be insulin, glucagon, arginine, clonidine, or macimorelin. Not every medicine is used for every age group or at every centre.

Blood samples are collected at set times, often over two to four hours. The team may also monitor your blood glucose, pulse, blood pressure, and symptoms.

The medicine can cause temporary effects. These may include sleepiness, nausea, dizziness, flushing, hunger, sweating, or a headache. Insulin testing intentionally causes low blood sugar, so it requires close supervision and rapid access to glucose treatment.

After the final sample, the IV is removed. You will usually be offered food or a sweet drink and observed until you feel well enough to leave.

Understanding your results

The laboratory reports growth hormone levels from each sample. Your clinician looks mainly at the highest level reached after stimulation.

A peak below the cutoff used for that specific test may indicate an inadequate response. However, there is no single universal cutoff. Interpretation varies by laboratory method, stimulating medicine, age, sex, stage of puberty, pregnancy status, body size, medicines, and clinical context.

A low response does not automatically mean you have growth hormone deficiency. The result

is compared with your growth pattern or symptoms, IGF-1 level, other pituitary hormones, and medical history. In some situations, testing with a second stimulating medicine is needed.

A response above the chosen cutoff makes severe growth hormone deficiency less likely. It may not completely exclude a milder problem if the history remains strongly suggestive.

What affects the results

Several factors can change the peak growth hormone level even when the laboratory has measured the sample correctly:

Pregnancy changes normal growth hormone physiology and may also affect which stimulating medicines are appropriate. A recent blood transfusion does not usually alter this test directly, but the illness that required it may influence whether testing should be postponed.

- Body size: People with obesity often have a lower growth hormone response, which can make deficiency appear more likely.
- Age and puberty: Responses change with age and pubertal stage. Some centres use short-term sex hormone preparation before testing selected children near puberty.
- Stimulating medicine: Insulin, glucagon, arginine, clonidine, and macimorelin do not produce directly interchangeable results.
- Laboratory assay: Laboratories may use different methods to measure growth hormone, producing different numbers and cutoffs.
- Timing and sampling: A delayed or missed sample can miss the highest growth hormone level.
- Food and glucose: Eating before a fasting test, high blood glucose, or poorly controlled diabetes may alter the response.
- Exercise, sleep, and stress: Recent vigorous exercise, poor sleep, and the stress of testing can affect natural growth hormone release.
- Health and nutrition: Acute illness, undernutrition, thyroid disorders, and other untreated hormone deficiencies can complicate interpretation.
- Medicines and hormones: Growth hormone treatment, estrogen, glucocorticoids, and some other medicines may affect results or the cutoff used.

Accuracy and limitations

There is no perfect reference test for growth hormone deficiency. A stimulation test can sometimes show a low response in someone whose growth hormone production is adequate. This is more likely when factors such as obesity, age, pubertal timing, illness, or an unsuitable cutoff are not considered.

The test can also appear normal when a problem is present. A brief peak may be captured even if overall growth hormone production is reduced, or the selected test may not challenge the pituitary in the most informative way for that person.

Different stimulation tests do not agree in every case. The insulin tolerance test is often treated as an important reference test in adults, but its low-blood-sugar effects mean it is not appropriate for everyone. Glucagon or macimorelin testing may be a better option in some adults. Paediatric protocols often use other medicines.

Because both false low and false reassuring results are possible, diagnosis should not rest on the stimulation result alone. A repeat test, a different stimulating medicine, or further pituitary assessment may be more useful when the result conflicts with the wider clinical picture.

Risks and complications

The IV may cause brief discomfort, bruising, or minor bleeding. Some people feel faint during blood collection.

Risks from the stimulating medicine differ. Insulin can cause marked low blood sugar, while glucagon may cause nausea or vomiting. Clonidine can lower blood pressure and cause sleepiness. The testing team monitors you and treats these effects if needed.

Contact the testing centre routinely if vomiting continues after you leave or if the IV site becomes increasingly painful, swollen, or red.

Seek urgent medical help for loss of consciousness, a seizure, chest pain, severe breathing difficulty, or symptoms of low blood sugar that do not improve after following the discharge instructions.

What happens next

You will usually have a routine follow-up appointment to discuss the complete pattern of results. The laboratory report alone may not provide a final interpretation.

If the response is low, the next step may include reviewing IGF-1 and other pituitary hormones, repeating stimulation testing, or arranging pituitary imaging. In children, growth measurements

and pubertal development remain central to the assessment.

If the response is within the expected range, growth hormone deficiency becomes less likely. Your healthcare team may then look for other explanations for poor growth or adult symptoms.

Treatment is considered only after the result has been interpreted with the rest of your assessment. A low laboratory number by itself is not enough to decide whether growth hormone treatment is appropriate.

Common questions

Can I drink coffee before the test?

Usually not. Most protocols require an overnight fast and allow only plain water. Coffee can affect fasting conditions, even without milk or sugar.

Can I exercise beforehand?

Avoid vigorous exercise before the test unless your centre says otherwise. Exercise can temporarily raise growth hormone and make the result harder to interpret.

Does the time of day matter?

The appointment is often scheduled in the morning because fasting is easier overnight. The timed medicine and blood samples are more important than a random time-of-day growth hormone level.

Can I take my usual medicines?

Some medicines should be taken as normal, while others may need adjusting or delaying. Ask the testing centre in advance and do not stop prescribed medicines on your own.

Can I drive home afterward?

Ask your centre because this depends on the stimulating medicine and how you feel. Arrange transport if the protocol may cause low blood sugar, dizziness, or marked sleepiness.

Will one low result confirm growth hormone deficiency?

Not always. A low response must be considered with your history, IGF-1 level, other hormone tests, body size, age, and the specific test method. Some people need a second stimulation test.

Sources

- Molitch ME, Clemmons DR, Malozowski S, et al. "Evaluation and Treatment of Adult Growth Hormone Deficiency: An Endocrine Society Clinical Practice Guideline." Journal of Clinical Endocrinology & Metabolism . 2011;96(6):1587-1609.
- Yuen KCJ, Biller BMK, Radovick S, et al. "American Association of Clinical Endocrinologists and American College of Endocrinology Guidelines for Management of Growth Hormone Deficiency in Adults and Patients Transitioning From Pediatric to Adult Care." Endocrine Practice . 2019;25(11):1191-1232.
- Grimberg A, DiVall SA, Polychronakos C, et al. "Guidelines for Growth Hormone and Insulin-Like Growth Factor-I Treatment in Children and Adolescents." Hormone Research in Paediatrics . 2016;86(6):361-397.
- Yuen KCJ. "Growth Hormone Stimulation Tests in Assessing Adult Growth Hormone Deficiency." Endotext . MDText.com, Inc.; updated 2023.
- U.S. Food and Drug Administration. Macrilen (macimorelin) Prescribing Information . Current prescribing information reviewed for test administration, interactions, and adverse effects.