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IGF-1

Also known as: Somatomedin

C

Formally known as: Insulin-like Growth Factor - 1

Related tests: [Growth Hormone \(GH\)](#), [Glucose](#), [Glucose Tolerance Test](#)

At A Glance

Why get tested?

To identify diseases and conditions caused by deficiencies and overproduction of growth hormone (GH), to evaluate pituitary function, and to monitor the effectiveness of GH treatment

When to get tested?

As part of an evaluation of pituitary function; if you have symptoms of slow growth, short stature, and delayed development (in children) or decreased bone density, reduced muscle strength, and increased lipids (in adults) that suggest insufficient GH and IGF-1 production; if you have symptoms of gigantism (in children) or acromegaly (in adults) that suggest excess GH and IGF-1 production; during and after treatment for GH abnormalities

Sample required?

A blood sample drawn from a vein in your arm or by a fingerstick (in children)

The Test Sample

What is being tested?

The insulin-like growth factor - 1 (IGF-1) test is an indirect measure of the average amount of growth hormone (GH) being produced by the body. IGF-1 and GH are peptide hormones, small proteins that are vital for normal bone and tissue growth and development. GH is produced by the pituitary (a grape-sized gland located at the base of the brain behind the bridge of your nose) and secreted into the bloodstream in pulses throughout the day and night with peaks that occur mostly during the night. IGF-1 is produced, primarily in response to GH stimulation, by the liver and some is also produced by skeletal muscles. It mediates many of the actions of GH and so stimulates the growth of bones and other tissues and promotes the production of lean muscle mass. IGF-1 mirrors GH excesses and deficiencies, but its level is stable throughout the day, making it a useful indicator of average GH levels.

Like GH, IGF-1 levels normally are low in early childhood, increase gradually during childhood,

peak during puberty, and then decline in adult life. Deficiencies in GH and IGF-1 may be caused by conditions such as hypopituitarism (hypothalamic-pituitary disease; resulting in a general lack of GH production by the pituitary) or the presence of a non-GH-producing pituitary tumor that damages hormone-producing cells. Deficiencies in IGF-1 also occur where there is a lack of responsiveness to GH (GH Insensitivity; GHI). GHI may be primary (genetic) or secondary to conditions such as **malnutrition** and chronic diseases.

Deficiencies early in life can inhibit bone growth and overall development and can result in a child with a shorter than normal stature. While levels of GH and IGF-1 are not as high in adults as in children, they do play a continuing role in regulating bone density, muscle mass, and lipid metabolism. Therefore, decreased production can lead to low bone densities, less muscle mass, and altered lipids.

Excess GH and IGF-1 can cause abnormal growth of the skeleton and other signs and symptoms characteristic of gigantism and acromegaly. With gigantism, which occurs in the young, bones grow longer, resulting in a very tall person with large feet and hands. Acromegaly, which occurs in adults, causes bones to thicken and soft tissues, such as the nose, to swell. Both conditions can lead to enlarged organs, such as the heart, and a decreased life span. The most common reason for the pituitary to secrete excessive amounts of GH is a GH-producing pituitary tumor (usually **benign**). Frequently, the tumor can be surgically removed and/or treated with drugs or radiation. In most cases, this will cause GH and IGF-1 levels to return to normal or near normal levels.

How is the sample collected for testing?

A blood sample is obtained by inserting a needle into a vein in your arm or by a fingerstick (in children).

The Test

How is it used?

IGF-1 is measured to help diagnose the cause of growth abnormalities and to evaluate pituitary function. IGF-1 levels reflect integrated GH status and, along with GH provocation tests, are used to help diagnose GH deficiency. These tests, while generally ordered in children suspected of GH abnormalities, may also be used in adults with GH deficiency. IGF-1 levels and the measurement of **GH** also provide information related to GH Insensitivity (GHI).

IGF-1 also may be ordered with other pituitary hormone tests, such as **ACTH** (Adrenocorticotrophic hormone), to help diagnose hypopituitarism. It also may be used to monitor the effectiveness of treatment for growth hormone deficiencies and GHI.

IGF-1 testing and a GH suppression test can be used to detect a GH-producing pituitary tumor. Its presence is then confirmed with imaging scans that help identify and locate the tumor. If surgery is necessary, GH and IGF-1 levels are measured after the tumor's removal to determine whether or not all of it was successfully removed. Drug and/or radiation therapy may be used in addition to (or sometimes instead of) surgery to try to decrease GH production and return IGF-1 to normal or near normal concentrations. IGF-1 may be used to monitor the effectiveness of this therapy at regular intervals for years afterward to monitor GH production and to detect tumor recurrence.

When is it ordered?

IGF-1 testing may be ordered, along with a **GH stimulation test**, when a child has symptoms of GH deficiency, such as a slowed growth rate and short stature. They also may be ordered

in adults with suspected GH deficiency. An IGF-1 also may be ordered when a doctor suspects that a person has an underactive pituitary gland. In addition, IGF-1 levels are ordered to monitor patients on GH therapy.

IGF-1 testing may be ordered, along with a **GH suppression test**, when a child has symptoms of gigantism, an adult shows signs of acromegaly, and/or when a doctor suspects that a patient has hyperpituitarism.

When a GH-producing pituitary tumor is found, GH and IGF-1 are ordered after the tumor is surgically removed to determine whether all of the tumor has been extracted. IGF-1 also is ordered at regular intervals when a patient is undergoing the drug and/or radiation therapy that frequently follow tumor surgery.

IGF-1 levels may be ordered at regular intervals for many years to monitor a patient's GH production and to watch for pituitary tumor recurrence.

What does the test result mean?

If IGF-1 concentrations are decreased, then it is likely that there is a deficiency of GH (GH Deficiency; GHD) or an insensitivity to GH (GH Insensitivity; GHI). If this is in a child, the GH deficiency may have already caused short stature and delayed development and may be treated with GH supplementation. While it is normal for adult levels to be lower than those in children because of an age-related decrease in production, adults also may have low IGF-1 due to GHD or GHI and will need to be treated.

If a decrease in IGF-1 is due to a more general decrease in pituitary function (hypopituitarism), then several of the patient's pituitary hormones will need to be evaluated and may be supplemented to bring them up to normal levels. Reduced pituitary function may be due to inherited defects or can rise as a result of pituitary damage following conditions such as trauma, infections, and inflammation.

Decreased levels of IGF-1 also may be seen with nutritional deficiencies (including anorexia nervosa), chronic **kidney** or **liver disease**, inactive/ineffective forms of GH, and with high doses of estrogen.

Elevated levels of IGF-1 usually indicate an increased production of GH. Since GH levels vary throughout the day, IGF-1 concentrations are a reflection of average GH production, not of the actual amount of GH in the blood. This is accurate up to the point at which the liver's capacity to create IGF-1 is reached. With severely increased GH production, IGF-1 levels will stabilize at an elevated maximum concentration.

Increased concentrations of GH and IGF-1 are normal during puberty and **pregnancy** but otherwise are most frequently due to pituitary tumors (usually **benign**). If other pituitary hormones are also abnormal, then the patient may have a condition causing general hyperpituitarism.

If IGF-1 is still elevated after the surgical removal of a pituitary tumor, then the surgery may not have been fully effective. Decreasing IGF-1 concentrations during subsequent drug and/or radiation therapies indicate that the treatment is lowering GH production. If levels of IGF-1 become "normalized," then the patient is no longer producing excess amounts of GH. When a patient is undergoing long term monitoring, an increase in IGF-1 levels may indicate a recurrence of the pituitary tumor.

Is there anything else I should know?

Patients should fast overnight for their IGF-1 test.

IGF-1 testing is being evaluated as part of a sports-related drug abuse screen for GH-related performance-enhancing substances. GH and IGF-1 enhancers (supplements taken by some athletes during the training season to increase muscle mass and strength) have been banned by U.S. and international sports federations. It is difficult to detect increases in IGF-1 related to the use of supplements as opposed to those increases due to rigorous training. Approaches using a combination of GH, IGF-1, IGF-binding proteins, and other biological markers seem promising and could lead to the development of anti-doping tests.

Common Questions

1. What signs and symptoms are seen with deficient GH and IGF-1?

In children the following may indicate GH and/or IGF-1 deficiency:

- slowed growth rate in early childhood relative to group norms
- shorter stature than others of the same chronological age
- delayed puberty
- x-rays showing delayed bone development.

In adults, abnormally low levels of GH and/or IGF-1 may cause subtle, nonspecific symptoms such as:

- Decreased bone density
- Fatigue
- Adverse lipid changes
- Reduced exercise tolerance.

2. What signs and symptoms are seen with excess GH and IGF-1 production?

In a child, it is unusual tallness that is often first noticed. With an adult, it may be more subtle: a larger nose, thicker lips, a more prominent jaw, or rings and shoes that no longer fit. Other signs and symptoms may include:

- Deepened, husky voice
- Enlarged organs - liver, heart, kidneys, and spleen
- Enlarged tongue
- Erectile dysfunction
- Fatigue
- Headaches and visual disturbances
- Joint pain and swelling
- Menstrual cycle irregularities
- Muscle weakness
- Snoring
- Sweating and body odor
- Thickening of the skin, skin tags
- Trapped nerves (Carpal tunnel syndrome)

3. How long do I have to be monitored?

As long as you are considered to have abnormal (low or high) GH production or are receiving GH replacement therapy, your IGF-1 will need to be monitored.

Ask A Question

If you still have a question about your test or need help interpreting the results of your test, you can visit the ASCLS web site to complete a lab testing information request form, and a certified clinical laboratory scientist will gladly help you! Your communication will be kept confidential. Go there now: <http://www.ascls.org/labtesting/disclaimer.asp>.

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