how kids grow

A parent’s guide to understanding a growth hormone problem in children
The Growing Years
Could My Child Have a Growth Hormone Problem?
Diagnosing Pediatric Growth Hormone Deficiency
Tracking Your Child’s Growth
Treating Growth Hormone Deficiency
Available Devices
Living with Growth Hormone Deficiency
Groups That Can Help
A baby arrives in this world ready to begin the vital process of growth. Most babies grow an astounding 10 inches during their first year, and about 5 inches in their second year. The process slows down after that. Most children grow about 2 inches a year from age 3 until puberty, when another growth spurt occurs.

Children don’t grow at exactly the same rate, of course, and even if a child grows faster or slower than average, there is usually nothing to worry about. But if you have concerns about your child’s growth, it makes sense to talk with your healthcare provider and to take a closer look.
Signs and Symptoms of Growth Hormone Deficiency

The most noticeable symptom—and the one that causes most parents to seek a doctor’s help—is slow growth (less than 2 inches per year) or no growth. Other signs can include:

- An immature appearance—making the child look younger than he or she really is
- A history of low blood sugar as an infant

Causes of Growth Hormone Deficiency

Sometimes, a child is born with growth hormone deficiency, possibly because of a problem with the pituitary gland. In this case, the disorder is called congenital.

In other cases, the disorder develops later in life and is called acquired. There are many possible reasons for this, some of which may include:

- A tumor in the pituitary gland or a part of the brain called the hypothalamus
- Damage to the pituitary gland or hypothalamus from radiation treatment around the head or neck
- Trauma to the head that caused brain damage

Occasionally, doctors cannot find any reason for a child’s growth hormone deficiency. This is known as idiopathic growth hormone deficiency.

About Growth Hormone Deficiency (GHD)

Growth problems can be caused by a number of factors, including genetic or hormonal disorders, chronic illnesses that affect the whole body (e.g., kidney, heart or lung disease, diabetes) and poor absorption of nutrients.

Growth hormone deficiency is one of the endocrine (hormonal) disorders that can cause poor growth.

In order for a child to grow properly, an important gland called the pituitary must release enough growth hormone. The pituitary gland is located at the base of the brain. It releases hormones, including growth hormone, which is also called somatropin. When the pituitary does not release enough growth hormone, growth hormone deficiency occurs and a child’s growth is affected.
Referral to a Pediatric Endocrinologist

If your child appears to have a growth problem, the pediatrician may refer you to a pediatric endocrinologist—a doctor who specializes in diagnosing, treating and managing disorders involving hormones and the glands that make them.

Patient History

At your first visit, your pediatric endocrinologist will likely be interested in your child’s medical history, including:

- **Birth history:** A traumatic delivery, low blood sugar in an infant or prolonged jaundice may increase the chance of growth hormone deficiency.

- **Medical history:** Certain illnesses, especially those involving the pituitary gland, may signal the possibility of growth hormone deficiency. Head trauma or infections in the central nervous system can also increase the risk.

- **Family history:** Growth hormone deficiency is sometimes inherited, so the doctor may ask you about family history and the adult height of both parents.

Physical Evaluation and Laboratory Tests

In addition to taking a patient history, the doctor will conduct a physical evaluation that may include the following:

- **An examination:** The doctor will check your child’s overall health, including physical development and may observe your child’s growth over a period of time.

- **Laboratory evaluation:** This may include blood tests to help rule out other illnesses.

- **Stimulation (STIM) test:** Testing for growth hormone deficiency requires more than a simple blood test. The growth hormone stimulation test helps the doctor find out if your child’s body is producing enough growth hormone. Two tests are usually needed to confirm the diagnosis. During the test, your child receives a substance, or stimulant. An IV is inserted into a vein, and a small amount of blood is taken, usually 5 times, 30 minutes apart. Several blood samples need to be taken to show how your child’s body responds to the stimulant over time. If the blood samples don’t show an increase in growth hormone, your healthcare team is one step closer to the diagnosis of growth hormone deficiency. Two stimulation tests are required for the diagnosis of GHD in children (Growth Hormone Research Society. JCEM 2000; 85:3990–3).

- **Bone age X-rays:** An X-ray of the left hand and wrist may be taken. The bone images will help determine the maturity of the bone and growth potential.
Many healthcare providers track a child's growth using growth charts like the ones shown here. These charts allow a doctor to plot a child's height and weight over time, and to compare a child's growth to others the same age.

The colored lines (blue in the boys' chart and red in the girls' chart) show height and weight in percentiles. If a child's height falls on the 75% line, for example, it means 25% of children are taller and 75% are shorter.

The percentile is not as meaningful as steady growth over time. A child who stays in the 5th percentile over time may be growing just as well as one who stays in the 95th percentile. If you have concerns, talk to your healthcare provider.

Source: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
The Role of Growth Hormone Therapy

Once your child has been diagnosed with growth hormone deficiency, the pediatric endocrinologist will likely recommend treatment with growth hormone replacement therapy. The major goal of treatment is to achieve an adult height that is as close to normal as possible for your child.

What You Might Expect from Treatment

A growing child! Growth hormone therapy helps bones grow, which causes an increase in height. But the process takes patience. It may take time before you begin to see a distinct change. During the first 2 years of therapy, your child may grow several inches. After that, growth continues until the growth plates close and treatment with Saizen for growth failure should be discontinued.

The growth hormone used in treatment is manufactured using biotechnology. The structure of the growth hormone is identical to the growth hormone produced by the pituitary gland.

Treatment Options

Growth hormone is available by prescription only. One brand of growth hormone called Saizen® [somatropin (rDNA origin) for injection] is an option for treatment of growth failure in children who produce low amounts of growth hormone. The medical diagnosis for this condition is called growth hormone deficiency or GHD.

As with any prescription medicine, your doctor will do a complete evaluation of your child's health. Patients and caregivers should discuss with their doctor the benefits and side effects of using Saizen® [somatropin (rDNA origin) for injection] or any other therapy to treat children with GHD. Your doctor will monitor your child’s growth and possible side effects during the course of treatment.

How is Saizen® [somatropin (rDNA origin) for injection] given?

Saizen® [somatropin (rDNA origin) for injection] is given as an injection under the skin. Saizen® can be delivered by needle and syringe, using an electronic injection device or by a special injection device that delivers the medicine under the skin without a needle.

Most injections are given in the arms, legs, abdomen or buttocks. Your healthcare provider will explain the best injection sites for your child.

Important Risk Information

Who should not take Saizen®?

Saizen® should not be used in children who have completed growth or have any of the following conditions because serious side effects can occur:

• a critical illness caused by certain types of heart or stomach surgery, serious injury or a sudden and severe breathing problem
• cancer or other tumors
• certain types of eye problems caused by diabetes
• allergies to any of the ingredients in the medicine including benzyl alcohol
• Prader-Willi syndrome with obesity or a history of breathing problems including sleep apnea

What should patients tell their doctor before taking Saizen® [somatropin (rDNA origin) for injection]?

Patients should tell their doctor about their medical and family history, past illnesses and treatment use, and past and existing medical conditions such as but not limited to the following:

• diabetes
• cancer or any tumor
• use of prescription and non prescription medicines, steroids, vitamins, and herbal supplements
• allergies

The following side effects were infrequently seen in children in clinical trials:

• local reactions at the injection site (such as pain, numbness, redness and swelling)
• low levels of thyroid hormone (hypothyroidism)
• low blood sugar (hypoglycemia)
• seizures or convulsions
• worsening of skin psoriasis
• swelling associated with fluid retention

Please see the enclosed Full Prescribing Information for Saizen®. If you have questions, talk to your doctor.
available devices

Most growth hormone treatments come with their own injection devices. The chart below shows currently available devices for each brand of growth hormone therapy. Each injection device is listed by category along with the growth hormone it was designed to deliver. There are 3 categories: electronic, pens and needle-free devices. After you have reviewed them, you may want to discuss them with your healthcare provider. Together, you can select the one that fits your child best.

Not every injection device is appropriate for every child. Your doctor will recommend options that are right for your child’s age, weight, acceptance of needles, ability to bruise, other medical conditions like a blood disorder and your health insurance plan. Device use requires training and adult supervision. Injection site reactions can occur.

Other possible side effects of Saizen® [somatropin (rDNA origin) for injection] in children being treated for GHD are:

- return of tumor or cancerous growths
- high blood sugar (hyperglycemia)
- headaches, changes in vision, nausea or vomiting (these may be symptoms of raised pressure in the brain which requires immediate medical attention)
- hip and knee pain or a limp in children, that can be a sign of slipped capital femoral epiphysis
- worsening of pre-existing curvature of the spine (scoliosis)
- intense pain and tenderness in the abdomen that can be a sign of inflammation of the pancreas (pancreatitis)

Please see the enclosed Full Prescribing Information for Saizen®. If you have questions regarding any of the devices available, please talk to your doctor.

### Electronic Device

<table>
<thead>
<tr>
<th>Device name</th>
<th>Growth hormone used with device</th>
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<tbody>
<tr>
<td>easypod® from EMD Serono</td>
<td>Saizen® [somatropin (rDNA origin) for injection]</td>
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### Needle-Free

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<tr>
<td>cool.click®2 from EMD Serono</td>
<td>Saizen® [somatropin (rDNA origin) for injection]</td>
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### Pens

<table>
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<th>Growth hormone used with device</th>
</tr>
</thead>
<tbody>
<tr>
<td>one.click® from EMD Serono</td>
<td>Saizen® [somatropin (rDNA origin) for injection]</td>
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### Nutropin AQ NuSpin™ from Genentech | Nutropin® [somatropin (rDNA origin) injection] |

### HumatroPen® from Eli Lilly | Humatrope® [somatropin (rDNA origin) for injection] |

### Nutropin AQ Pen® from Genentech | Nutropin® [somatropin (rDNA origin) injection] |

### Nordiflex® from Novo Nordisk | Norditropin® [somatropin (rDNA origin) injection] |

### NordiPen® from Novo Nordisk | Norditropin® [somatropin (rDNA origin) injection] |

### Genotropin Pen® from Pfizer | Genotropin® [somatropin (rDNA origin) for injection] |

### Genotropin MiniQuick® from Pfizer | Genotropin® [somatropin (rDNA origin) for injection] |

### Omnitrope® Pen from Sandoz | Omnitrope® [somatropin (rDNA origin) for injection] |

Please see the enclosed Full Prescribing Information for Saizen®. If you have questions regarding any of the devices available, please talk to your doctor.
Set realistic expectations; your child should know that even with therapy, growth takes time.

Growth Hormone Therapy Is Often Long Term

Just as it takes a child a number of years to naturally grow to his or her adult height, treatment may be recommended for several years. Growth hormone treatment can continue until your child has achieved his or her final height. It is more than likely your child will take growth hormone until bone maturation has occurred.

Long-term commitment to growth hormone therapy can be especially difficult for a child. There may be times when your child/teen wants to discontinue treatment. It’s important to remember that people who take growth hormone as prescribed have better outcomes than those who miss doses or take breaks from treatment. Remind your child that stopping therapy may limit the growth benefit he or she gets.

Things You Can Do as a Parent or Caregiver

To help your child stay committed to therapy, consider these ideas:

• Set realistic expectations; your child should know that even with therapy, growth takes time
• Keep a log so that your child has a written reminder of his or her progress
• Plan a small reward after every week or month your child takes growth hormone as prescribed
• Ask your healthcare provider to review the benefits of growth hormone therapy with your child
• Everyone likes praise; let your child know you appreciate the commitment he or she is making
groups that can help

Human Growth Foundation
997 Glen Cove Avenue • Glen Head, NY 11545
Phone: 1-800-451-6434
Website: www.hgfound.org

The Human Growth Foundation (HGF) is a national, nonprofit organization dedicated to helping individuals with growth-related disorders and their families. It provides education and support for the family as well as education for healthcare professionals. HGF also acts as an advocate for those with growth problems.

The MAGIC Foundation
6645 W. North Avenue • Oak Park, IL 60302
Phone: 1-800-3-MAGIC 3 or 1-800-362-4423 • 1-708-383-0808
Website: www.magicfoundation.org

The MAGIC Foundation is a nonprofit, national organization created to provide support and educational services for the families of children who have a wide variety of chronic and/or critical disorders, syndromes and diseases that affect growth.