

**TEV-TROPIN® [somatropin (rDNA origin) for injection]  
5 mg (15 IU)**

**Rx only**

**DESCRIPTION**

TEV-TROPIN® (somatropin, rDNA origin, for injection), a polypeptide of recombinant DNA origin, has 191 amino acid residues and a molecular weight of about 22,124 daltons. It has an amino acid sequence identical to that of human growth hormone of pituitary origin. TEV-TROPIN® is synthesized in a strain of *Escherichia coli* modified by insertion of the human growth hormone gene.

TEV-TROPIN® is a sterile, white, lyophilized powder, intended for subcutaneous administration, after reconstitution with bacteriostatic 0.9% sodium chloride injection, USP, (normal saline) (benzyl alcohol preserved). The quantitative composition of the lyophilized drug per vial is:

5 mg (15 IU) vial:

Somatropin	5 mg (15 IU)
Mannitol	30 mg

The diluent contains bacteriostatic 0.9% sodium chloride injection, USP, (normal saline), 0.9% benzyl alcohol as a preservative, and water for injection. A 5 mL vial of the diluent will be supplied with each dispensed vial of TEV-TROPIN®.

TEV-TROPIN® is a highly-purified preparation. Reconstituted solutions have a pH in the range of 7.0 to 9.0.

**CLINICAL PHARMACOLOGY**

Clinical trials have demonstrated that TEV-TROPIN® is equivalent in its therapeutic effectiveness and in its pharmacokinetic profile to those of human growth hormone of pituitary origin (somatropin). TEV-TROPIN® stimulates linear growth in children who lack adequate levels of endogenous growth hormone. Treatment of growth hormone-deficient children with TEV-TROPIN® produces increased growth rates and IGF-1 (Insulin-Like Growth Factor/Somatomedin-C) concentrations that are similar to those seen after therapy with human growth hormone of pituitary origin.

Both TEV-TROPIN® and somatropin have also been shown to have other actions including:

A. Tissue Growth

1. Skeletal Growth. TEV-TROPIN® stimulates skeletal growth in patients with growth hormone deficiency. The measurable increase in body length after

administration of TEV-TROPIN<sup>®</sup> results from its effect on the epiphyseal growth plates of long bones. Concentrations of IGF-1, which may play a role in skeletal growth, are low in the serum of growth hormone-deficient children but increase during treatment with TEV-TROPIN<sup>®</sup>. Mean serum alkaline phosphatase concentrations are increased.

2. Cell Growth. It has been shown that there are fewer skeletal muscle cells in short statured children who lack endogenous growth hormone as compared with normal children. Treatment with somatotropin results in an increase in both the number and size of muscle cells.
3. Organ Growth. Somatotropin influences the size of internal organs and it also increases red cell mass.

*B. Protein Metabolism*

Linear growth is facilitated, in part, by increased cellular protein synthesis. Nitrogen retention, as demonstrated by decreased urinary nitrogen excretion and serum urea nitrogen, results from treatment with somatotropin.

*C. Carbohydrate Metabolism*

Children with hypopituitarism sometimes experience fasting hypoglycemia that is improved by treatment with somatotropin. Large doses of somatotropin may impair glucose tolerance.

*D. Lipid Metabolism*

Administration of somatotropin to growth hormone-deficient patients mobilizes lipid, reduces body fat stores, and increases plasma fatty acids.

*E. Mineral Metabolism*

Sodium, potassium, and phosphorous are conserved by somatotropin. Serum concentrations of inorganic phosphates increased in patients with growth hormone deficiency after therapy with TEV-TROPIN<sup>®</sup> or somatotropin. Serum calcium concentrations are not significantly altered in patients treated with either somatotropin or TEV-TROPIN<sup>®</sup>.

*F. Connective Tissue Metabolism*

Somatotropin stimulates the synthesis of chondroitin sulfate and collagen as well as the urinary excretion of hydroxyproline.

## PHARMACOKINETICS

Following intravenous administration of 0.1 mg/kg of TEV-TROPIN<sup>®</sup>, the elimination half-life was about 0.42 hours (approximately 25 minutes) and the mean plasma clearance ( $\pm$  SD) was 133 ( $\pm$  16) mL/min in healthy male volunteers.

In the same volunteers, after a subcutaneous injection of 0.1 mg/kg TEV-TROPIN<sup>®</sup> to the forearm, the mean peak serum concentration ( $\pm$  SD) was 80 ( $\pm$  50) ng/mL which occurred approximately 7 hours post-injection and the apparent elimination half-life was approximately

2.7 hours. Compared to intravenous administration, the extent of systemic availability from subcutaneous administration was approximately 70%.

## INDICATION AND USAGE

TEV-TROPIN<sup>®</sup> is indicated only for the long-term treatment of children who have growth failure due to an inadequate secretion of normal endogenous growth hormone.

## CONTRAINDICATIONS

TEV-TROPIN<sup>®</sup> reconstituted with bacteriostatic 0.9% sodium chloride injection, USP (normal saline) (benzyl alcohol preserved) should not be administered to patients with a known sensitivity to benzyl alcohol (see **WARNINGS**).

Somatropin should not be used for growth promotion in pediatric patients with closed epiphyses.

Somatropin is contraindicated in patients with active proliferative or severe non-proliferative diabetic retinopathy.

In general, somatropin is contraindicated in the presence of active malignancy. Any preexisting malignancy should be inactive and its treatment complete prior to instituting therapy with somatropin. Somatropin should be discontinued if there is evidence of recurrent activity. Since growth hormone deficiency may be an early sign of the presence of a pituitary tumor (or, rarely, other brain tumors), the presence of such tumors should be ruled out prior to initiation of treatment. Somatropin should not be used in patients with any evidence of progression or recurrence of an underlying intracranial tumor.

Somatropin should not be used to treat patients with acute critical illness due to complications following open heart surgery, abdominal surgery or multiple accidental trauma, or those with acute respiratory failure. Two placebo-controlled clinical trials in non-growth hormone deficient adult patients (n = 522) with these conditions in intensive care units revealed a significant increase in mortality (41.9% vs. 19.3%) among somatropin-treated patients (doses 5.3 to 8 mg/day) compared to those receiving placebo (see **WARNINGS**).

Somatropin is contraindicated in patients with Prader-Willi syndrome who are severely obese or have severe respiratory impairment (see **WARNINGS**). Unless patients with Prader-Willi syndrome also have a diagnosis of growth hormone deficiency, TEV-TROPIN<sup>®</sup> is not indicated for the long term treatment of pediatric patients who have growth failure due to genetically confirmed Prader-Willi syndrome.

## WARNINGS

See **CONTRAINDICATIONS** for information on increased mortality in patients with acute critical illnesses due to complications following open heart surgery, abdominal surgery or multiple accidental trauma, or those with acute respiratory failure. The safety of continuing somatropin treatment in patients receiving replacement doses for approved indications who concurrently develop these illnesses has not been established. Therefore, the potential benefit of treatment continuation with somatropin in patients having acute critical illnesses should be weighed against the potential risk.

There have been reports of fatalities after initiating therapy with somatropin in pediatric patients with Prader-Willi syndrome who had one or more of the following risk factors: severe obesity, history of upper airway obstructions or sleep apnea, or unidentified respiratory infection. Male patients with one or more of these factors may be at greater risk than females. Patients with Prader-Willi syndrome should be evaluated for signs of upper airway obstruction and sleep apnea before initiation of treatment with somatropin. If during treatment with somatropin, patients show signs of upper airway obstruction (including onset of or increased snoring) and/or new onset sleep apnea, treatment should be interrupted. All patients with Prader-Willi syndrome treated with somatropin should also have effective weight control and be monitored for signs of respiratory infection, which should be diagnosed as early as possible and treated aggressively (see **CONTRAINDICATIONS**).

Unless patients with Prader-Willi syndrome also have a diagnosis of growth hormone deficiency, TEV-TROPIN<sup>®</sup> is not indicated for the long term treatment of pediatric patients who have growth failure due to genetically confirmed Prader-Willi syndrome.

Benzyl alcohol as a preservative in bacteriostatic normal saline, USP, has been associated with toxicity in newborns. When administering TEV-TROPIN<sup>®</sup> to newborns, reconstitute with sterile normal saline for injection, USP. WHEN RECONSTITUTING WITH STERILE NORMAL SALINE, USE ONLY ONE DOSE PER VIAL AND DISCARD THE UNUSED PORTION.

## **PRECAUTIONS**

### **General**

Therapy with TEV-TROPIN<sup>®</sup> should be directed by physicians who are experienced in the diagnosis and management of children with growth hormone deficiency.

Treatment with somatropin may decrease insulin sensitivity, particularly at higher doses in susceptible patients. As a result, previously undiagnosed impaired glucose tolerance and overt diabetes mellitus may be unmasked during somatropin treatment. Therefore, glucose levels should be monitored periodically in all patients treated with somatropin, especially in those with risk factors for diabetes mellitus, such as obesity (including obese patients with Prader-Willi syndrome), Turner syndrome, or a family history of diabetes mellitus. Patients with preexisting type 1 or type 2 diabetes mellitus or impaired glucose tolerance should be monitored closely during somatropin therapy. The doses of antihyperglycemic drugs (i.e., insulin or oral agents) may require adjustment when somatropin therapy is instituted in these patients.

Patients with preexisting tumors or growth hormone deficiency secondary to an intracranial lesion should be examined routinely for progression or recurrence of the underlying disease process. In pediatric patients, clinical literature has revealed no relationship between somatropin replacement therapy and central nervous system (CNS) tumor recurrence or new extracranial tumors. However, in childhood cancer survivors, an increased risk of a second neoplasm has been reported in patients treated with somatropin after their first neoplasm. Intracranial tumors, in particular meningiomas, in patients treated with radiation to the head for their first neoplasm, were the most common of these second neoplasms. In adults, it is unknown whether there is any relationship between somatropin replacement therapy and CNS tumor recurrence.

Intracranial hypertension (IH) with papilledema, visual changes, headache, nausea, and/or vomiting has been reported in a small number of patients treated with somatropin products. Symptoms usually occurred within the first eight (8) weeks after the initiation of somatropin therapy. In all reported cases, IH-associated signs and symptoms rapidly resolved after cessation of therapy or a reduction of the somatropin dose. Funduscopy examination should be performed routinely before initiating treatment with somatropin to exclude preexisting papilledema, and periodically during the course of somatropin therapy. If papilledema is observed by funduscopy during somatropin treatment, treatment should be stopped. If somatropin-induced IH is diagnosed, treatment with somatropin can be restarted at a lower dose after IH-associated signs and symptoms have resolved. Patients with Turner syndrome, chronic renal insufficiency, and Prader-Willi syndrome may be at increased risk for the development of IH.

In patients with hypopituitarism (multiple hormone deficiencies), standard hormonal replacement therapy should be monitored closely when somatropin therapy is administered.

Undiagnosed/untreated hypothyroidism may prevent an optimal response to somatropin, in particular, the growth response in children. Patients with Turner syndrome have an inherently increased risk of developing autoimmune thyroid disease and primary hypothyroidism. In patients with growth hormone deficiency, central (secondary) hypothyroidism may first become evident or worsen during somatropin treatment. Therefore, patients treated with somatropin should have periodic thyroid function tests and thyroid hormone replacement therapy should be initiated or appropriately adjusted when indicated.

Patients should be monitored carefully for any malignant transformation of skin lesions.

When somatropin is administered subcutaneously at the same site over a long period of time, tissue atrophy may result. This can be avoided by rotating the injection site.

As with any protein, local or systemic allergic reactions may occur. Parents/patients should be informed that such reactions are possible and that prompt medical attention should be sought if allergic reactions occur.

#### **Pediatric Patients (see PRECAUTIONS, General)**

Slipped capital femoral epiphysis may occur more frequently in patients with endocrine disorders (including pediatric growth hormone deficiency and Turner syndrome) or in patients undergoing rapid growth. Any pediatric patient with the onset of a limp or complaints of hip or knee pain during somatropin therapy should be carefully evaluated.

Progression of scoliosis can occur in patients who experience rapid growth. Because somatropin increases growth rate, patients with a history of scoliosis who are treated with somatropin should be monitored for progression of scoliosis. However, somatropin has not been shown to increase the occurrence of scoliosis. Skeletal abnormalities including scoliosis are commonly seen in untreated Turner syndrome patients. Scoliosis is also commonly seen in untreated patients with Prader-Willi syndrome. Physicians should be alert to these abnormalities, which may manifest during somatropin therapy.

### **Information for Patients**

Patients being treated with TEV-TROPIN<sup>®</sup> (and/or their parents) should be informed about the potential benefits and risks associated with TEV-TROPIN<sup>®</sup> treatment. This information is intended to better educate patients (and caregivers); it is not a disclosure of all possible adverse or intended effects.

Patients and caregivers who will administer TEV-TROPIN<sup>®</sup> should receive appropriate training and instruction on the proper use of TEV-TROPIN<sup>®</sup> from the physician or other suitably qualified health care professional. A puncture-resistant container for the disposal of used syringes and needles should be strongly recommended. Patients and/or parents should be thoroughly instructed in the importance of proper disposal, and cautioned against any reuse of needles and syringes. This information is intended to aid in the safe and effective administration of the medication.

### **Laboratory Tests**

Serum levels of inorganic phosphorus, alkaline phosphatase, parathyroid hormone (PTH) and IGF-1 may increase during somatropin therapy.

### **Drug Interactions**

Somatropin inhibits 11 $\beta$ -hydroxysteroid dehydrogenase type 1 (11 $\beta$ HSD-1) in adipose/hepatic tissue and may significantly impact the metabolism of cortisol and cortisone. As a consequence, in patients treated with somatropin, previously undiagnosed central (secondary) hypoadrenalism may be unmasked requiring glucocorticoid replacement therapy. In addition, patients treated with glucocorticoid replacement therapy for previously diagnosed hypoadrenalism may require an increase in their maintenance or stress doses; this may be especially true for patients treated with cortisone acetate and prednisone since conversion of these drugs to their biologically active metabolites is dependent on the activity of the 11 $\beta$ HSD-1 enzyme.

Excessive glucocorticoid therapy may attenuate the growth promoting effects of somatropin in children. Therefore, glucocorticoid replacement therapy should be carefully adjusted in children with concomitant GH and glucocorticoid deficiency to avoid both hypoadrenalism and an inhibitory effect on growth.

Limited published data indicate that somatropin treatment increases cytochrome P450 (CP450) mediated antipyrine clearance in man. These data suggest that somatropin administration may alter the clearance of compounds known to be metabolized by CP450 liver enzymes (e.g., corticosteroids, sex steroids, anticonvulsants, cyclosporine). Careful monitoring is advisable when somatropin is administered in combination with other drugs known to be metabolized by CP450 liver enzymes. However, formal drug interaction studies have not been conducted.

In patients with diabetes mellitus requiring drug therapy, the dose of insulin and/or oral agent may require adjustment when somatropin therapy is initiated (see **PRECAUTIONS, General**).

### **Carcinogenesis, Mutagenesis, Impairment of Fertility**

Carcinogenesis, mutagenesis and reproduction studies have not been conducted with TEV-TROPIN<sup>®</sup>.

### **Pregnancy**

#### **Pregnancy Category C**

Animal reproduction studies have not been conducted with TEV-TROPIN<sup>®</sup>. It is not known whether TEV-TROPIN<sup>®</sup> can cause fetal harm when administered to a pregnant woman or can affect reproduction capacity. TEV-TROPIN<sup>®</sup> should be given to a pregnant woman only if clearly needed.

### **Nursing Mothers**

There have been no studies conducted with TEV-TROPIN<sup>®</sup> in nursing mothers. It is not known whether this drug is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when TEV-TROPIN<sup>®</sup> is administered to a nursing woman.

### **Geriatric Use**

The safety and effectiveness of TEV-TROPIN<sup>®</sup> in patients aged 65 and over has not been evaluated in clinical studies. Elderly patients may be more sensitive to the action of somatropin, and therefore may be more prone to develop adverse reactions. A lower starting dose and smaller dose increments should be considered for older patients (see **DOSAGE AND ADMINISTRATION**).

### **ADVERSE REACTIONS**

Utilizing a double-antibody immunoassay, no antibodies to growth hormone could be detected in a group of 164 naïve and previously treated clinical trial patients after treatment with TEV-TROPIN<sup>®</sup> for up to 40 months. However, utilizing the less specific polyethylene glycol (PEG) precipitation immunoassay, 27 of the 164 patient group were tested after treatment with TEV-TROPIN<sup>®</sup> for 4 to 6 months and antibodies to growth hormone were detected in two patients (7.4%). The binding capacity of the antibodies from the two antibody positive patients was not determined.

None of the patients with anti-GH antibodies in the clinical studies experienced decreased linear growth response to TEV-TROPIN<sup>®</sup> or any other associated adverse event. Growth hormone antibody binding capacities below 2 mg/L have not been associated with growth attenuation. In some cases, when binding capacity exceeds 2 mg/L, growth attenuation has been observed.

In studies of growth hormone-deficient children, headaches occurred infrequently. Injection site reactions (e.g., pain, bruise) occurred in 8 of the 164 treated patients.

Leukemia has been reported in a small number of patients treated with other growth hormone products. It is uncertain whether this risk is related to the pathology of growth hormone deficiency itself, growth hormone therapy, or other associated treatments such as radiation therapy for intracranial tumors.

## OVERDOSAGE

The recommended dosage of up to 0.1 mg/kg (0.3 IU/kg) of body weight 3 times per week should not be exceeded. Acute overdose could cause initial hypoglycemia and subsequent hyperglycemia. Long-term repeated use of doses in excess of those recommended could result in signs and symptoms of gigantism and/or acromegaly consistent with the known effects of excess human growth hormone.

## DOSAGE AND ADMINISTRATION

A dosage of up to 0.1 mg/kg (0.3 IU/kg) of body weight administered 3 times per week by subcutaneous injection is recommended. The dosage schedule for TEV-TROPIN<sup>®</sup> should be individualized for each patient. Subcutaneous injection of greater than 1 mL of reconstituted solution is not recommended.

After the dose has been determined, each vial of TEV-TROPIN<sup>®</sup> should be reconstituted with 1 to 5 mL of bacteriostatic 0.9% sodium chloride for injection, USP (benzyl alcohol preserved).<sup>\*</sup> The stream of normal saline should be aimed against the side of the vial to prevent foaming. Swirl the vial with a GENTLE rotary motion until the contents are completely dissolved and the solution is clear. DO NOT SHAKE. Since TEV-TROPIN<sup>®</sup> is a protein, shaking or vigorous mixing will cause the solution to be cloudy. If the resulting solution is cloudy or contains particulate matter, the contents MUST NOT be injected.

<sup>\*</sup> Benzyl alcohol as a preservative in bacteriostatic normal saline, USP, has been associated with toxicity in newborns. When administering TEV-TROPIN<sup>®</sup> to newborns, reconstitute with sterile normal saline for injection, USP.

Occasionally, after refrigeration, some cloudiness may occur. This is not unusual for proteins like TEV-TROPIN<sup>®</sup> growth hormone. Allow the product to warm to room temperature. If cloudiness persists or particulate matter is noted, the contents MUST NOT be used.

Before and after injection, the septum of the vial should be wiped with rubbing alcohol or an alcoholic antiseptic solution to prevent contamination of the contents by repeated needle insertions. It is recommended that TEV-TROPIN<sup>®</sup> be administered using sterile disposable syringes and needles. The syringes should be of small enough volume that the prescribed dose can be drawn from the vial with reasonable accuracy.

## STABILITY AND STORAGE

Before Reconstitution – Vials of TEV-TROPIN<sup>®</sup> are stable when refrigerated at 36° to 46°F (2° to 8°C). Expiration dates are stated on the labels.

After Reconstitution – Vials of TEV-TROPIN<sup>®</sup> are stable for up to 14 days when reconstituted with bacteriostatic 0.9% sodium chloride (normal saline), USP, and stored in a refrigerator at 36° to 46°F (2° to 8°C). Do not freeze the reconstituted solution.

## HOW SUPPLIED

TEV-TROPIN<sup>®</sup> (somatotropin, rDNA origin, for injection) is supplied as 5 mg (15 IU) of lyophilized, sterile somatotropin per vial.



Each 5 mg carton contains one vial of TEV-TROPIN<sup>®</sup> (5 mg per vial) and one vial of diluent [5 mL of bacteriostatic 0.9% sodium chloride for injection, USP (benzyl alcohol preserved)], and is supplied in single cartons or cartons of six.

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