

CLINICAL SPECIFICATIONS

SOMATOTROPIN

Function:

Somatotropin is a growth hormone (GH) secreted by the anterior pituitary gland. It is a major participant in control of several complex physiologic processes, including growth and metabolism.

Associated With:

Recombinant human growth hormone therapy¹

Known Cross-Reactions: A β ₄₂ peptide²

Clinical Significance:

Deficiency in growth hormone or defects in its binding to receptor are seen as growth retardation or dwarfism. The manifestation of growth hormone deficiency depends upon the age of onset of the disorder and can result from either heritable or acquired disease. Excessive secretion of growth hormone, depending on age of onset, can result in gigantism, if occurring in childhood, or acromegaly, if occurring during adulthood. GHs stimulate the liver and other tissues to produce insulin-like growth factor-I (IGFI), which regulates growth and metabolism. GHs have also been shown to have direct effects on growth that is independent of IGFI. GHs, directly or indirectly via IGFI, can act on immune system molecules including B cells, T cells, NK cells, macrophages, and neutrophils to exert immunomodulatory activities.¹ In a murine amyotrophic lateral sclerosis (ALS) study, GH level was measured in preclinical, clinical onset and end-stage ALS male mice; compared to controls, levels were not elevated during the preclinical phase, were highly elevated during clinical onset, and decreased at end-stage of the disease.³ GH is a well-documented antagonist against the metabolic action of insulin, resulting in insulin resistance or hyperglycemic “dawn phenomenon.”^{reviewed in 4} In the largest central nervous system (CNS) tissue sample study to date, CNS accumulation of amyloid beta (A β ₄₂) was found in 50% of patients who had received human GH (hGH) treatment. The severe cerebral amyloid angiopathy (CAA) found in the older hGH control patients in this study suggests that hGH recipients may be at greater risk for CAA, including spontaneous lobar cerebral hemorrhage, perivascular inflammation, cognitive impairment and Creutzfeldt-Jakob disease.⁵ The use of anti-GH therapies can lead to anti-GH antibodies,¹ which can neutralize circulating growth hormone and inhibit its growth promoting effects. Furthermore, in a recent study, Vojdani and Vojdani showed that made against anti-A β ₄₂ peptide reacted strongly with somatotropin or growth hormone.² Due to cross-reactivity with amyloid beta peptide,² patients with circulating antibodies to somatotrophin may be at greater risk for AD and other neurological disorders when the blood-brain barrier is breached.

References:

1. Ahangari et al. Growth hormone antibodies formation in patients treated with recombinant human growth hormone. *Int J Immunopathol Pharmacol*, 2004; 17(1):33-38.
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3. Steyn et al. Growth hormone secretion is correlated with neuromuscular innervation rather than motor neuron number in early-symptomatic male amyotrophic lateral sclerosis mice. *Endocrinology*, 2013; 154(12):4695-4706.
4. Takano et al. Growth hormone induces cellular insulin resistance by uncoupling phosphatidylinositol 3-kinase and its downstream signals in 3T3-L1 adipocytes. *Diabetes*, 2001; 50:1891-1900.
5. Ritchie et al. Amyloid- β accumulation in the CNS in human growth hormone recipients in the UK. *Acta Neuropathol*, 2017; 134:221-240.