

Growth hormone (GH), produced by the pituitary gland, is essential for normal growth and development throughout childhood and adolescence, while continuing to play important roles in adult metabolism. Its secretion is pulsatile and follows a complex regulatory pattern involving multiple hormones and neural pathways.

The production and release of GH is primarily controlled by two hypothalamic hormones:

- Growth hormone-releasing hormone (GHRH), which stimulates GH synthesis and release
- Somatostatin (SRIF), which inhibits GH secretion Additional factors influencing GH secretion include:
- Ghrelin, often called the "hunger hormone"
- Sleep patterns, particularly slow-wave sleep
- Exercise and physical stress
- Nutritional status
- Various neurotransmitters

GH exerts its effects both directly and through the production of insulin-like growth factor 1 (IGF-1) in the liver and other tissues. The GH/IGF-1 axis influences:

- Linear growth during childhood and adolescence
- Protein synthesis and muscle mass
- Bone density and mineralization
- Fat metabolism and distribution
- Glucose homeostasis
- Cardiac function and tissue repair
- Cognitive function and neuroprotection

Growth hormone deficiency can result from genetic mutations, trauma, tumors, or radiation therapy. Symptoms vary by age of onset but may include:

- Short stature in children
- Increased body fat, particularly visceral fat
- Decreased muscle mass and strength
- Reduced bone density
- Impaired quality of life and psychological well-being

Excess GH production, typically caused by pituitary adenomas, leads to acromegaly in adults or gigantism in children if occurring before growth plate closure. Treatment options include:

- GH replacement therapy for deficiency
- Surgery, radiation, or medical therapy for excess
- Regular monitoring of IGF-1 levels
- Management of comorbid conditions

Modern therapeutic applications of GH extend beyond traditional replacement therapy, though many uses remain controversial. Research continues to explore its potential roles in aging, sports performance, and tissue repair.