

## Growth hormone

**Growth hormone (GH)** or **somatotropin**, also known as **human growth hormones (hGH or HGH)** in its human form, is a [peptide hormone](#) that stimulates growth, [cell](#) reproduction, and cell regeneration in humans and other animals. It is thus important in [human development](#).

### Actions

Somatostatin is synthesized by the delta cells in the pancreas, as well as in the gut and hypothalamus, where it is a hypophysiotropic hormone. In the pancreas, the major product of the somatostatin prohormone is a 14-amino-acid peptide.

Pancreatic somatostatin secretion is stimulated by factors related to the ingestion of food, including increased blood levels of glucose, amino acids, and fatty acids and a number of gastrointestinal hormones.

Somatostatin inhibits gastrointestinal motility, secretion, and absorption and is a potent inhibitor of insulin and glucagon secretion; it delays the assimilation of nutrients from the gastrointestinal tract and the utilization of absorbed nutrients by the liver and peripheral tissues

### Regulation

Secretion of growth hormone (GH) in the pituitary is regulated by the [neurosecretory](#) nuclei of the [hypothalamus](#). These cells release the peptides [growth hormone-releasing hormone](#) (GHRH or *somatocrinin*) and [growth hormone-inhibiting hormone](#) (GHIH or *somatostatin*) into the [hypophyseal portal](#) venous blood surrounding the pituitary. GH release in the pituitary is primarily determined by the balance of these two peptides, which in turn is affected by many physiological stimulators (e.g., exercise, nutrition, sleep) and inhibitors (e.g., free fatty acids) of GH secretion

Somatotropic cells in the anterior [pituitary](#) gland then synthesize and secrete GH in a pulsatile manner, in response to these stimuli by the hypothalamus. The largest and most predictable of these GH peaks occurs about an hour after onset of sleep with plasma levels of 13 to 72 ng/mL

A number of factors are known to affect GH secretion, such as age, sex, diet, exercise, stress, and other hormones. Young adolescents secrete GH at the rate of about 700 µg/day, while healthy adults secrete GH at the rate of about 400 µg/day. Sleep deprivation generally suppresses GH release, particularly after early adulthood.

Stimulators of growth hormone (GH) secretion include:

- Peptide hormones

- **GHRH** (*somatocrinin*) through binding to the growth hormone-releasing hormone receptor (**GHRHR**)
- **Ghrelin** through binding to growth hormone secretagogue receptors (**GHSR**)
- Sex hormones
  - Increased **androgen** secretion during puberty (in males from testes and in females from adrenal cortex)
  - **Testosterone** and **DHEA**
  - **Estrogen**
- **Clonidine** and **L-DOPA** by stimulating GHRH release
- **$\alpha 4\beta 2$  nicotinic agonists**, including **nicotine**, which also act synergistically with **clonidine**.
- **Hypoglycemia**, **arginine** and **propranolol** by inhibiting **somatostatin** release<sup>[23]</sup>
- **Deep sleep**
- **Insulin**
- **Glucagon**
- **Niacin** as nicotinic acid (vitamin B<sub>3</sub>)
- **Fasting**
- Vigorous **exercise**

*Inhibitors* of GH secretion include:

- **GHIH** (*somatostatin*) from the **periventricular nucleus**
- circulating concentrations of GH and **IGF-1** (**negative feedback** on the pituitary and **hypothalamus**)
- **Hyperglycemia**
- **Glucocorticoids**
- **Dihydrotestosterone**
- **Phenothiazines**

In addition to control by endogenous and stimulus processes, a number of foreign compounds (**xenobiotics** such as drugs and **endocrine disruptors**) are known to influence GH secretion and function.

