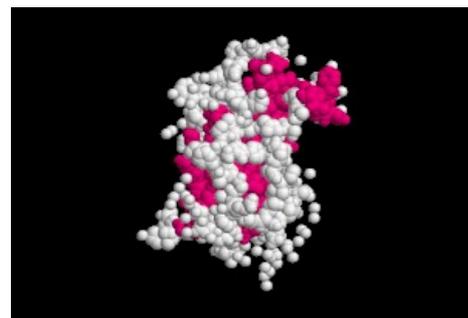


Growth hormone (general)

Structure, synthesis

Growth hormone (GH, somatotropin, somatotrophic hormone, STH) is a linear polypeptide of 191 amino acids with two internal disulfide bridges and molecular weight of 21 500 daltons. From other mammal growth hormones, only monkey GH is immunologically and chemically approaching it. Monkey GH is also the only one biologically effective in humans, the others are completely ineffective. Growth hormone is formed from a larger precursor (28 000 daltons), so-called pre-GH (pre-STH), which is also secreted into the blood but it has no physiological effect. STH is synthesized and secreted in adenohypophyseal somatotrophs, which make up approximately 50 % of adenohypophysis cells. Somatotrophs and lactotrophs are acidophilic secretory cells of the anterior pituitary lobe, stained with acidic dyes (eg. eosin).



Growth hormone structure

Receptor for STH

The growth hormone Receptor is a 620 amino acids protein with a large extracellular portion, a transmembrane domain, and a large portion of molecule in the cytoplasm, which belongs to the cytokine receptor family. STH has two receptor binding sites, i.e. when STH binds to one receptor subunit, the second somatotropin binding site attracts the second receptor subunit. This creates a **homodimer**, that is essential for receptor activation resulting in various intracellular cascades (mainly through JAK2-Stat gene activation in the nuclei).

Transport STH

In plasma, STH is bound to **GHBP** (GH binding protein), which is a large fragment of the extracellular domain of the receptor. GHBP is probably formed by cleavage of STH receptors and its concentration is therefore proportional to the number of STH receptors in the tissues. About half of the STH activity is tied up, which creating a STH reservation that can compensate for large fluctuations in its secretions. Free STH has a half-life of 20-50 min in the blood. Radioimmunoassay determines both the free and bound forms because it uses several higher affinities for hormones than for binding proteins.

Values

- healthy adults secrete approximately 40 µg STH per day (18,6 nmol/day);
- adolescents secrete about 700 µg/day (32,5 nmol/day);
- daily hormone output in adult is 0,2-1,0 mg/day;
- in adults, the fasting morning blood concentration of STH below 5 ng/ml (232 pm/l), sometimes even lower (2 ng/ml).

Genes

The gen for STH is located on long arm of chromosome 17 in a cluster of five genes: **STH-N** encodes human STH, **STH2** encodes a variant of STH which is produced in the placenta, **CSH1** and **CSH2** encode prolactin, and **CSHP1** encodes a variant of the prolactin molecule. STH, which is a product of the STH-N gene, is present in the largest amount and represents about 75 % of the STH in the blood.

Gen for hCS

The STH2 gene is expressed mainly in the placenta and its product is **human chorionic somatomammotropin** (hCS), which is consisted of 191 amino acids, but is different from „normal“ STH (it differs in 13 amino acids). It is produced by syncytiotrophoblast, it is found in large amounts in the mother's blood during pregnancy, but little passes into the blood of the fetus. In retrospect, it can reduce the mother's STH secretion from the pituitary gland. hCS is thought to have a lactogenic effect (a positive effect on mammary gland growth and lactation) and the main effects of growth hormone: causes retention of nitrogen, potassium and calcium, lipolysis and a decrease in glucose utilization during pregnancy, which helps supply glucose to the fetus. The amount of hCS production is proportional to the size of the placenta.

Links

Related articles

- Growth hormone
- Growth hormone (secretion)

Source

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