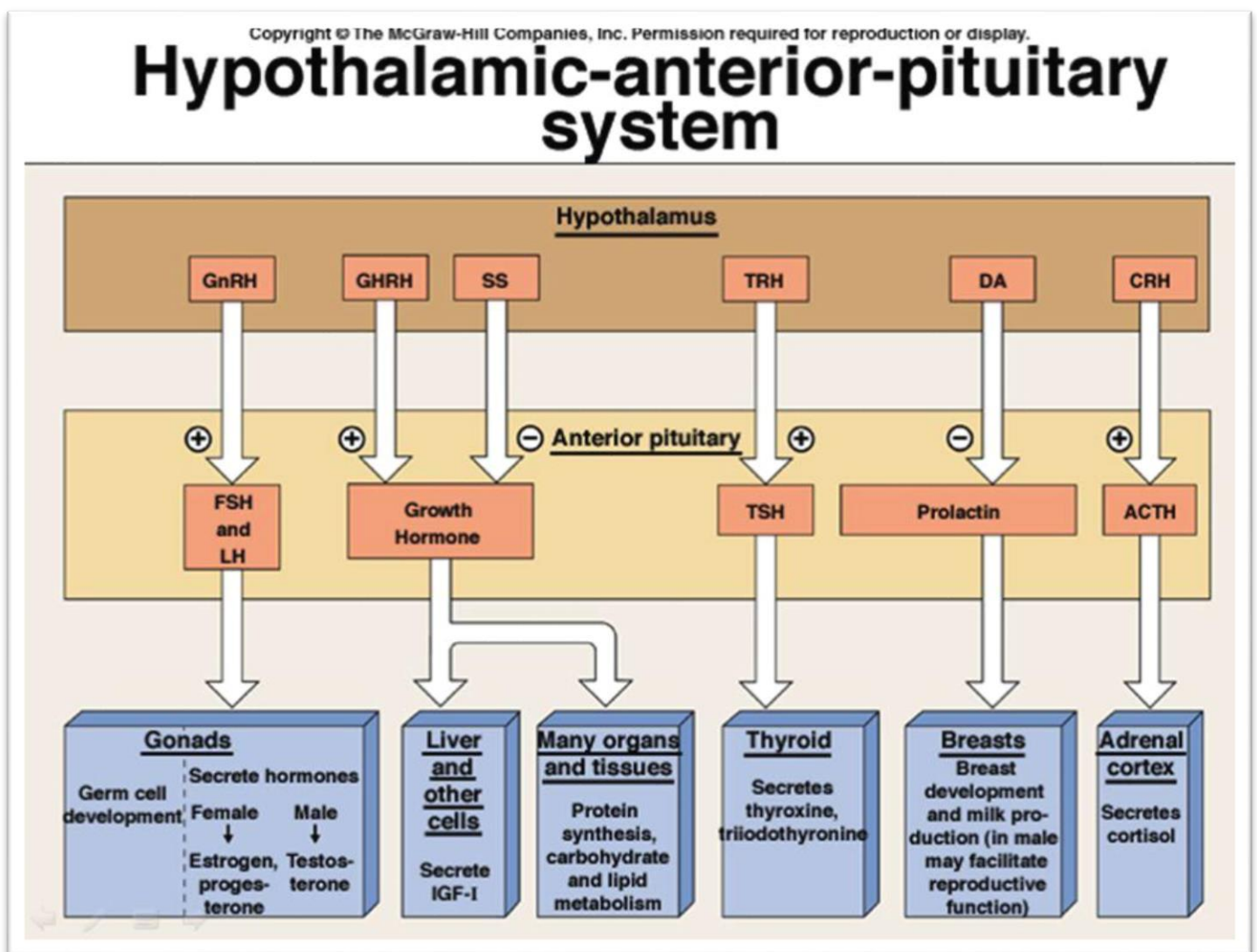


The anterior lobe

- The anterior pituitary secretes
- thyroid-stimulating hormone (TSH, thyrotropin),
- adrenocorticotrophic hormone (ACTH), luteinizing hormone (LH),
- follicle-stimulating hormone (FSH),
- prolactin,
- and growth hormone



- The gland receives almost all of its blood supply from the portal hypophysial vessels that pass initially through the median eminence, a structure immediately below the hypothalamus

- prolactin acts on the breast.
- The remaining five are, at least in part, **tropic hormones**; that is, they stimulate secretion of hormonally active substances by other endocrine glands or, in the case of growth hormone, the liver and other tissues

Growth hormone

Plasma Levels, Binding, & Metabolism

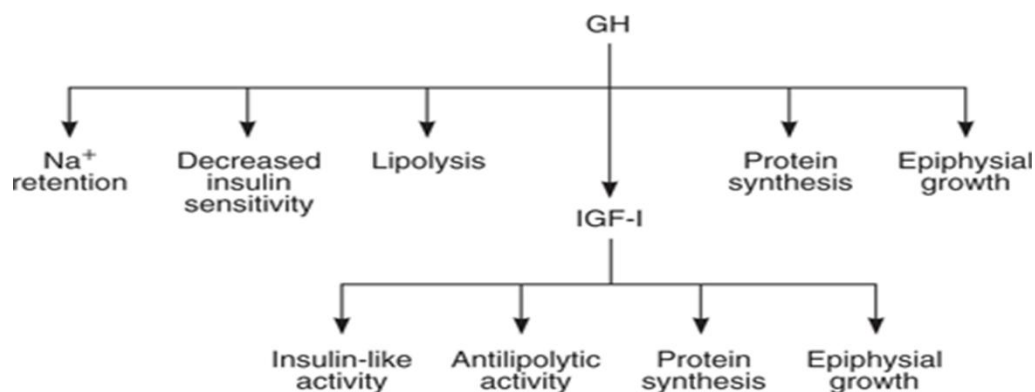
- 50% of the circulating pool of growth hormone activity is in the bound form.

adult humans is normally less than 3 ng/mL

- represents both the protein-bound and free forms
- Growth hormone is metabolized rapidly, probably at least in part in the liver
- half-life of circulating growth hormone in humans is
- 6–20 min, and the daily growth hormone output is
- 0.2–1.0 mg/d in adults.

Effects on Protein & Electrolyte Metabolism

- is a protein anabolic hormone and produces :
- 1-positive nitrogen and phosphorus balance,
- 2- ↑Gastrointestinal absorption of Ca^{2+} .
- 3- Na^+ and K^+ excretion is ↓by an action independent of the adrenal glands,



Effects on Carbohydrate & Fat Metabolism

- growth hormone are diabetogenic because they : 1- increase hepatic glucose output and exert an anti-insulin effect in muscle.
- 2- GH is ketogenic and increases circulating free fatty acid (FFA) levels.
- 3-GH not stimulate beta cells of the pancreas directly, but it increases the ability of the pancreas to respond to insulinogenic stimuli such as arginine and glucose.
- This is an additional way growth hormone promotes growth, since insulin has a protein anabolic effect

Somatomedins

- The effects of growth hormone on growth, cartilage, and protein metabolism depend on an interaction between growth hormone and **somatomedins**, which are polypeptide growth factors secreted by the liver and other tissues.
- they are members of an increasingly large family of **growth factors** that affect many different tissues and organs.
- The principal circulating somatomedins are **insulin-like growth factor I (IGF-I, somatomedin C)**
- and **insulin-like growth factor II (IGF-II)**.
- These factors are closely related to insulin
- The IGF-I receptor is very similar to the insulin receptor and probably uses similar or identical intracellular signaling pathways

Direct & Indirect Actions of Growth Hormone

- growth hormone and somatomedins can act both in cooperation and independently to stimulate pathways that lead to growth.
- growth hormone probably combines with circulating and locally produced IGF-I in various proportions to produce different effects in different tissues.

Hypothalamic & Peripheral Control of Growth Hormone Secretion

- 1-hypothalamus controls growth hormone production by secreting growth hormone-releasing hormone (GHRH) & somatostatin,
- 2-the balance between the effects of these hypothalamic factors on the pituitary will determine the level of growth hormone release.
- 3-third regulator of growth hormone secretion is **ghrelin** (synthesis and secretion in the stomach) , but it is also produced in the hypothalamus and has marked growth hormone-stimulating activity.
- In addition, it appears to be involved in the regulation of food intake.

Feedback control

- Growth hormone secretion is under feedback control.
- 1-It acts on the hypothalamus to antagonize GHRH release.
- 2-GH also increases circulating IGF-I, and IGF-I in turn exerts a direct inhibitory action on growth hormone secretion from the pituitary. 3-It also stimulates somatostatin secretion

About G H

- 1- secretion of GH is not stable over time.
- 2- Adolescents have the highest circulating levels of GH ,then children, then adults.
- 3- There are also diurnal variations in growth hormone secretion superimposed on these developmental stages
- 4- GH is found at relatively low levels during the day.
- 5- During sleep, large pulsatile bursts of growth hormone secretion occur.
- 6- basal plasma growth hormone concentration ranges from 0–3 ng/mL in normal adults.

Stimuli Affecting Growth Hormone Secretion

- 1) conditions such as hypoglycemia and fasting in which there is an actual or threatened decrease in the substrate for energy production in cells,
- (2) conditions in which the amounts of certain amino acids are increased in the plasma,
- (3) stressful stimuli.
- The response to glucagon has been used as a test of growth hormone reserve.

Stimuli that decrease secretion

- REM sleep
- Glucose
- Cortisol
- FFA
- Medroxyprogesterone
- Growth hormone and IGF-I

Growth Periods

- two periods of rapid growth occur:
- 1- in infancy
- 2- in late puberty just before growth stops, growth is due to GH, androgens, and estrogens
- subsequent cessation of growth is due to closure of the epiphyses in the long bones by estrogens