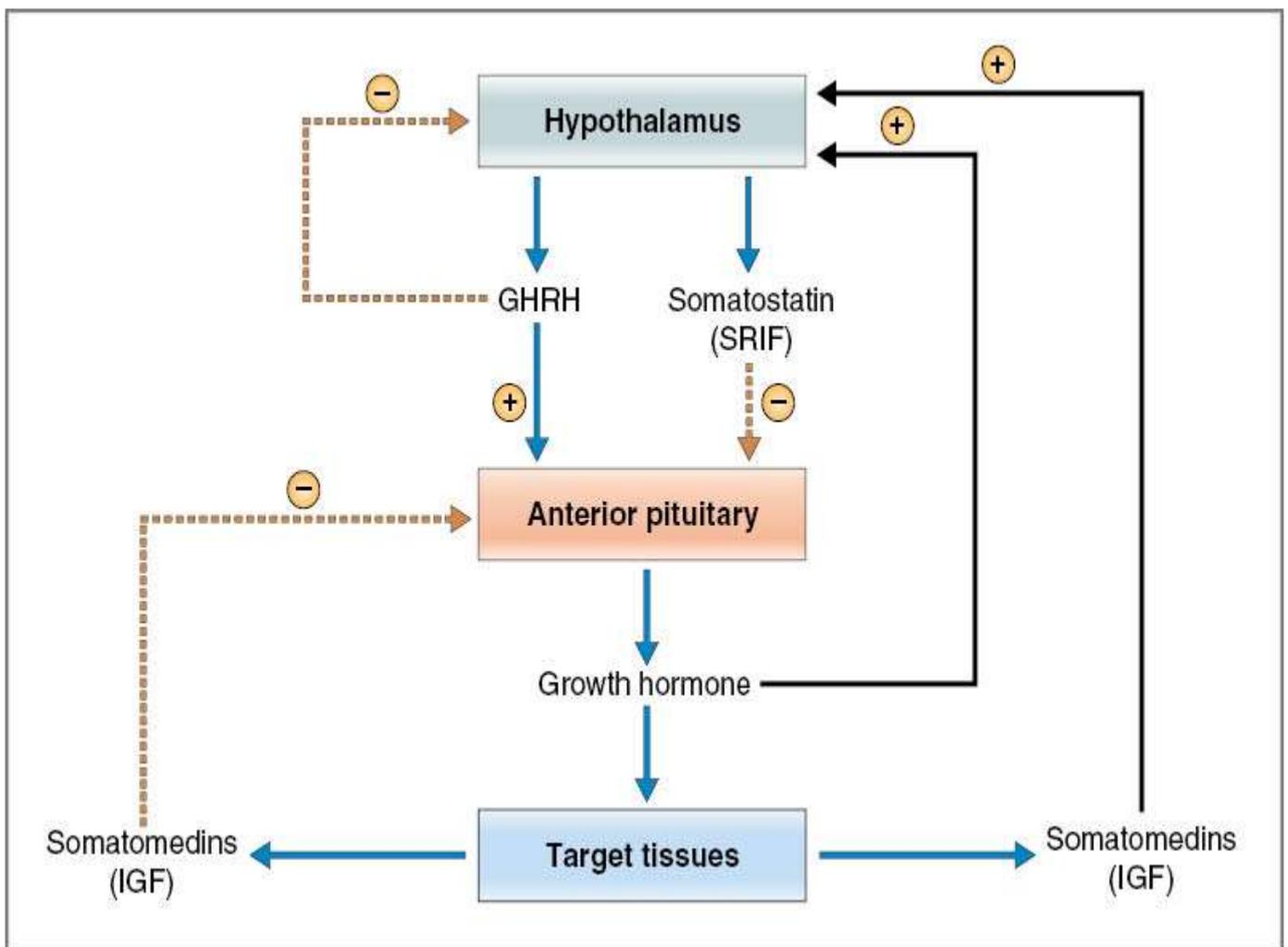


GROWTH HORMONE

- Somatotrophic hormone, somatotropin.
- Somatotrophs.(20%)
- 191 AA.
- GHRH (ventromedial nucleus).



- GHRH → receptor → Gs protein

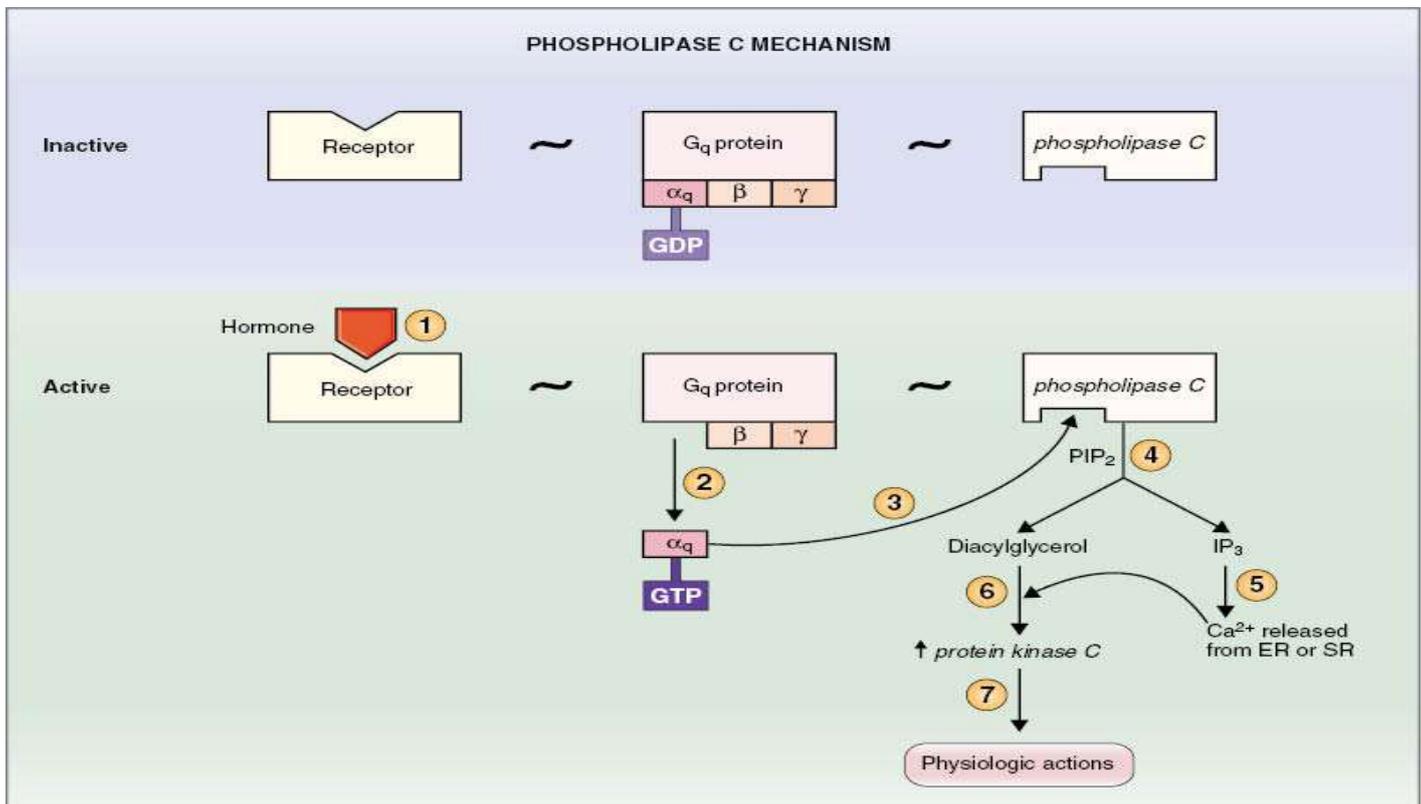
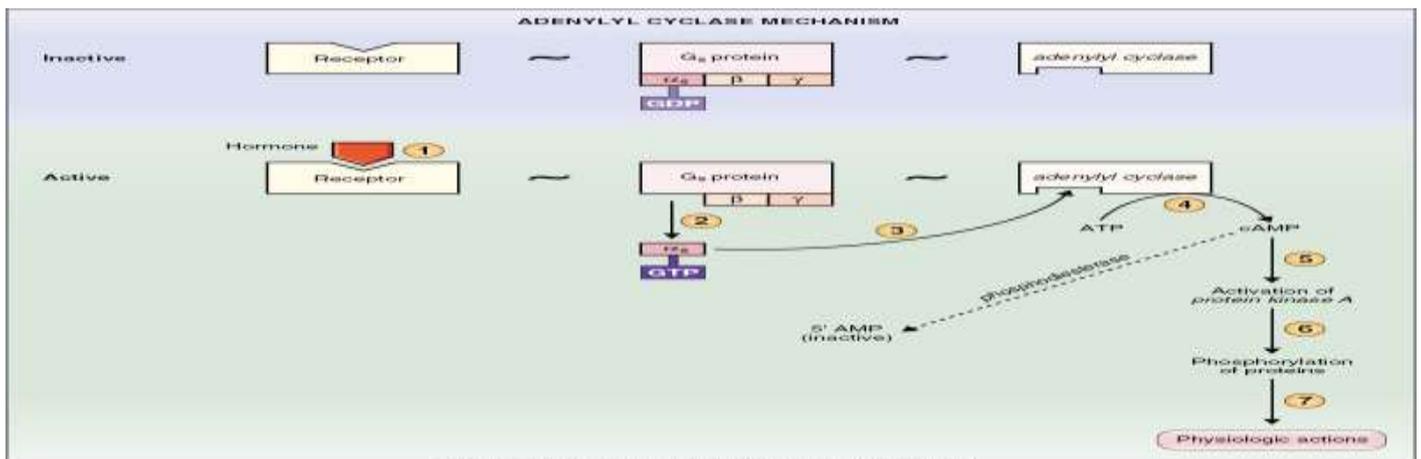
Adenylyl cyclase and phospholipase C →

cAMP and IP3/Ca → secretion + synthesis.

- Somatostatin (SRIF) → receptor

Gi → inhibit generation of cAMP →

Decrease secretion.



SECRETION

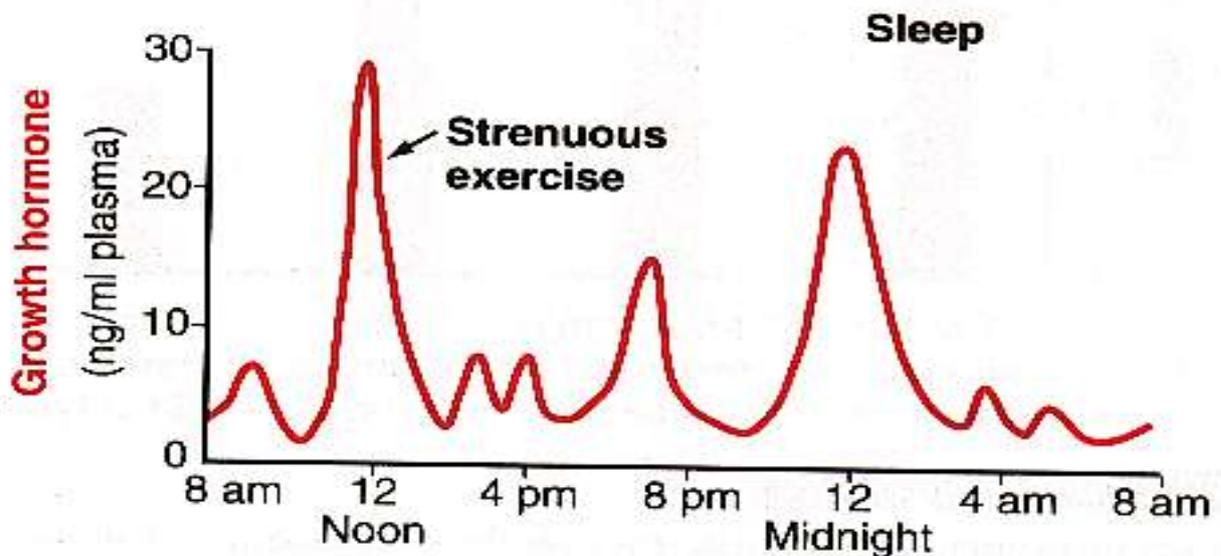


FIGURE 75 - 6

Typical variations in growth hormone secretion throughout the day, demonstrating the especially powerful effect of strenuous exercise and also the high rate of growth hormone secretion that occurs during the first few hours of deep sleep.

- Pulsatile every 2H.

Table 9-4 Factors Affecting Growth Hormone Secretion

Stimulatory Factors	Inhibitory Factors
Decreased glucose concentration	Increased glucose concentration
Decreased free fatty acid concentration	Increased free fatty acid concentration
Arginine	Obesity
Fasting or starvation	Senescence
Hormones of puberty (estrogen, testosterone)	Somatostatin
Exercise	Somatomedins
Stress	Growth hormone
Stage III and IV sleep	β -Adrenergic agonists
α -Adrenergic agonists	Pregnancy

TABLE 16.1 Pituitary Hormones: Summary of Regulation and Effects

HORMONE (CHEMICAL STRUCTURE AND CELL TYPE)	REGULATION OF RELEASE	TARGET ORGAN AND EFFECTS	EFFECTS OF HYPOSECRETION ↓ AND HYPERSECRETION ↑
Anterior Pituitary Hormones			
 Growth hormone (GH) (Protein, somatotroph)	Stimulated by GHRH* release, which is triggered by low blood levels of GH as well as by a number of secondary triggers including hypoglycemia, increases in blood levels of amino acids, low levels of fatty acids, exercise, other types of stressors, and estrogens	 Liver, muscle, bone, cartilage, and other tissues: anabolic hormone; stimulates somatic growth; mobilizes fats; spares glucose Growth-promoting effects mediated indirectly by IGFs	↓ Pituitary dwarfism in children ↑ Gigantism in children; acromegaly in adults
	Inhibited by feedback inhibition exerted by GH and IGFs, and by hyperglycemia, hyperlipidemia, obesity, and emotional deprivation via either increased GHIH* (somatostatin) or decreased GHRH* release		

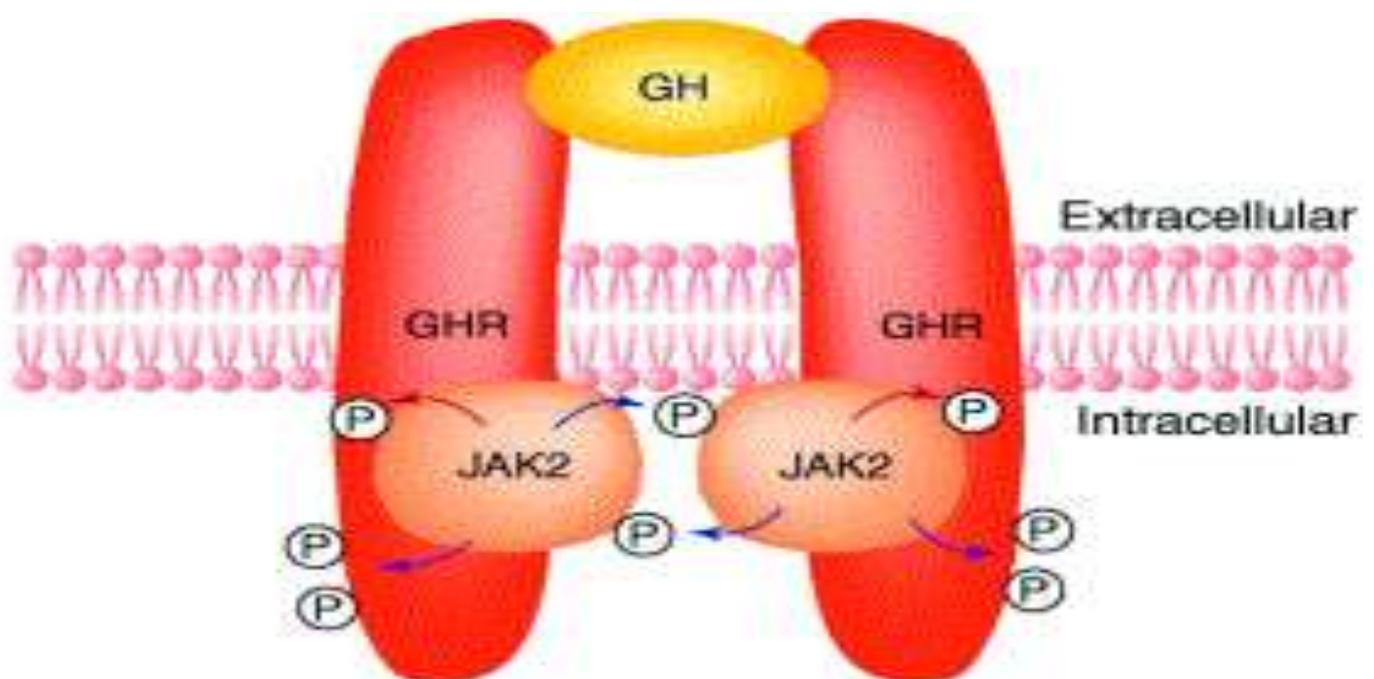
*Indicates hypothalamic releasing and inhibiting hormones:

GHRH = growth hormone-releasing hormone; GHIH = growth hormone-inhibiting hormone

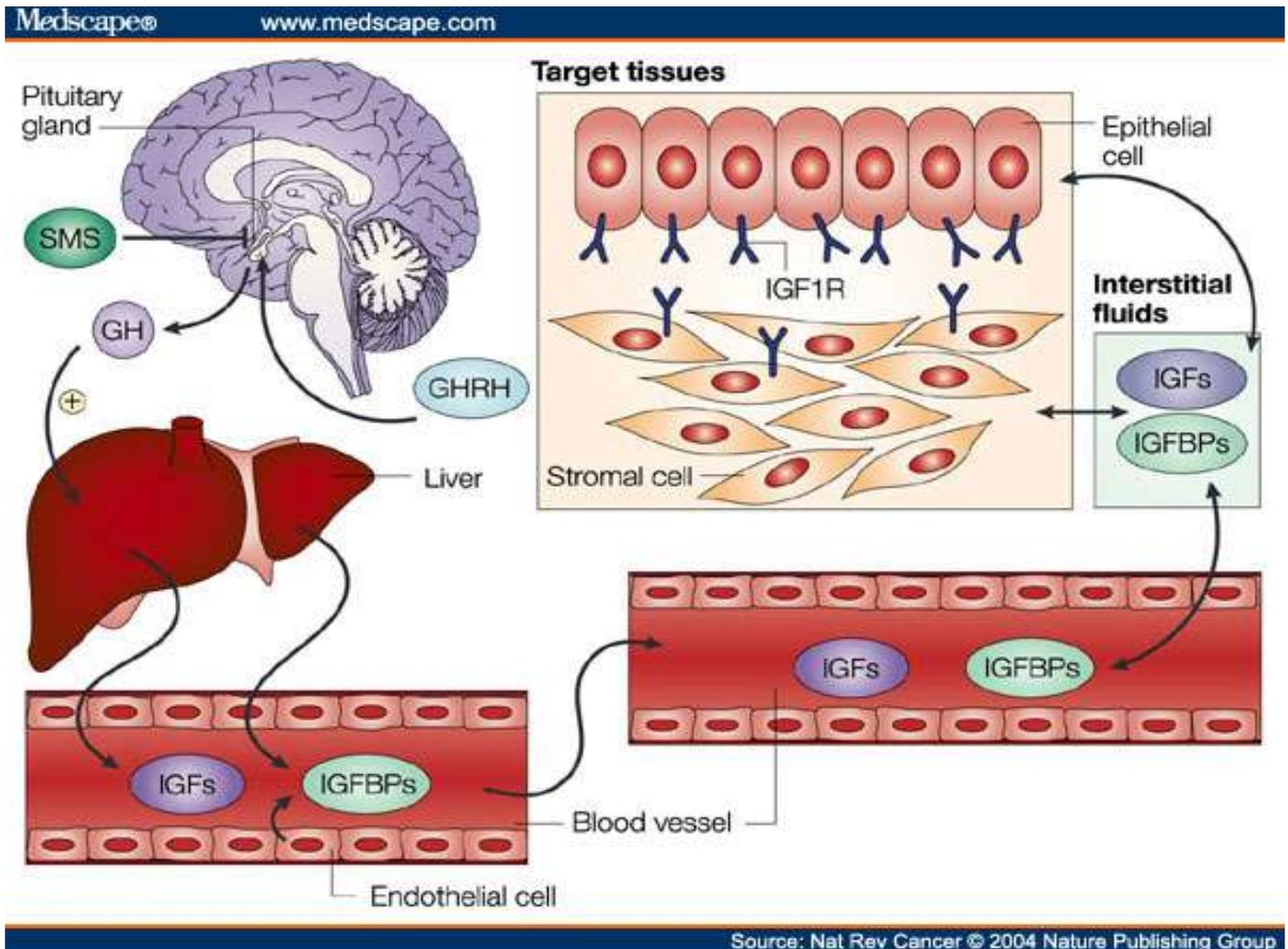
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ACTION OF GROWTH HORMONE

- Direct.
- Skeletal muscles, liver and adipose.



- Indirect (somatomedine IGF).
- 4500-7500 MW.
- Somatomedine C.



Source: Nat Rev Cancer © 2004 Nature Publishing Group

EFFECT ON CARBOHYDRATE

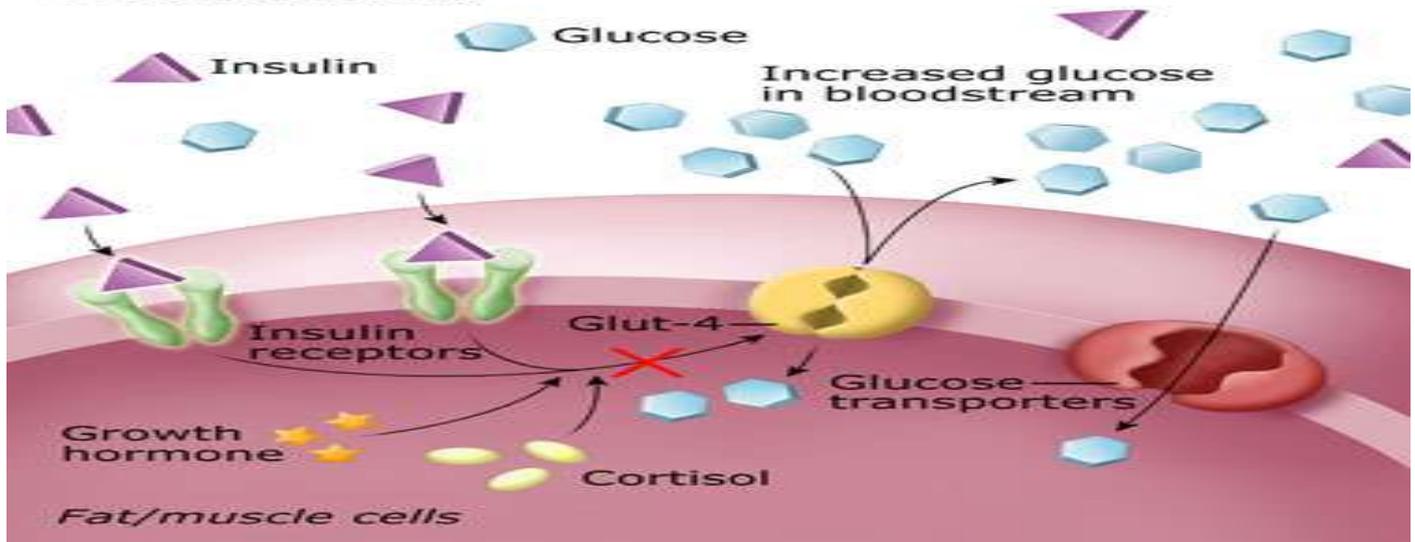
- Increase blood glucose.(Diabetogenic effect.)

(↑ gluconeogenesis)

Decrease glucose utilization in energy.

- Increase in insulin.

Glucose Counter-regulatory Hormones: Effect on Fat and Muscle Cells



EFFECT ON PROTEIN

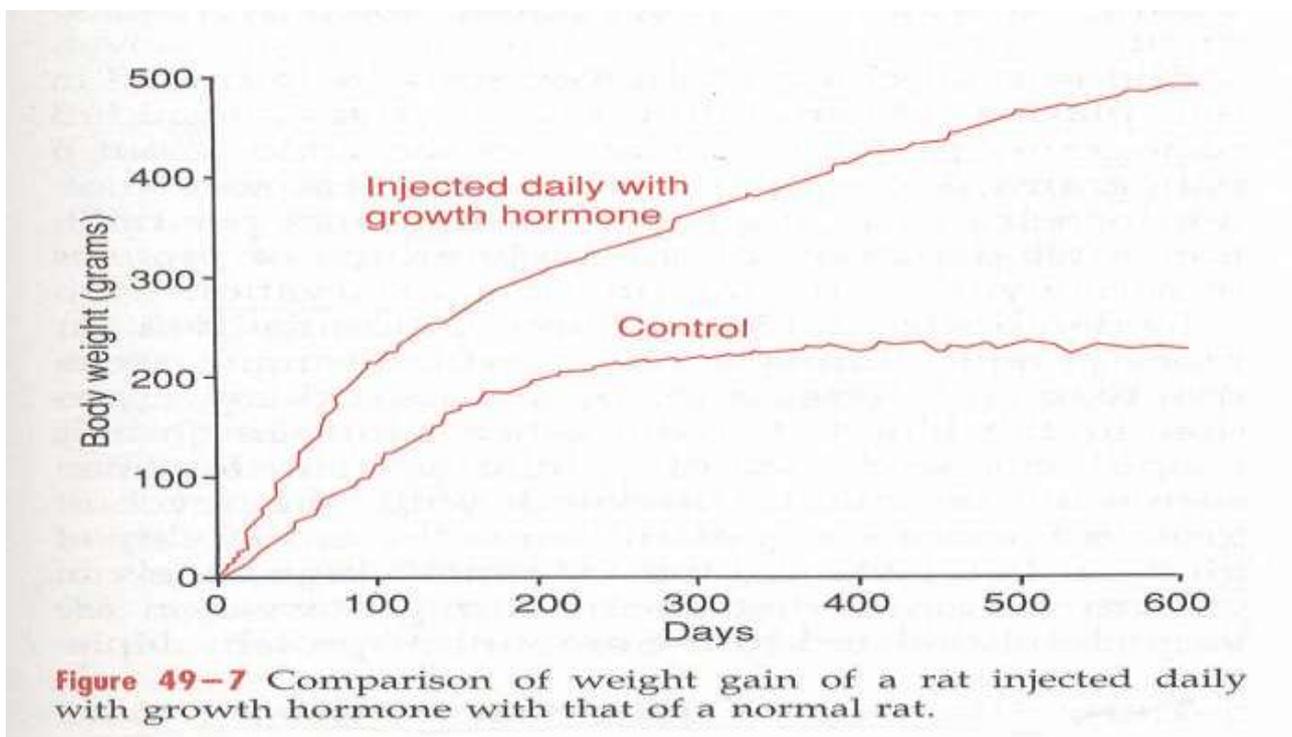
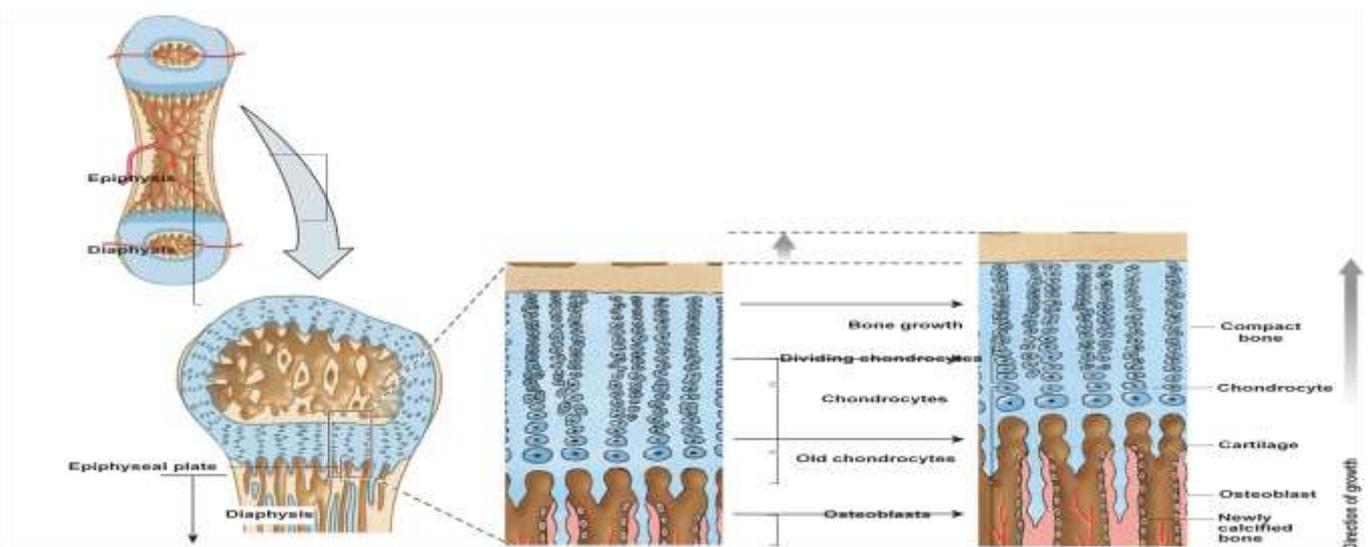
- Increase protein synthesis.
 - a- Increase AA uptake.
 - b- Increase DNA synthesis.
 - c- Increase RNA synthesis.
- Decrease protein catabolism.

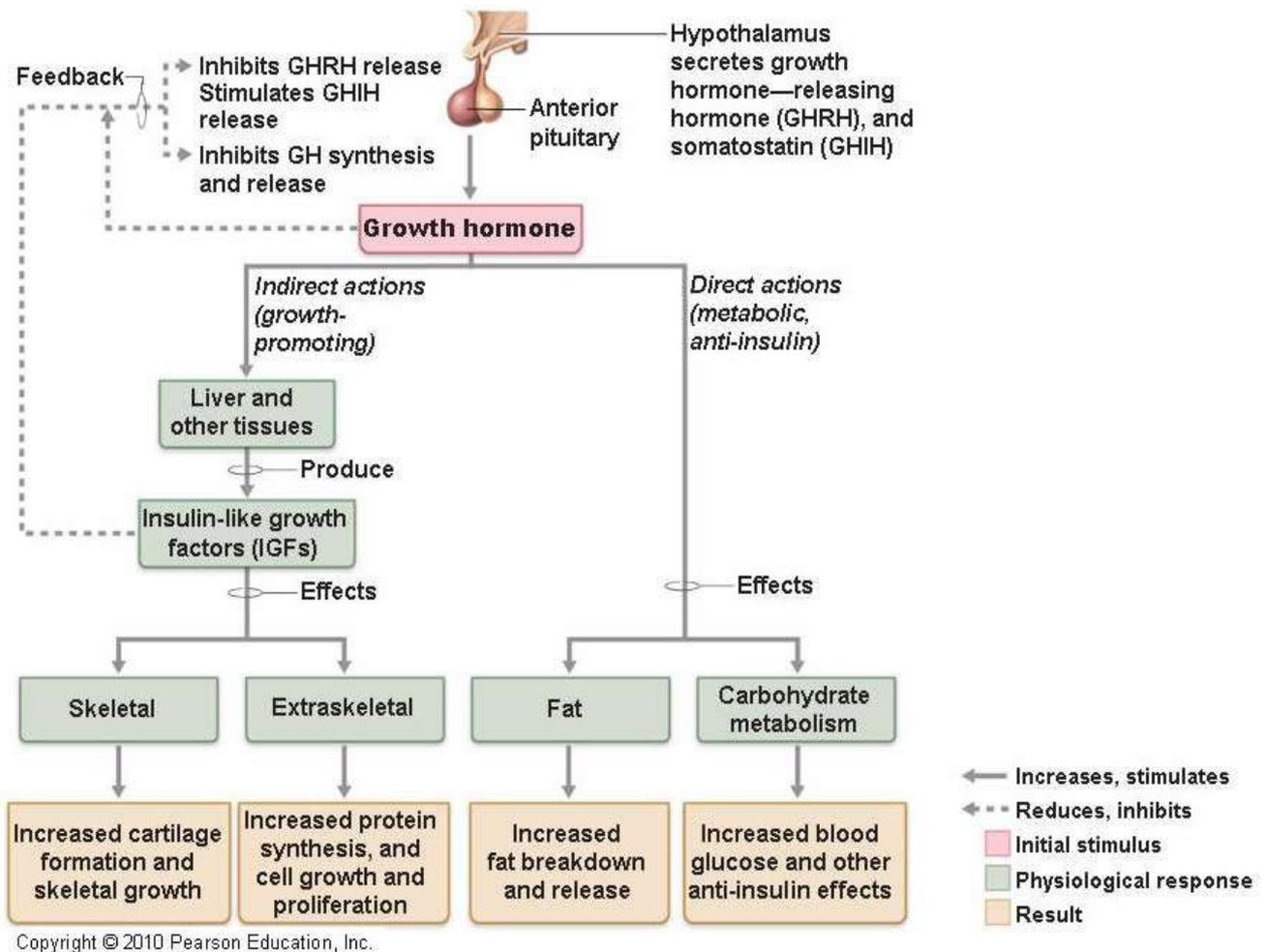
EFFECT IN FAT

- 1- Increase FFA.
- 2- FFA Acetyl-CoA energy

EFFECT IN BONE AND CARTILAGE

- 1- Increase linear growth.
- 2- Increase metabolism in cartilage forming cells.
- 3- Increase proliferation of chondrocytes.
- 4- Widening of the epiphyseal plate.





ABNORMALITIES

1- Hyposecretion of GH.

Dwarfism.

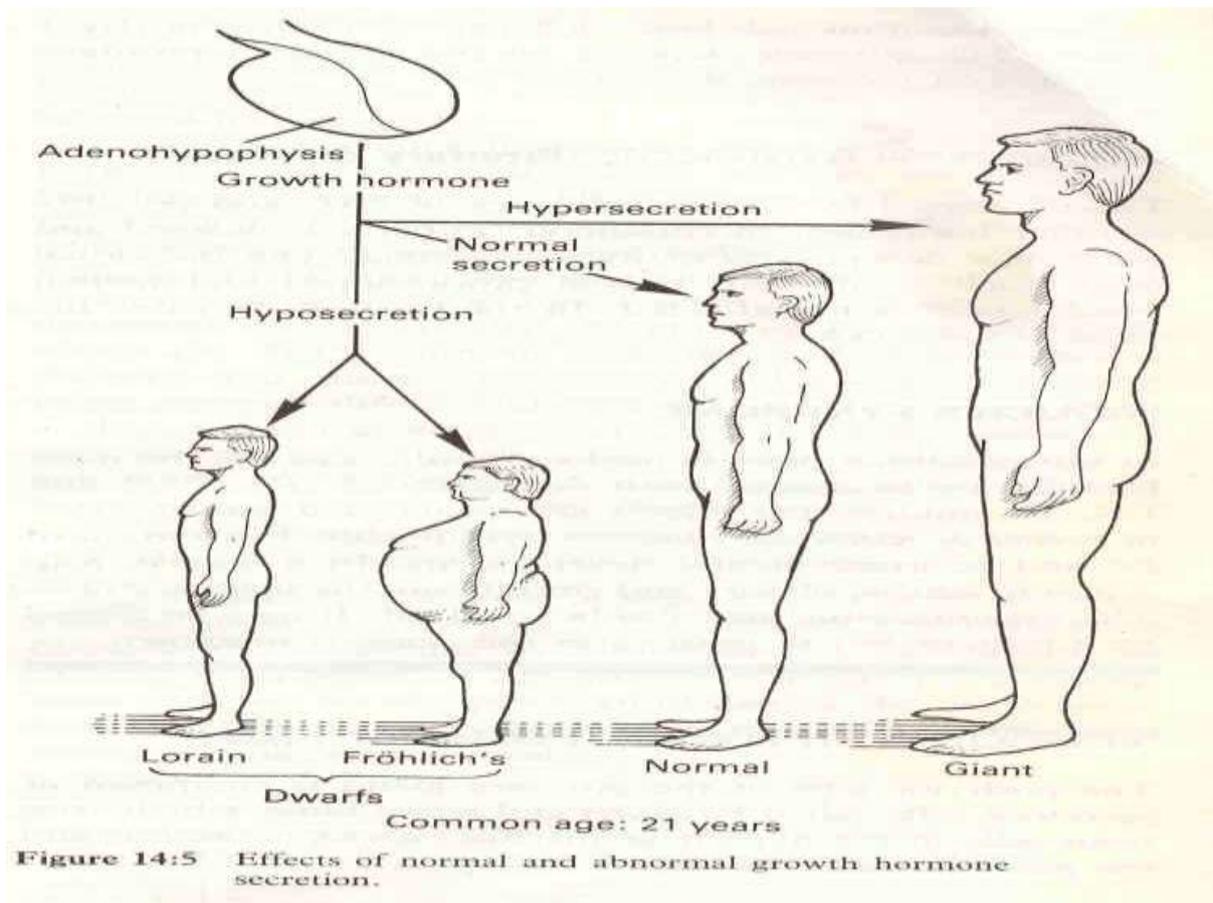
Causes?.

where?



2- Hypersecretion.

- Often associated with tumor.
- Gigantism.
- Acromegaly.
- Octreotide.



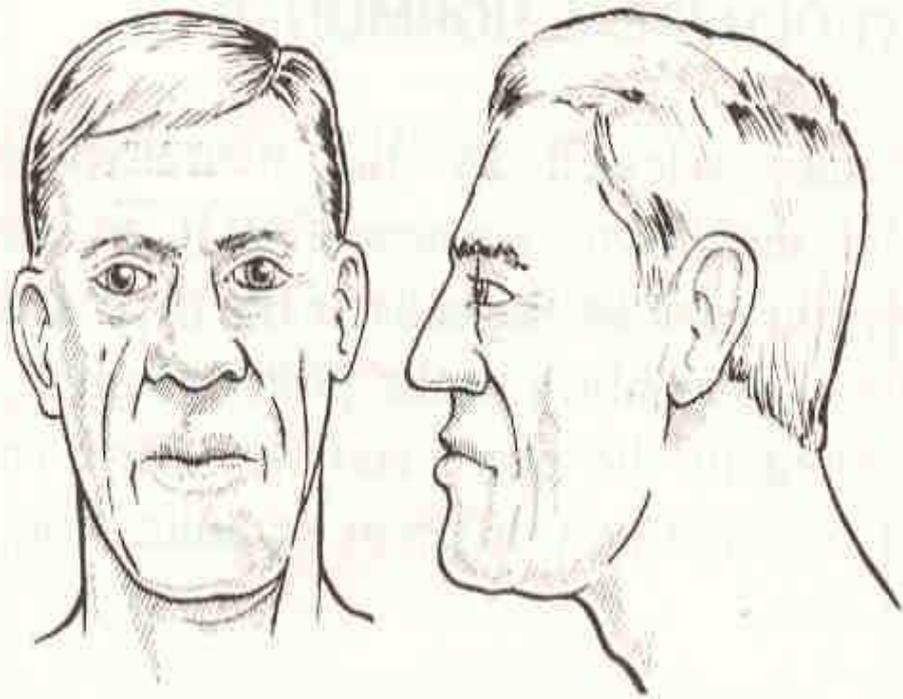


Figure 14:6 Acromegaly.





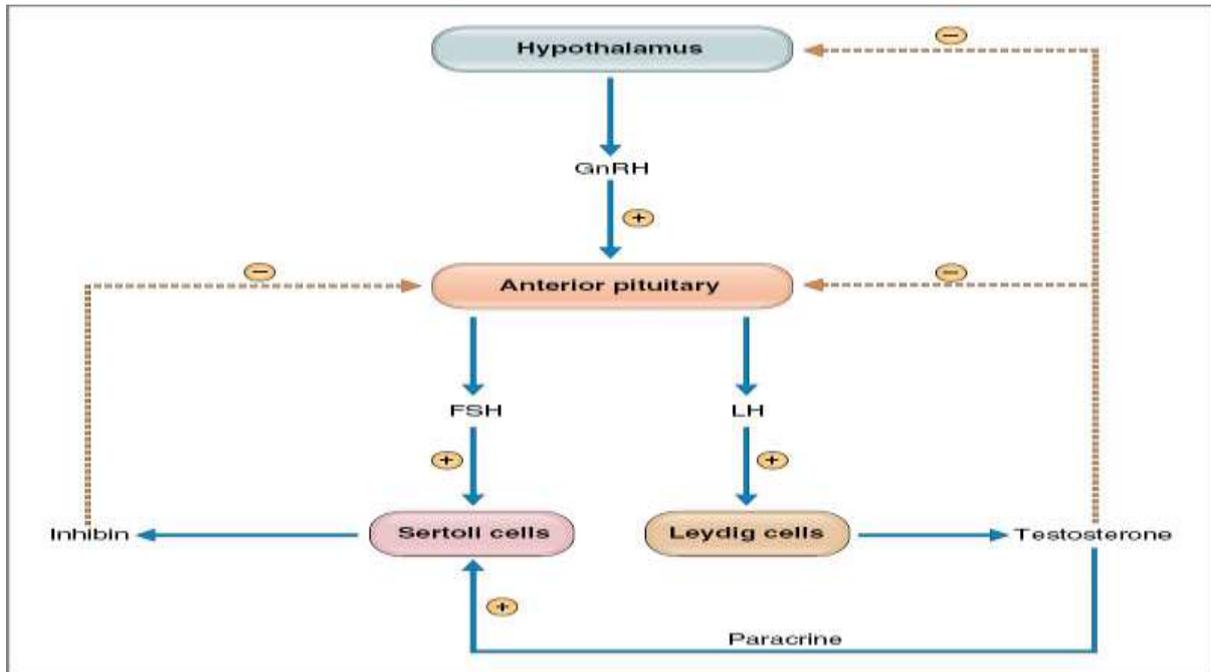
Figure 49-8 An acromegalic patient. (Courtesy of Dr. Herbert Langford.)

FSH AND LH

- **Glycoproteins.**
- **Gonadotrophs (15%)**

- **α and β .**
- **Related to TSH.**

SECRETION



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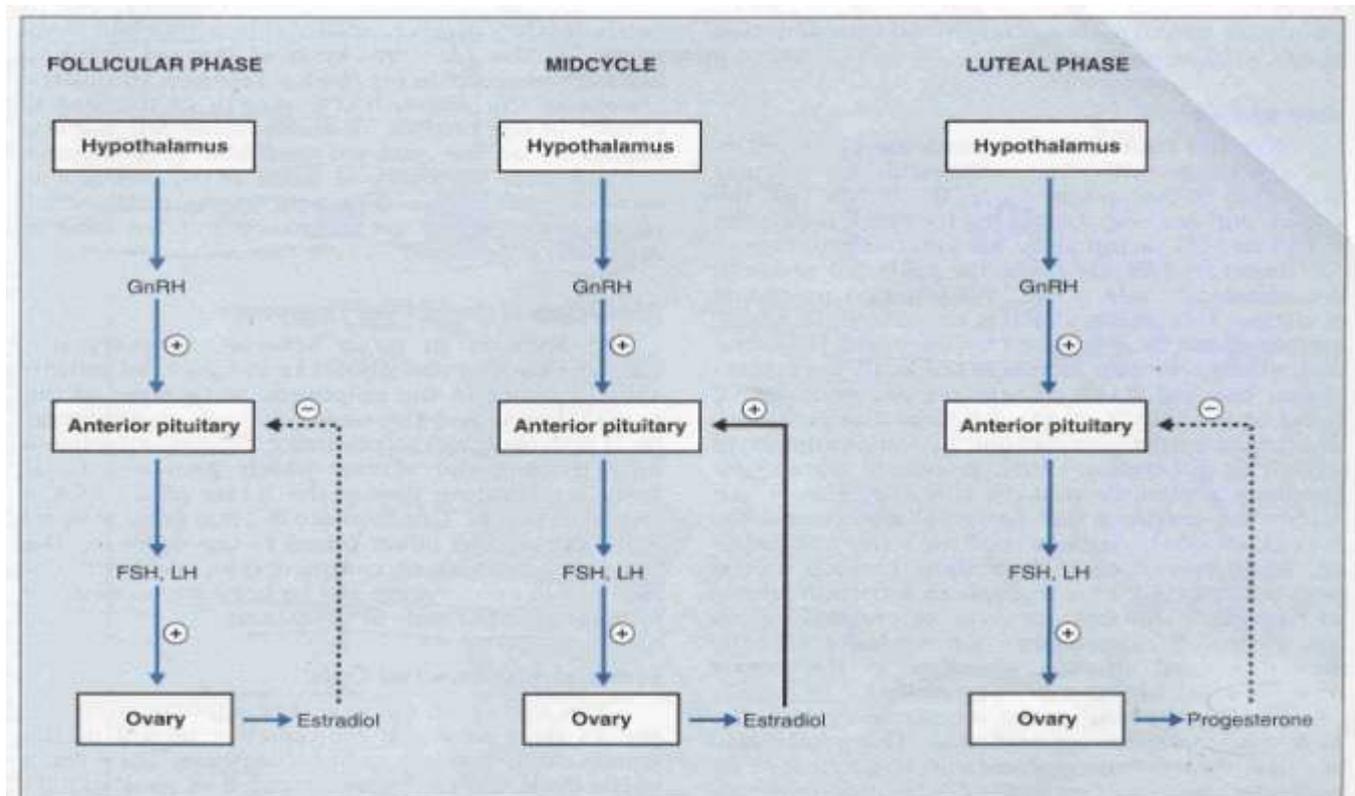
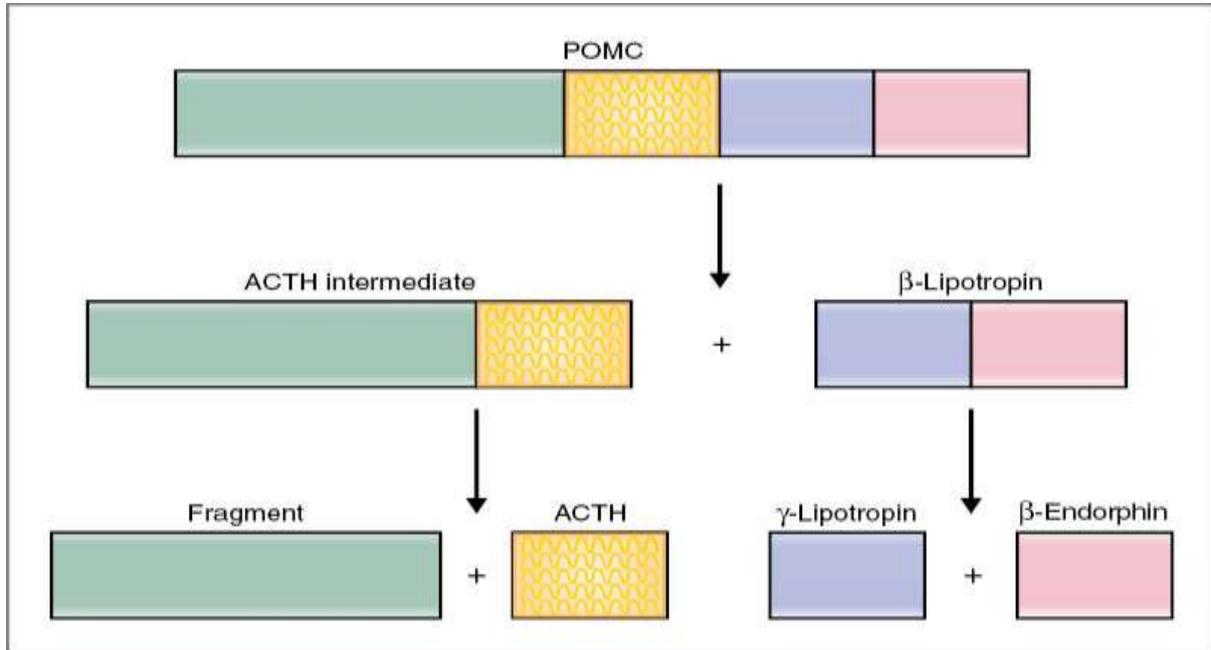


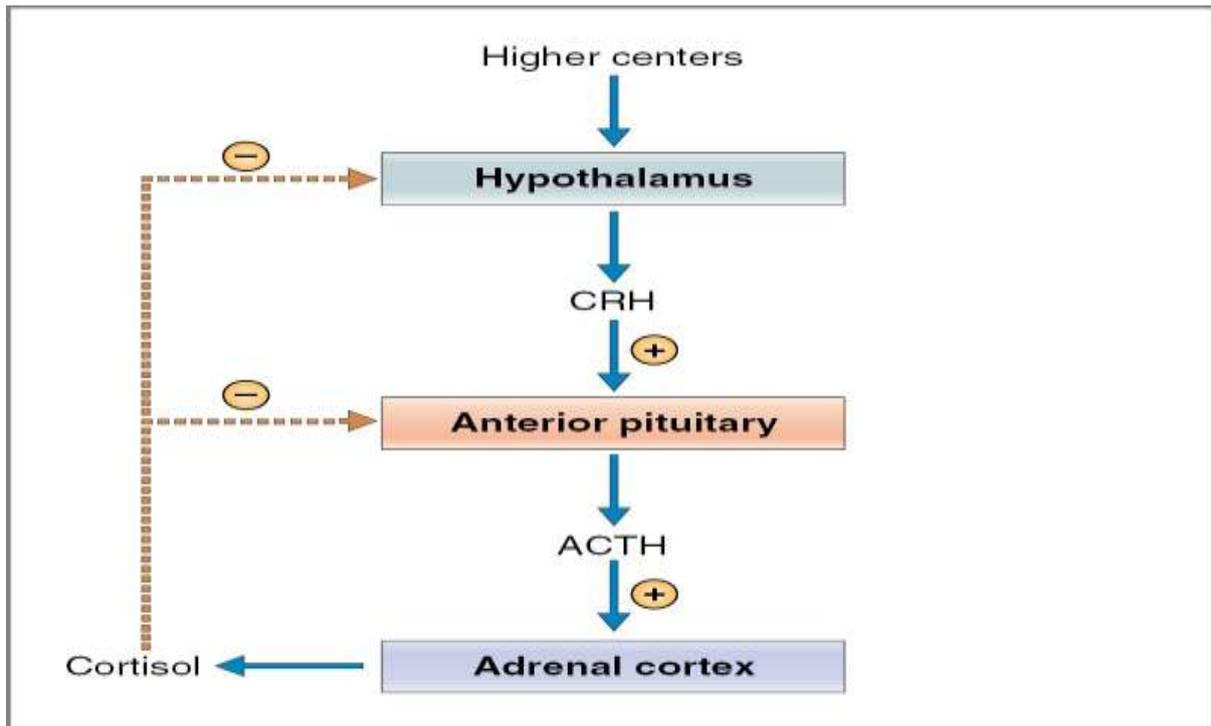
FIGURE 10-9. Control of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) secretion in females during the menstrual cycle. The follicular and luteal phases are characterized by negative feedback of estradiol and progesterone, respectively, on the anterior pituitary. Midcycle is characterized by positive feedback of estradiol on the anterior pituitary. GnRH, gonadotropin-releasing hormone.

ACTH

- Corticotrophs.(15%)
- ACTH, MSH, β -endorphin.
- Preproopiomelanocortin (POMC).



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Table 9-10 Factors Affecting ACTH Secretion

Stimulatory Factors	Inhibitory Factors
Decreased blood cortisol levels	Increased blood cortisol levels
Sleep-wake transition	Opioids
Stress; hypoglycemia; surgery; trauma	Somatostatin
Psychiatric disturbances	
ADH	
α -Adrenergic agonists	
β -Adrenergic antagonists	
Serotonin	

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ACTION

- Stimulate synthesis and secretion of adrenal cortical hormones.