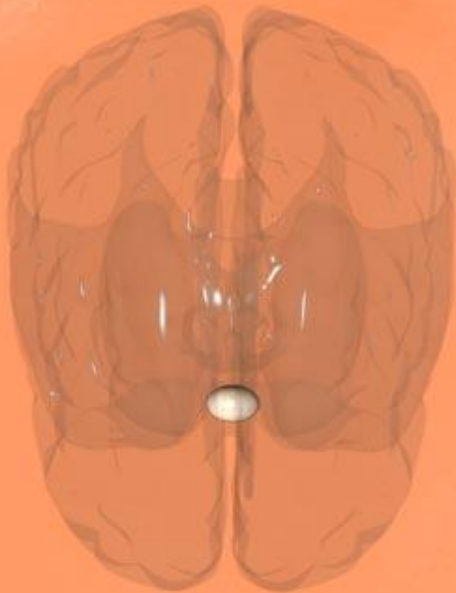


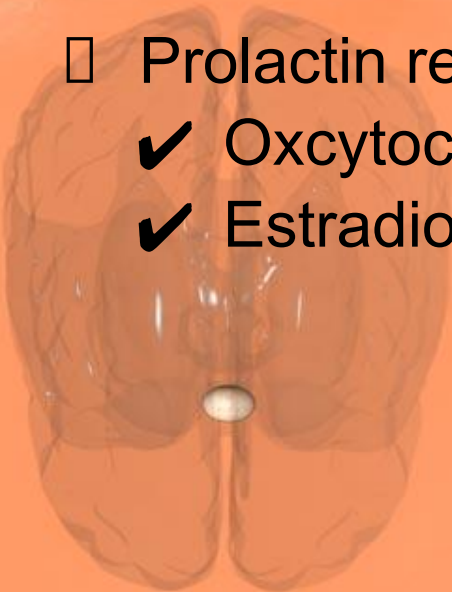
Physiology of pituitary gland



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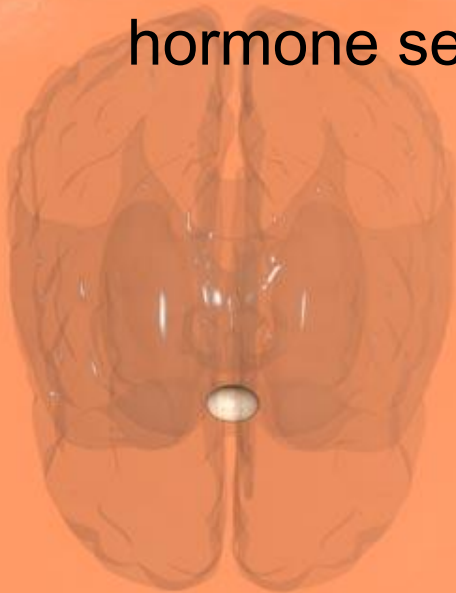
Lactotrophs

- Site of production of prolactin
- Lactogenesis (milk synthesis) requires prolactin
- Dopamine inhibits prolactin
- Prolactin releasing hormone is TRH
 - ✓ Oxytocin also stimulates prolactin release
 - ✓ Estradiol enhances prolactin synthesis



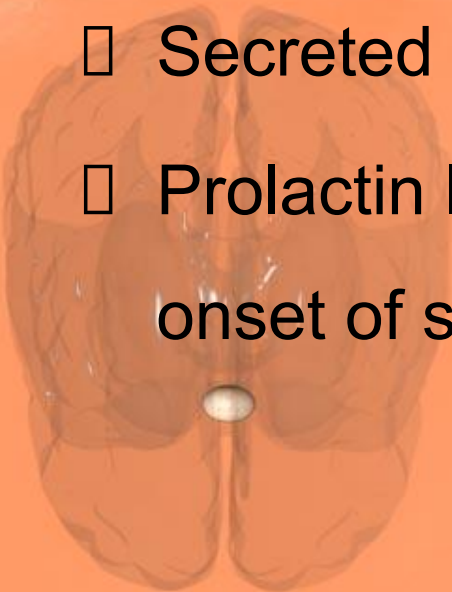
Prolactin

- It circulates in different molecular sizes—a **(small)** form (mol wt 22,000), a **(big)** form (mol wt 50,000), and an even larger **(big-big)** form (mol wt >100,000)
- The small form is biologically active, and about 80% of the hormone secreted is in this form



Prolactin

- It is one of the stress hormones
- It has a short half-life (20 min)
- Sleep-related circadian rhythm , highest in the early morning & lower in the afternoon
- Secreted in a pulsatile fashion
- Prolactin levels increase shortly (60-90min) after onset of sleep, peaking in the early morning.



Prolactin

- Stimulates breast development and lactogenesis
- Enhance breast development during pregnancy and to induce lactation
- May be involved in development of Leydig cells in pre-pubertal males
- binds to specific receptors in the lymphoid cells, and liver, thymus
- Immunomodulatory effects— stimulates T cell functions

Neuroendocrine Regulation of Prolactin Secretion

□ PIF

- ✓ Dopamine
- ✓ Gonadotropin-associated peptide (GAP)

□ Prolactin releasing factors (PRF)

- ✓ Thyrotropin releasing hormone
- ✓ VIP



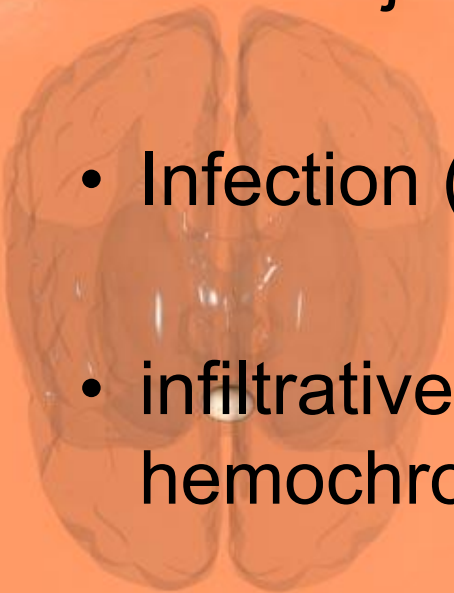
Factors affecting prolactin secretion

Factors affecting prolactin secretion hyperprolactinemia

Physiological	Pharmacological	Pathological
Pregnancy	TRH	Pituitary tumor
Lactation	Estrogen	Chest wall lesions
Exercise	Dopamine antagonists	Spinal cord lesions
Stress	MAOI	Hypothyroidism
Sleep	Cimetidine	Chronic renal failure
Hypoglycemia	Verapamil	Liver failure Stalk syndrome

Prolactin deficiency

- postpartum pituitary necrosis (Sheehan syndrome)
- Tumor or treatment of tumor, parasellar diseases, head injury,
- Infection (tuberculosis, histoplasmosis)
- infiltrative diseases (Sarcoidosis, hemochromatosis , lymphocytic hypophysitis).



Hyperprolactinemia

- Is a condition of elevated serum prolactin
- Prolactinomas are the most common hormone-secreting pituitary tumors approximately 40% of all pituitary tumors
- prolactinoma can be classified as a microprolactinoma (10 mm diameter)



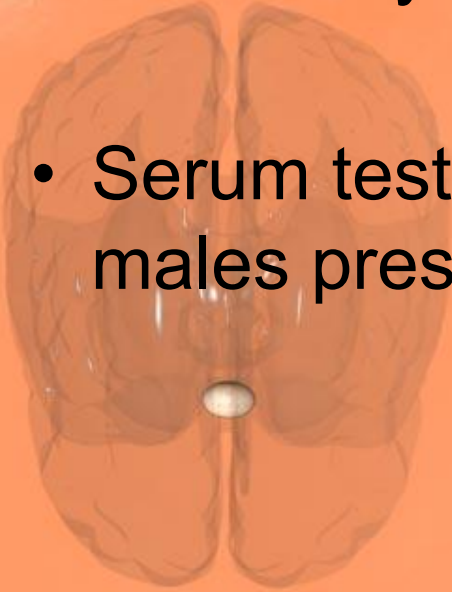
Prolactinoma

- Features
 - ✓ Headache
 - ✓ Bitemporal hemianopia (due to pressure on optic chiasm)
 - ✓ Galactorrhoea
 - ✓ Hypogonadism (resulting in amenorrhoea)
 - ✓ Erectile dysfunction

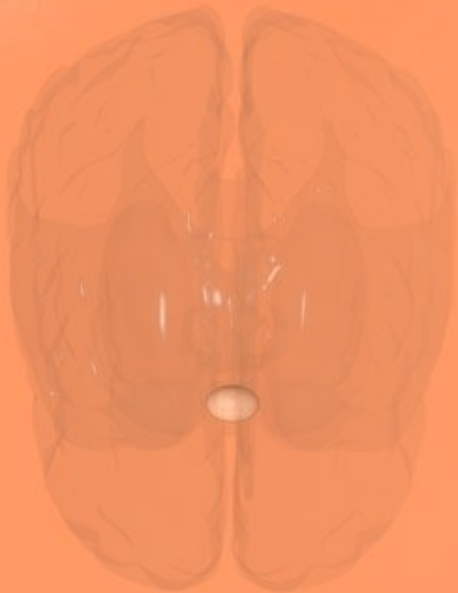


Laboratory studies include the following

- Serum prolactin (PRL)
- Serum pregnancy test
- Serum thyroid-stimulating hormone (TSH)
- Serum testosterone or bioavailable testosterone: In males presenting with symptoms of hypogonadism

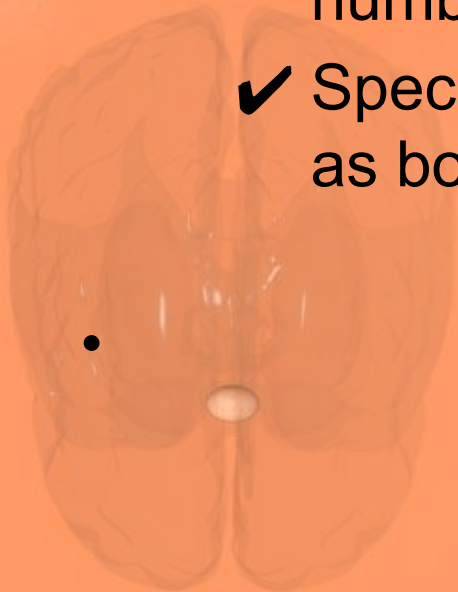


Growth hormone



Growth hormone

- Growth hormone. **It causes growth of almost all tissues of the body that are capable of growing.**
 - ✓ It promotes increased sizes of the cells
 - ✓ Increased mitosis, with development of greater numbers of cells
 - ✓ Specific differentiation of certain types of cells such as bone growth cells and early muscle cells



Regulation of GH secretion

- Growth hormone is released in **pulsatile** fashion
- The change of GH concentration within one day.

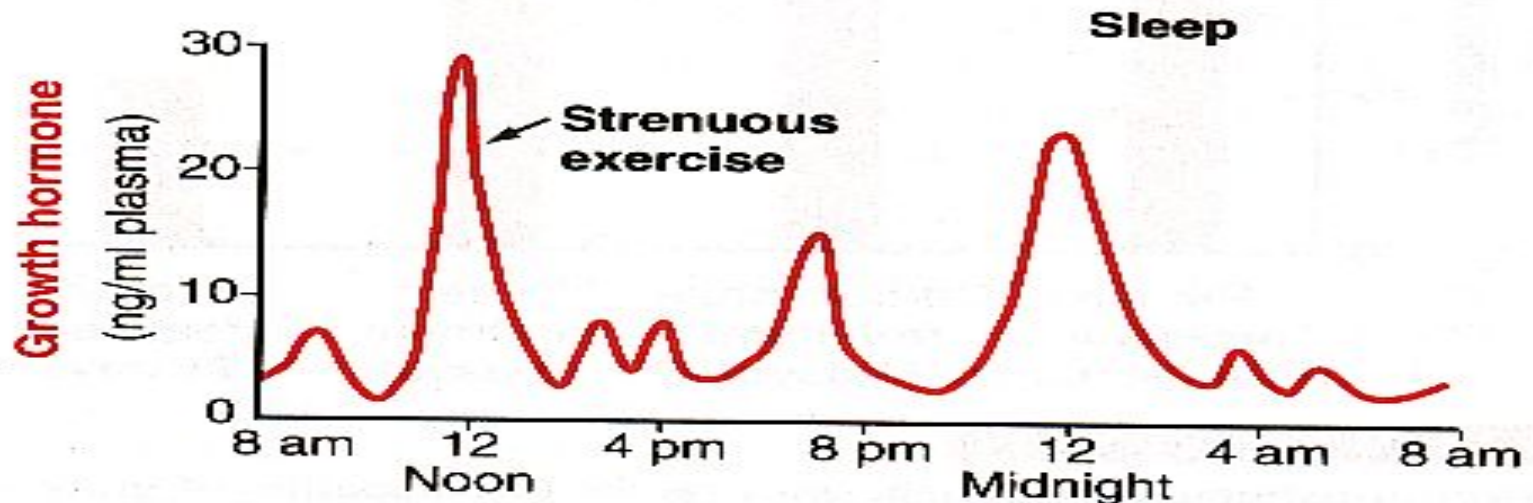


FIGURE 75 – 6

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.

Functions of growth hormone

Promotion of growth

- ✓ ↑ cellular sizes & ↑ mitosis (no.).
- ✓ ↑ tissue growth & organ size.
- ✓ Does not act directly on bone & cartilage.

Depends on somatomedin C ('insulin– like growth factor I' [IGF-I] secreted by the liver, which is responsible for effect of GH on bone & cartilage growth.

GH → liver → produces peptides → bone & cartilage growth & development
(somatomedins)

Growth Hormone Has Metabolic Effects

- Growth hormone has multiple specific metabolic effects, including
 - Increased rate of protein synthesis in most cells of the body
 - Increased mobilization of fatty acids from adipose tissue, increased free fatty acids in the blood, and increased use of fatty acids for energy
 - Decreased rate of glucose utilization throughout the body
 - ✓ Growth hormone enhances body protein, uses up fat stores, and conserves carbohydrates

Functions of growth hormone

Short- term metabolic effects

1. **Protein metabolism**: Anabolic,

↑ rate of protein synthesis in all cells.

2. **Fat metabolism**: Catabolic,

↑ mobilization of FFAs from adipose tissue stores to provide energy.

3. **CHO metabolism**: Hyperglycemic,

↓ rate of glucose utilization throughout the body, & ↓ glucose uptake by cells.

Thus, GH enhances body protein, uses up fat stores, & conserves carbohydrates

Role of GH in promoting protein synthesis

□ **GH has 4 effects to ↑ rate of protein synthesis in all cells of the body:**

1. Enhancement of aa transport through cell membranes.
2. Enhancement of RNA translation to cause protein synthesis by the ribosomes.
3. ↑ nuclear transcription of DNA to form RNA.
4. ↓ catabolism of protein & aa.

The net result is more intracellular protein

Role of GH in Fat metabolism

GH enhances fat utilization for energy

- GH acts on fat cells (adipocytes) to release fatty acids from the triglycerides to the blood.
- Formation of acetyl- CoA.
[acetate + Co-enzyme A (Co-A) $\rightarrow$ acetyl-CoA].
- Acetyl-CoA enters Krebs cycle to produce CO_2 + H_2O + Energy.

Role of GH in Carbohydrate Metabolism

□ GH ↓ CHO utilization

- ✓ Enhancement of glycogen deposition in the cell.
- ✓ Diminished uptake of glucose by the cells & ↑ blood glucose concentration – “**Pituitary Diabetes**”.
- ✓ ↓ use of glucose for energy.
- ✓ ↑ secretion of insulin – Diabetogenic effect of growth hormone.

GH is diabetogenic

