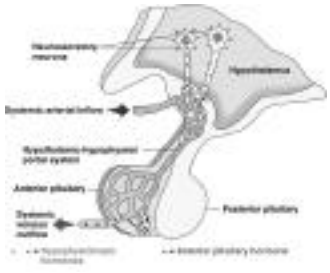
Thyroid and Pancreatic Hormones

Topics for today:

- Review of pituitary hormones
- Structure of thyroid gland
- Thyroid and parathyroid hormones
- Pancreatic endocrine tissue
- Action of insulin and glucagon
- Control of fed and fasted states

Anterior Pituitary hormones

anterior pituitary
- TSH
- ACTH
- growth hormone
- FSH
- luteining hormone
- prolactin



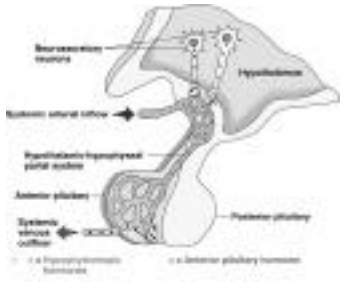
Effects of anterior pituitary hormones

- **TSH** - stimulates release of hormones from thyroid
- **ACTH** - stimulates release of hormones from adrenal cortex
- **growth hormone** - stimulate growth of somatic tissues
- **FSH** - stimulates gamete formation and follicle development
- **luteining hormone** - affects corpus luteum & Leydig cells
- **prolactin** - stimulates development of mammary ductules

Hypothalamus control of anterior pituitary

Hypothalamus secretes releasing factors which control anterior pituitary

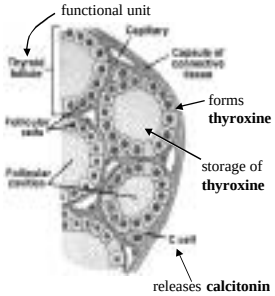
Releasing factors from hypothalamus:
CRF
TSHRF
STRF
FSHRF
LHRF
PIF



Thyroid gland

Gross anatomy of thyroid

Histology of thyroid

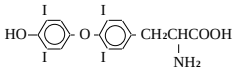


Synthesis and storage of thyroxin

1. Follicle cells synthesize tyrosine-containing thyroglobulin (TGB) which is moved into colloidal space and iodinated.
2. MIT and DIT are then formed on TGB and joined to yield triiodothyronine (T_3) and tetraiodothyronine (T_4).
3. TSH causes TGB movement back into follicle where T_3 and T_4 are removed and then secreted

Thyroid gland hormones & effects

Thyroxine
(amino acid derivative)



Act as a 'permissive' hormone in that it permits other hormones to exert their full effect

Thyroxine has multiple effects:

- lipid mobilization & oxidation
- increased glucose uptake
- increased glycogen synthesis
- increased protein synthesis
- increased cardiac output
- elevated body temperature
- increased bone growth
- promotes neural development

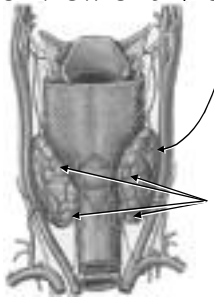
Thyroid gland hormones & effects

Calcitonin - a peptide hormone

effects of calcitonin:

- decreased plasma calcium level
- increased calcium deposition in bone matrix
- reduced Ca absorption in GI tract
- increased Ca excretion in urine

Posterior view of thyroid gland



Parathyroid glands

..four masses of tissue on back of thyroids

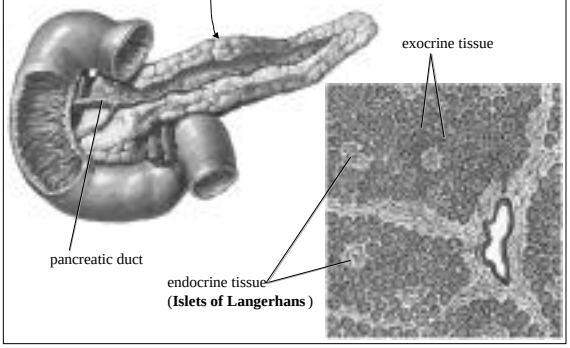
Parathyroid hormone

Parathormone - a peptide hormone

effects of parathormone:

- increased plasma calcium level
- increased calcium mobilization from bone
- induced Ca absorption in GI tract
- increased Ca reabsorption from kidney tubules

The **pancreas**



Endocrine secretions of pancreas

alpha cells secrete glucagon (hyperglycemia factor)

beta cells secrete insulin (hypoglycemia factor)

delta cells secrete somatostatin (growth suppression)

- *How is insulin related to type I diabetes?*
- *How is insulin related to type II diabetes?*

Pancreatic hormone effects

Insulin - peptide hormone
- associated with the **'fed'** state

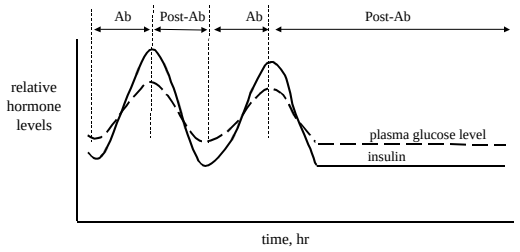
Physiologic effects of insulin:

- promotes glucose uptake via GLUT-4 transporter
- high glucose uptake by muscle & adipose tissue
- stimulation of glycolysis and glycogen synthesis
- stimulation of pentose phosphate pathway
- stimulation of synthesis and storage of triglycerides
- stimulation of protein synthesis

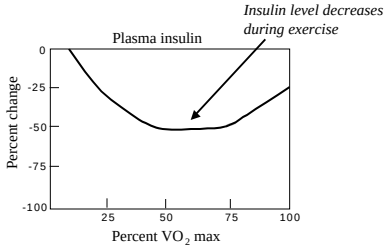
GLUT-4 recruitment

GLUT-4 cycles between plasma membrane and intracellular vesicles containing the receptor. Increased insulin causes rapid cycling to plasma membrane, resulting in 10- to 30-fold increase in glucose uptake.

Insulin levels during absorptive and postabsorptive states



Insulin changes in exercise



*Exercise **increases** insulin sensitivity such that fewer insulin receptors are needed.*

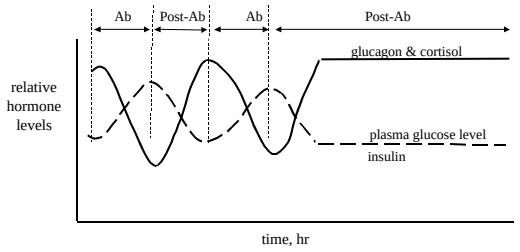
Pancreatic hormone effects

Glucagon - peptide hormone
- associated with the **'fasted'** state

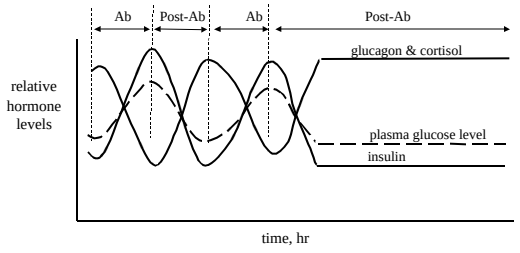
Physiologic effects of glucagon:

- increases blood glucose level
- stimulates glycogen breakdown
- stimulates gluconeogenesis

Glucagon levels during absorptive and postabsorptive states



Hormone oscillations in absorptive and postabsorptive states



Topic for Tuesday:

Adrenal Hormones