# PHARMACOLOGY

Dentalelle tutoring

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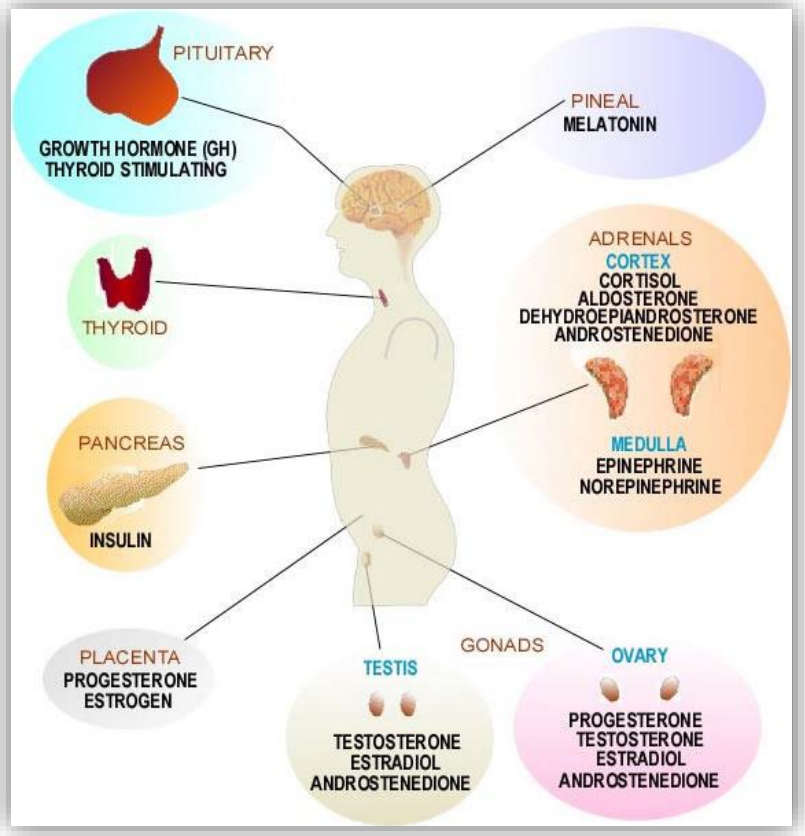
# HORMONES

Transported by the blood to target organs.

Help maintain homeostasis by regulating body functions.

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# PITUITARY HORMONES

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# ANTERIOR

The pituitary gland is located at the base of the brain and is called the MASTER GLAND

**Anterior Lobe (adenohypophysis)**

- growth hormone (somatotropin),
- luteinizing hormone (LH);  (used to treat infertility)
- follicle-stimulating hormone (FSH);  (used to treat infertility)
- thyroid-stimulating hormone (TSH) or thyrotropin,
- adrenocorticotropic hormone (ACTH) or corticotropin, and
- Prolactin
- Human chorionic gonadotropin (hCG) (hCG contains FSH &LH and is commercially available as menotropin (Pergonal)

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# POSTERIOR

**Posterior Lobe (neurohypophysis)**

Secrets vasopressin (antidiuretic/ADH) and oxytocin

Synthetic vasopressins (Stimate) are used to treat: (1) diabetic, (2) hemophilia A and von Willebrand disease (clotting disorders

**Oxytocin (Pitocin, Syntocinon)** used via injection to: induce labor, control postpartum hemorrhage, induce postpartum lactation

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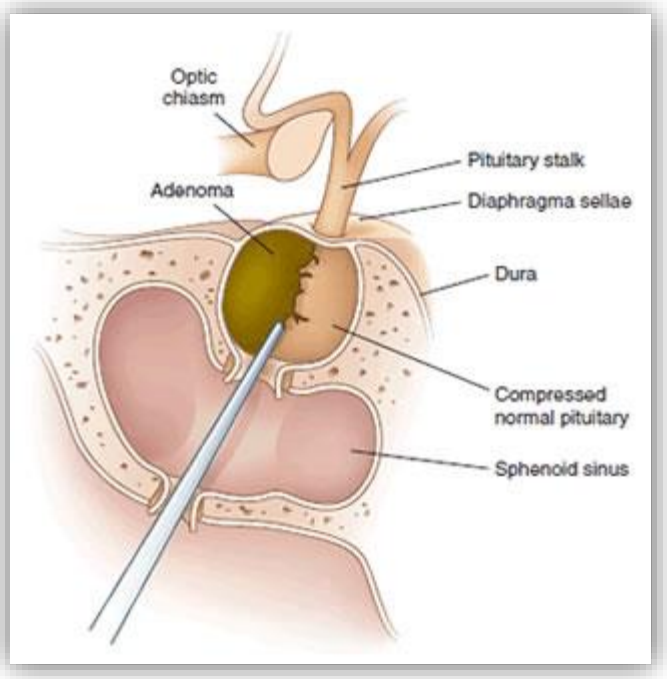
# HYPOPITUITARISM

**Deficiency of the pituitary:**

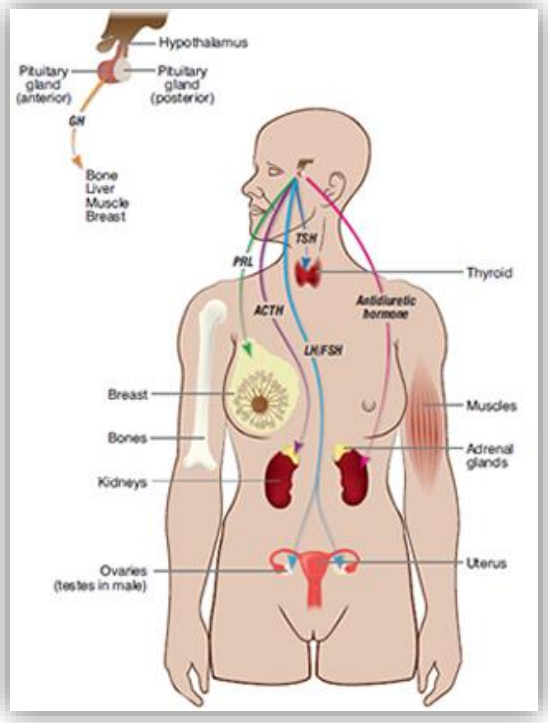
- Dwarfism, hypothyroidism, decreased metabolism, diabetes, Addisons disease



# HYPERPITUITARISM

**Pituitary hyper secretion:**

- Early puberty, goiter (increased thyroid gland), Cushing disease, Acromegaly (too much growth hormone)

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# THYROID HORMONES

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# THYROID HORMONES

Iodine

Hypothyroidism

Hyperthyroidism

The thyroid gland secretes two iodine-containing thyroid hormones:

- triiodothyronine (T3)
- tetraiodothyronine (thyroxine [T4]);

- **Important for energy metabolism, growth, and development.**
- Are synthesized from iodine and tyrosine and stored as complex protein until TSH stimulates their release.
- In addition, calcitonin regulates calcium metabolism.

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# IODINE

**The thyroid gland requires intake of adequate iodine.**

**Marine life is the only common food that is naturally rich in iodine.**

If iodine intake is deficient, normal amounts of thyroid hormones cannot be made.

TSH is secreted in excess, and the thyroid hypertrophies (**simple or nontoxic goiter**).

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# HYPOTHYROIDISM

**Hypothyroidism = ↓ in thyroid function.**

Called **cretinism** in a **child**.

Called **myxedema or simple hypothyroidism** in an **adult**.

Malocclusion, delayed tooth eruption, can develop perio easier, poorly shaped teeth & carious, inflamed or pale & enlarged gingiva

Mental and physical retardation could result

Patients are usually drowsy, weak, and listless and exhibit an expressionless, puffy face with edematous tongue and lips.

Abnormally sensitive to CNS depressants including opioids & sedatives.

Hypothyroid pregnant women tend to give birth to offspring with LARGE teeth.

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# TREATMENT OF HYPOTHYROIDISM

Oral replacement therapy with exogenous thyroid hormones.

**levothyroxine (Synthroid)**

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# HYPERTHYROIDISM

**Hyperthyroidism = ↑ in thyroid function.**

2 FORMS OF THYROID HYPERFUNCTION:

Diffuse toxic goiter: (**Graves disease**) - Characterized by a diffusely enlarged, highly vascular thyroid gland. YOUNG ADULTS

Toxic nodular goiter: (**Plummer disease**) - Characterized by nodules that secrete excessive hormone while the rest of the glandular tissue is atrophied. OLDER ADULTS.

**Hashimoto's disease** - Lymphocytes enter thyroid, diffuse goiter; hypothyroidism produced thyroiditis.

Enlarged eyes

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# EFFECTS

Accelerated tooth eruption, marked loss of alveolar process, diffuse demineralization of jawbone, rapidly progressive periodontitis.

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# TREATMENT

RADIOACTIVE IODINE

THYROIDECTOMY

**Either treatment usually results in hypothyroidism.**

DRUGS – Iodine

ANTITHYROID DRUGS - Radioactive iodine (iodine 131)

SURGERY - Partial thyroidectomy

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# REMEMBER

CV system is hyperactive thus, **epinephrine is contraindicated** (cardiac dose okay but careful); propranolol used to counteract tachycardia.


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# PANCREATIC HORMONES

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# HORMONES

Two primary hormones secreted by islets of Langerhans of the pancreas are:

**INSULIN**: promotes fuel storage (glucose out of blood)

**GLUCAGON**: promotes fuel mobilization (glucose into the blood)

**Diabetes:**

- **Type I** (insulin-dependent DM [IDDM])
- **Type II** (non–insulin-dependent DM [NIDDM])
- Symptoms and complications result, usually from inadequate or poorly timed secretion of insulin from the pancreas and/or insulin resistance of the cells.

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# DIABETES

**Type I:**

- **Younger than age 30 years** and results from autoimmune destruction of pancreatic beta cells.
- Associated with a complete lack of insulin secretion, increased glucagon secretion, rapid onset of disease, ketosis, and severe symptoms.
- **Treated with injections of insulin**

- **Type II:**
  - **Older than age 40 years,** (more cases of type II diabetes are being reported in persons younger than 20 years because of a much more inactive lifestyle and lack of exercise)
  - The pancreas can secrete enough insulin to prevent ketoacidosis but not enough to normalize plasma glucose and insulin secreted does not reduce glucose levels in serum to normal levels

  - **Type III**
    - Drug induced

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# DIABETES

Oral surgery should be performed 1.5 to 2 hours after the patient has eaten a normal breakfast and has taken regular anti-diabetes medication.

Uncontrolled diabetes is very important because so much can go wrong – infections, eye sight, loss of limbs, slower healing, etc.

Drugs that may ↓ insulin release or ↑ insulin requirements, should be used with caution in patients with diabetes , such as: *epinephrine, glucocorticoids, or opioid analgesics*

**Gangrene can occur in the peripheral extremities due to depressed immunity, less effective white blood cells, microvascular changes, and neuropathy.**

BUT IF DIABETES IS UNDER CONTROL, NO ISSUES ☺

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# LAB TESTS

**SERUM GLUCOSE -** measure of glucose at the time that blood is sampled; not a good reflection on patient's OVERALL glucose control

**GLYCOSYLATED HEMOGLOBIN (HbA1c)** – reflects glucose control over a 2-3 month period; more accurately reflects patient's OVERALL glucose control.

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# TREATMENT OF HYPOGLYCEMIA

SIGNS OF HYPOGLYCEMIA:  increased stress, not eating, not exercising, overdose of insulin

- The patient becomes weak, sweats, confused.

IF UNCONSCIOUS (& lacks swallowing reflex): **intravenous dextrose** (50%)

If CONCIOUS: sugar, orange juice, chocolate..anything with sugar in it ☺

**Clinically difficult to distinguish between hypo- & hyperglycemia so give sugar anyways.**

- It won't do any additional damage to hyperglycemics

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# DIABETES TYPES

## Type 1:

- Insulin - Usually administered by subcutaneous injection, **large molecular size prevents it from being absorbed from the gastrointestinal tract.**

## Type II:

- Sulfonylureas > oral hypoglycemic agents
- Biguanides
- Glucosidase inhibitors > antihyperglycemics
- Thiazolidinediones

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# INSULIN

## FAST ACTING

- insulin aspart (Novolog)
- insulin lispro (Humalog)
- insulin gallisin (Apidra)

## SHORT ACTING

- insulin regular (Novolin R, Humulin R)

## INTERMEDIATE ACTING

- insulin NPH (Humulin N, Novolin N)
- Humulin L Lente

**LONG ACTING**

insulin detemir (Levimir)

insulin glargine (Lantus)

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# MANAGEMENT OF THE DIABETES PATIENT

Hypoglycemia –when did they have their last meal?

Surgery should be 1-2 hours after a meal

Should see patients after they eat

Infection more likely

Healing prolonged

Drug interactions – Large doses of salicylates may produce hypoglycemia.

Give client an appointment in the morning AFTER breakfast and insulin or oral hypoglycemic agent.

Provide quick glucose source for hypoglycemia

Check for oral complications related to diabetes.

Ask client what the result of his or her blood glucose monitoring have been

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# FEMALE SEX HORMONES

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# ESTROGENS AND PROGESTINS

The two major female sex hormones are **ESTROGENS** and **PROGESTINS**.

The are secreted primarily by the **ovaries but also by the testes and placenta.**

They are largely responsible for producing female sex characteristics, developing the reproductive system, and preparing the reproductive system for conception.

**The corpus luteum is the primary source of progesterone during the normal female sexual cycle.**

**Progesterone** - Female sex hormone; plays role in reproduction, thickens uterine lining.

**Ovaries** - Two almond-shaped glands located at the opening of the fallopian tubes on both sides of the uterus; produce eggs and the sex hormones estrogen and progesterone.

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# HOW IT WORKS

An ovarian egg matures in response to **increased FSH.**

The follicle in which it is contained grows in size and begins to secrete estrogen.

**After ovulation, LH causes secretory cells** of the follicle to develop into a corpus luteum that secretes large quantities of estrogen and progesterone.

**This causes a feedback decrease in the secretion of both FSH and LH.**

The corpus luteum completely degenerates on approximately day 26.

The ↓ in estrogen and progesterone leads to menstruation and ↑'ed release of FSH and LH.

The FSH initiates growth of new follicles to begin a new cycle.

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# MENOPAUSE

**Menopause** - The period in a woman's life when menstruation stops, resulting in a reduced production of estrogen and cessation of egg production.

In addition to their presence in oral contraceptives, estrogens are used to treat menstrual disturbances (such as uterine bleeding), osteoporosis, etc.

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# GINGIVITIS

The increase in gingiva inflammation may occur even with a decrease in the amount of plaque.

This circumstance may be a result of increased levels of prostaglandin E (PGE), estradiol, and progesterone in the saliva.

# PROGESTINS

Available as an intramuscular injection administered every 3 months, as a progestin-only pill, in the form of an intrauterine device (IUD), or as an implant under the skin on the arm.

IUD has progesterone agent **levonorgestrel (Norplant)** – implanted under skin of arm – provides contraception for at least 5 years.

**medroxyprogesterone (Provera)**

- is used orally in conjunction with estrogens by postmenopausal women.

**It prevents an increase in the risk of uterine cancer that can occur when estrogen is used alone.**

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# DRUGS

**Tamoxifen (Nolvadex)**

- Inhibitor of estradiol at the receptor.
- Palliative treatment of advanced breast cancer in postmenopausal women.
- **Prophylaxis for women at high risk of developing breast cancer.**
- Raloxifene (Evista) is newer/similar

- **Clomiphene** - Has the ability to induce ovulation in some women.
- **Leuprolide** - Is used in the management of endometriosis and to treat infertility.
- **Danazol** - Is used to treat endometriosis and fibrocystic disease in women.
- **Aromatase Inhibitors** - Reduce almost the entire amount of estrogen made in the bodies of postmenopausal women.

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# ORAL CONTRACEPTIVES

A combo of estrogens and progestins

**Interfere with fertility by inhibiting FSH & LH & therefore preventing ovulation.**

Also interferes with impregnation by altering endometrium & secretions of the cervix.

**ANTIBIOTICS & ORAL CONTRACEPTIVES**

Evidence exists that antibiotics may reduce the effectiveness of hormonal contraceptives.

The patient might want to use an additional method of contraception until the end of her cycle.

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# MALE SEX HORMONES

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# ANDROGENS

ANDROGENs are responsible for development of male sex characteristics (can be used illegally for gaining muscle as well)

MAIN ANDROGEN:  testosterone, has both androgenic & anabolic effects.

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