

UNIT- I GENERAL ENDORINOLOGY

- (3) Biosynthesis & secretion of Pancreas
, Adrenal, Ovary, Testis & Thyroid hormones.**
- **Endocrine disorders – a brief description.**

)

SYNOPSIS

- Introduction
- Disorders of Pituitary gland
- Disorders of Thyroid gland
- Disorders of adrenal gland
- Disorders of Islet of Langerhans
- Disorders of Ovary
- Disorders of Testes
- Conclusion
- References

INTRODUCTION

- Broadly speaking, endocrine disorders may be subdivided into three groups:
- Endocrine gland hypo secretion (leading to hormone deficiency)
- Endocrine gland hyper secretion (leading to hormone excess)
- Tumors (benign or malignant) of endocrine glands
- Diagnosis of endocrine diseases may be difficult; it is often not possible to directly assay hormone levels in the blood, making indirect measurements necessary.

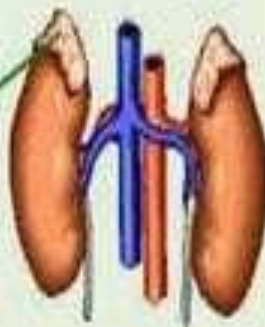
HYPOPHYSIS



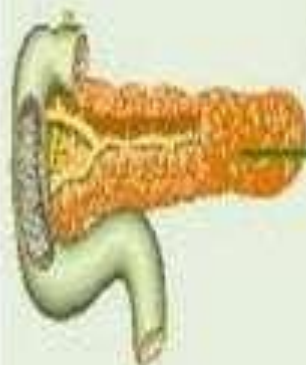
THYROID



ADRENAL



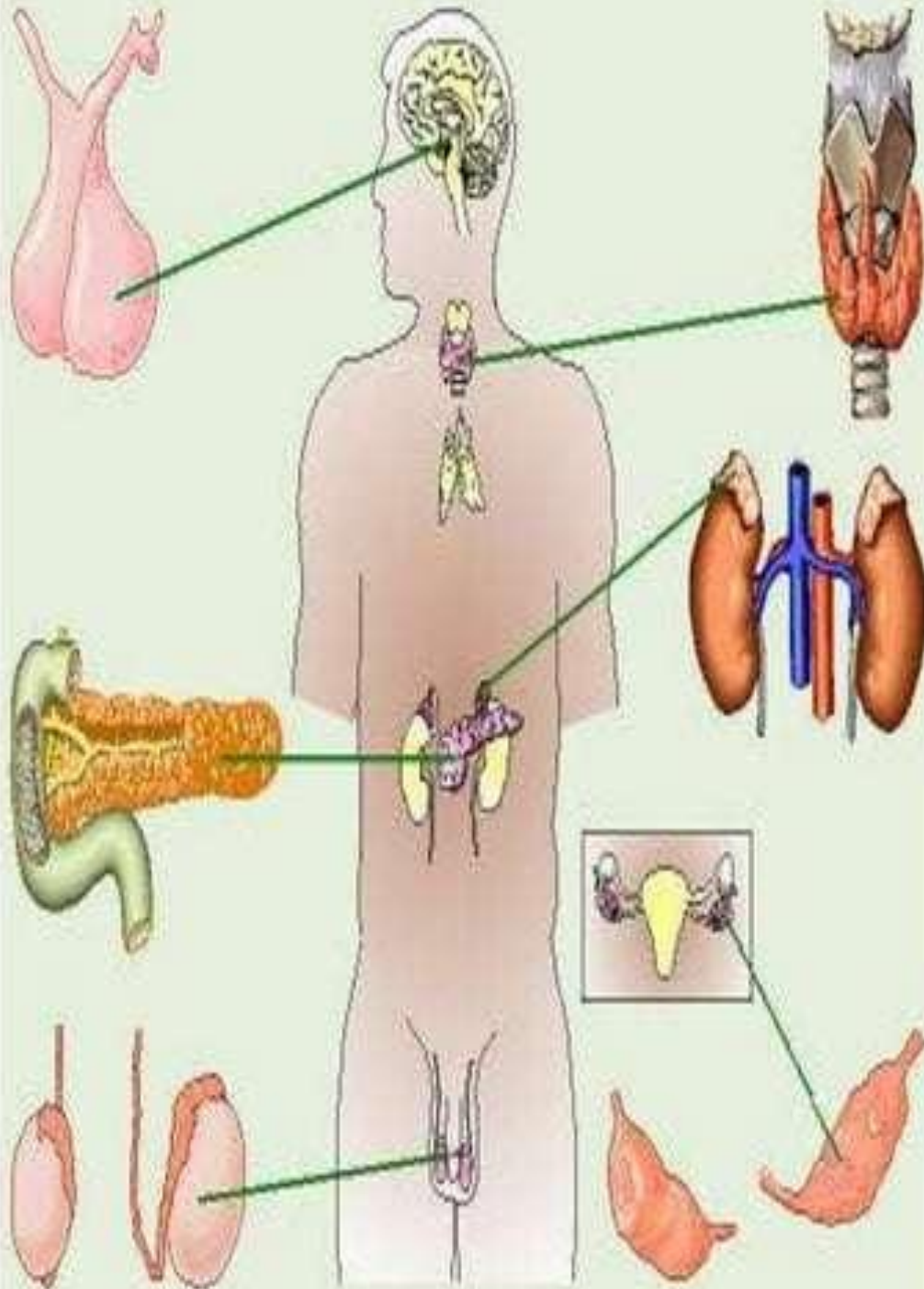
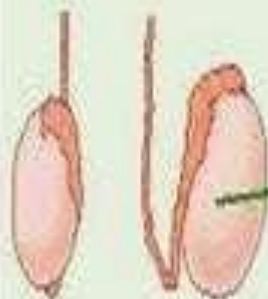
PANCREAS



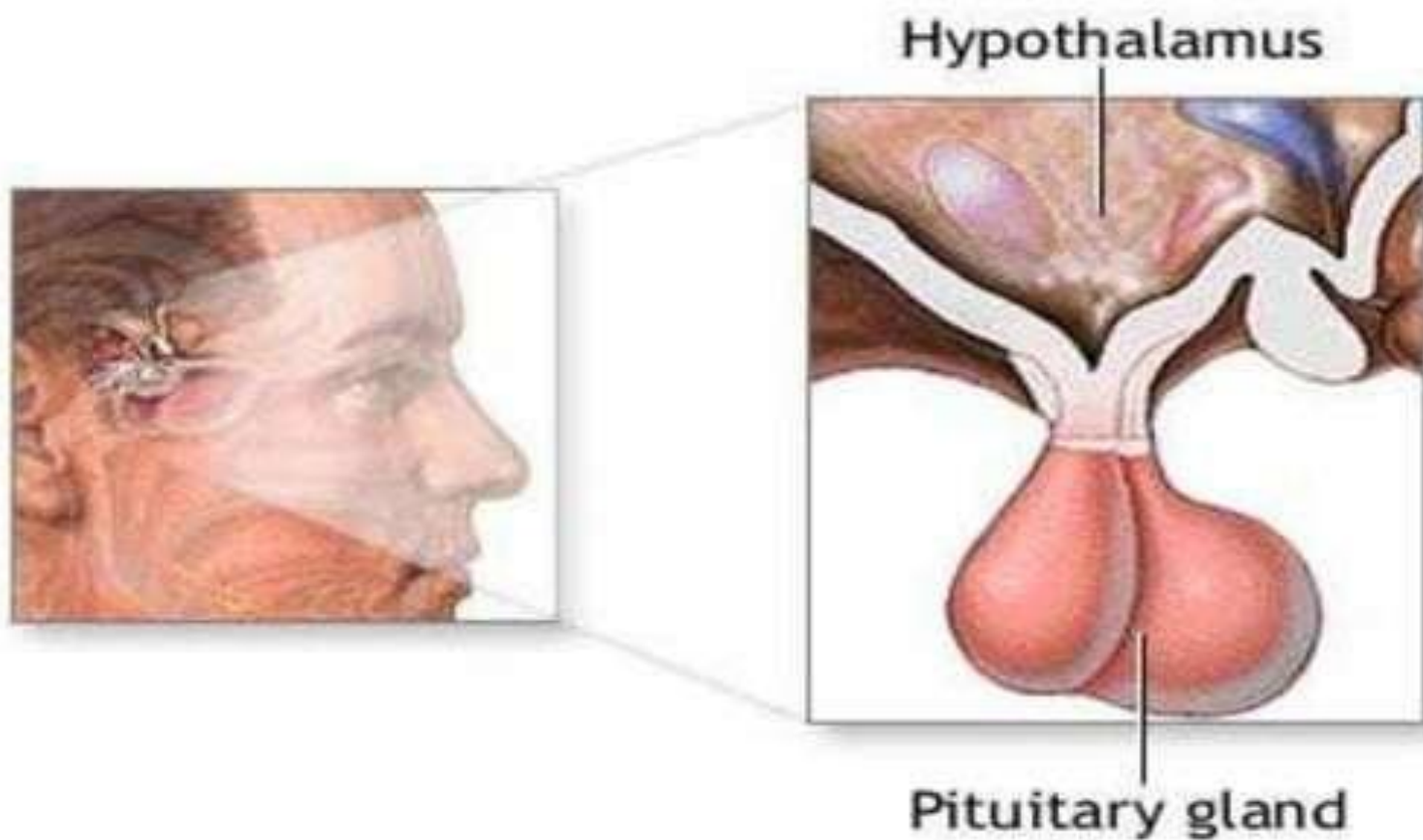
OVARY



TESTES



Hypophysis



HYPOPHYSIS

- Hypophysis is considered as the master gland as the hormones secreted are very vital for the proper development & functioning of the body.
- Disorders are classified under hyper & hyposecretion of hormones and pituitary cancer leading to alteration of the structure of hormone.
- The major disorders of pituitary are : Acromegaly, Diabetes insipidus, Hypopituitarism, Pituitary tumor

ACROMEGALY

- Caused by excessive secretion of Growth hormones.
- Characterized by excessive growth in the form of swelling of hands, legs & soft tissues.

SYMPTOMS

- Swelling of hands & feet.
- Facial features become coarse as bones grow .
- Protruding jaw.
- Degenerative arthritis.
- Enlargement of organs.



DIABETES INSIPIDUS

- Caused due to insufficient production of Anti diuretic hormone.
- Characterized by excessive thirst and excretion of large amounts of severely diluted urine.

SYMPTOMS

- Extreme thirst
- Blurred vision
- Dehydration
- extreme urination
- Fever, vomiting, or diarrhea

HYPOPITUITARISM

Deficiency of all anterior pituitary hormones is more common than individual hormone deficiency.

Luteinizing hormone (LH) & Follicle-stimulating hormone (FSH)

- Women experience infrequent menstrual periods and infertility.
- Men lose facial and trunk hair, as well as suffering decreased muscle mass and anemia increased risk of osteoporosis

Growth hormone (GH)

- decrease in muscle mass, central obesity
- impaired attention and memory
- Children experience growth retardation and short stature

Adrenocorticotrophic hormone (ACTH)

- lack of production of glucocorticoids such as cortisol by the adrenal gland.
- fatigue, weight loss, delayed puberty (in adolescents),
- hypoglycemia (low blood sugar levels), anemia and hyponatremia (low sodium levels).

Thyroid-stimulating hormone (TSH)

- deficiency leads to hypothyroidism
- Typical symptoms are tiredness, intolerance to cold, constipation, weight gain, hair loss, low blood pressure.

Prolactin

- It plays a role in breastfeeding, and inability to breastfeed may point at abnormally low prolactin levels.

Anti diuretic hormone

- inability to concentrate the urine
- extreme thirst

Oxytocin

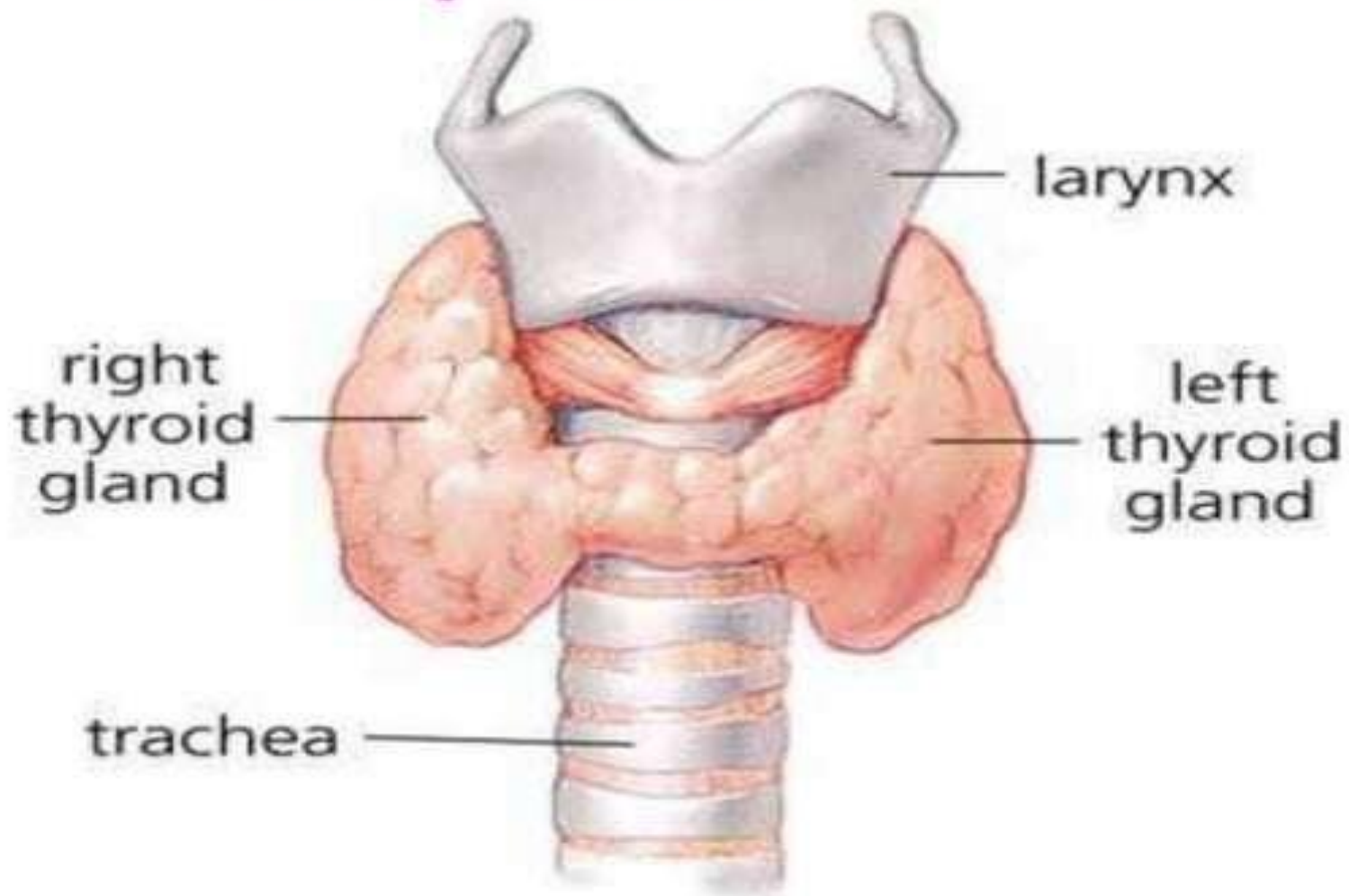
- deficiency generally causes few symptoms, as it is only required at the time of childbirth and breastfeeding.

PITUITARY TUMORS

- The two most common pituitary tumors are :
- **Pituitary adenomas** are tumors that occur in the pituitary gland , and account for about 15% of intracranial neoplasm
- **Prolactinomas** are the most common type of pituitary tumor. It secrete prolactin acidophilic galactorrhea, hypogonadism, amenorrhea , infertility, and impotence.



Thyroid



THYROID GLAND

- Largest endocrine gland in humans.
- It secretes three hormones which regulates metabolism & play a major in mental & physical development.
- The major disorders of thyroid gland are:
 1. Hypothyroidism – Cretinism, Myxedema & Hashimoto's disease.
 2. Hyperthyroidism- Graves disease.
 3. Goitre
 4. Thyroid cancer

CRETINISM

- Condition of severely stunted physical and mental growth.

SYMPTOMS

- Patient is dwarf with severe mental defect.
- Coarse dry skin
- Deficient hair & teeth.
- Retarded skeletal growth.
- Reduced BMR



MYXEDEMA

- Caused by diminished production of thyroxin.
- Condition is called Myxedema as a gelatinous mixture of mucoprotein & extracellular fluid is deposited in the intracellular space, specifically in dermal connective tissue giving it oedematous appearance.
- Rate of metabolism in all tissues is decreased to half.
- **SYMPTOMS**
 - Extremely lethargic & mentally sluggish.
 - Low BMR & pulse rate.
 - Dry skin & coarse hair.
 - In some cases, face may become puffy.
 - Sex functions are depressed.

MYXEDEMA



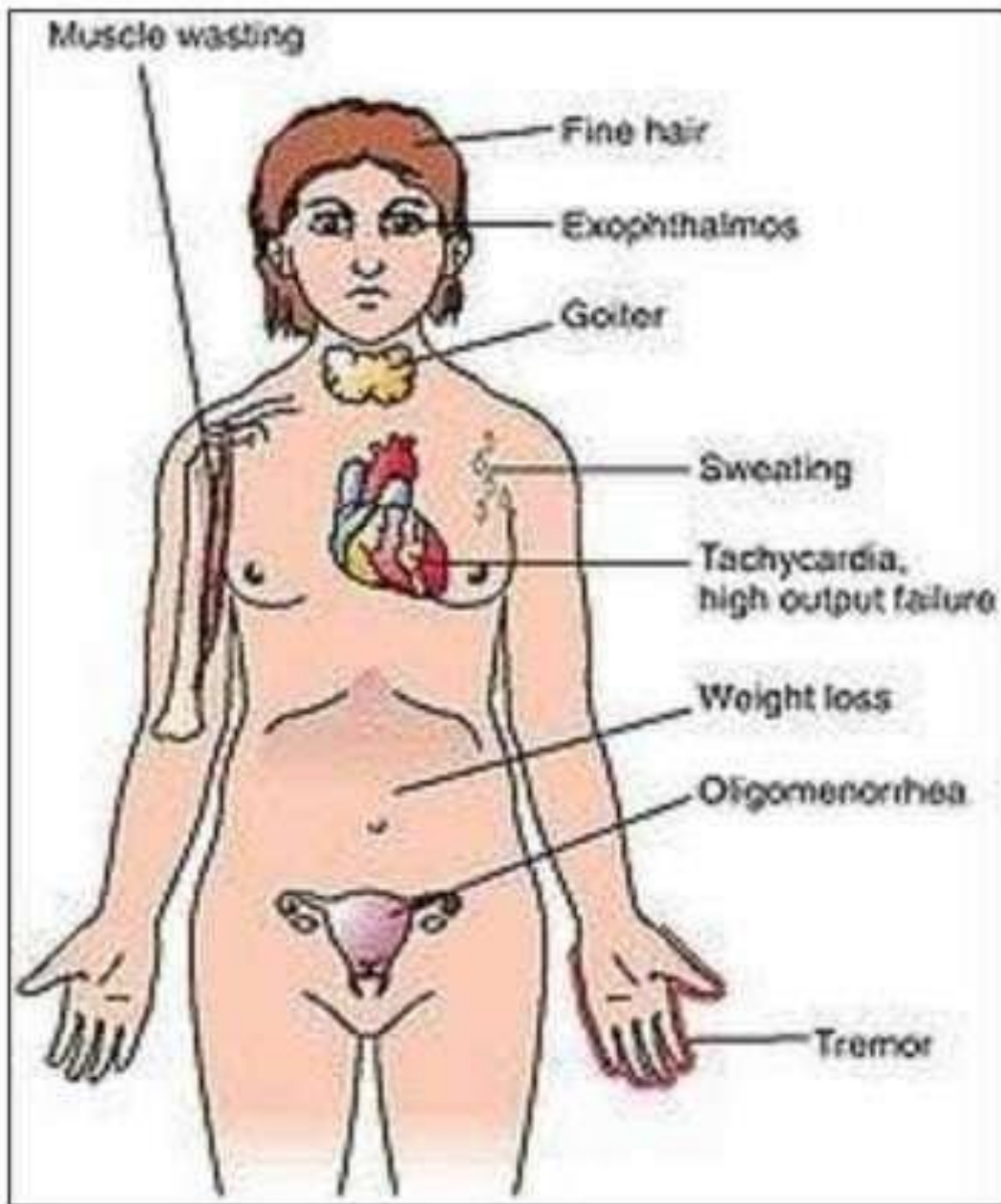
HASHIMOTO'S THYROIDITIS

- It is the inflammation of thyroid gland.
- It is an autoimmune disorder wherein the antibodies attack the thyroid gland.
- SYMPTOMS
 - Goitre
 - Fatigue
 - Muscle weakness
 - Weight gain



GRAVE'S DISEASE

- **Graves' disease** is an autoimmune disease where the thyroid is overactive, producing an excessive amount of thyroid hormones.
- This is caused by auto antibodies to the TSH-receptor that activate that TSH-receptor (TSHR), thereby stimulating thyroid hormone synthesis and secretion, and thyroid growth.
- SYMPTOMS
 - Eyes may look enlarged because the eye muscles swell and push the eye forward.
 - Weight loss inspite of increased appetite.
 - Increase in BMR



Exophthalmos

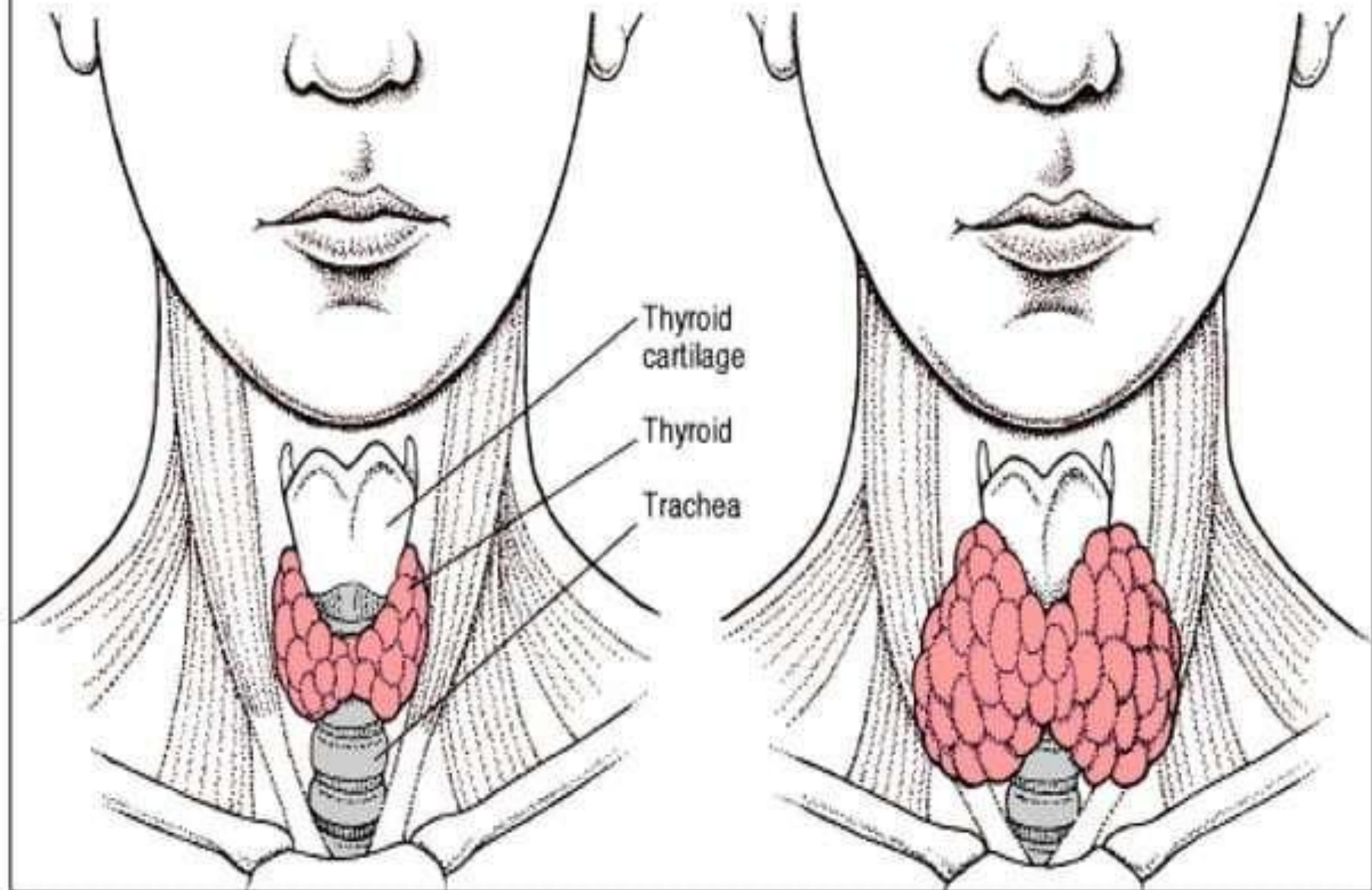
GOITRE

- It is a swelling in the thyroid gland, which can lead to a swelling of the neck or larynx (voice box).
- Goitre usually occurs when the thyroid gland is not functioning properly.
- Worldwide, the most common cause for goitre is iodine deficiency.



Normal Thyroid

Goiter



They are classified in different ways:

- ❖ A "**diffuse goitre**" is a goitre that has spread through all of the thyroid.
- ❖ "**Toxic goitre**" refers to goitre with hyperthyroidism. These are most commonly due to Graves' disease, but can be caused by inflammation .
- ❖ "**Nontoxic goitre**" (associated with normal or low thyroid levels) refers to all other types.

Adrenal gland

Right adrenal gland

Left adrenal gland



ADRENAL

- Also called supra renal gland.
- Consists of outer cortex & inner medulla.
- Hormones secreted are :
 - ❖ Cortex- androgens, aldosterone, corticosterone.
 - ❖ Medulla – epinephrine & nor epinephrine.
- Major disorders are : Cushing syndrome, Addison's disease, Primary aldosteronism, hyper secretion of catecholamine.

CUSHING SYNDROME

- It was described by Harvey Cushing in 1932.
- Caused by high levels of cortisol (hypercortisolism) in the blood.
- A tumor (adenoma) in the pituitary gland that produces large amounts of ACTH, which in turn elevates cortisol. It can usually be cured by surgery
- SYMPTOMS
 - Central obesity ,moon face hyperhidrosis
 - Growth of fat pads along the collar bone and on the back of the neck
 - Purple or red striae (the weight gain in Cushing's syndrome stretches the skin, which is thin and weakened, causing it to hemorrhage) on the trunk, buttocks, arms, legs or breasts, proximal muscle weakness (hips, shoulders).



ADDISON DISEASE

- Addison's disease is named after Dr. Thomas Addison.
- It is a rare endocrine disorder wherein the adrenal glands produce insufficient steroid hormones (glucocorticoids and often mineralocorticoids).
- SYMPTOMS
 - Low blood pressure
 - Darkening (hyper pigmentation) of the skin
 - Muscle weakness, fever, weight loss
 - Diarrhea, headache, sweating



PRIMARY ALDESTERONISM

- It is characterized by the overproduction of the mineralocorticoid hormone aldosterone.
- Aldosteronism has many causes, including adrenal hyperplasia and adrenal carcinoma.
- SYMPTOMS
 - Hyponatremia
 - Hypokalemia.
 - Increased bicarbonate retention and the excreted hydrogen combine to generate a metabolic alkalosis.
 - High pH of the blood makes calcium less available to the tissues and causes symptoms of hypocalcemia.
 - Elevated blood pressure
 - Manifestations of muscle cramps (due to hyperexcitability of neurons).
 - Muscle weakness (due to hypoexcitability of skeletal muscles).
 - Decreased cardiac output.

HYPER SECRETION OF CATECHOLAMINE

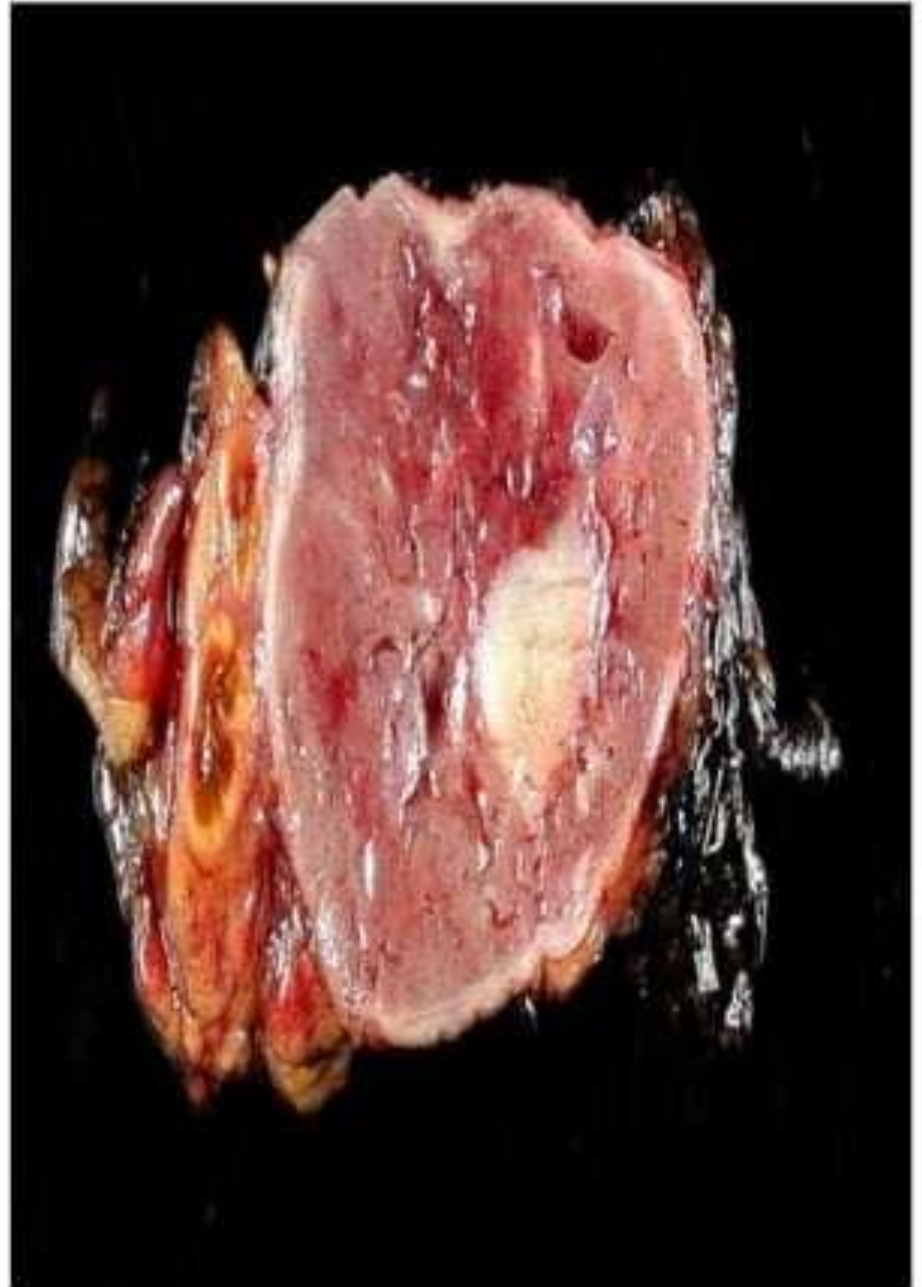
- Catecholamine are a group of biogenic amines that are neural transmitters, and include dopamine, nor epinephrine and epinephrine (adrenaline). Imbalance of catecholamine can result in autonomic dysfunction.
- The most common of this group is phaeochromocytoma.

PHAEOCHROMOCYTOMA

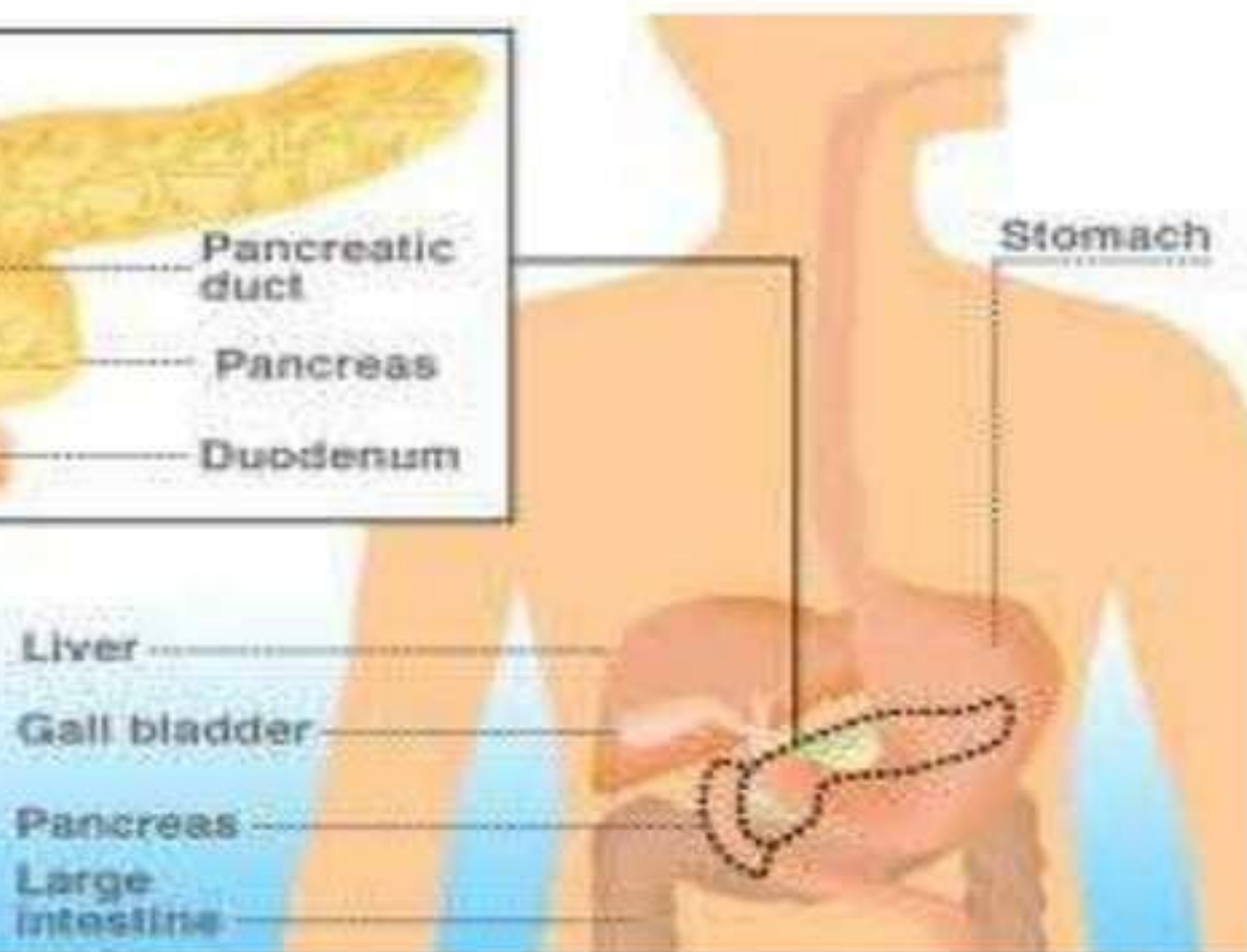
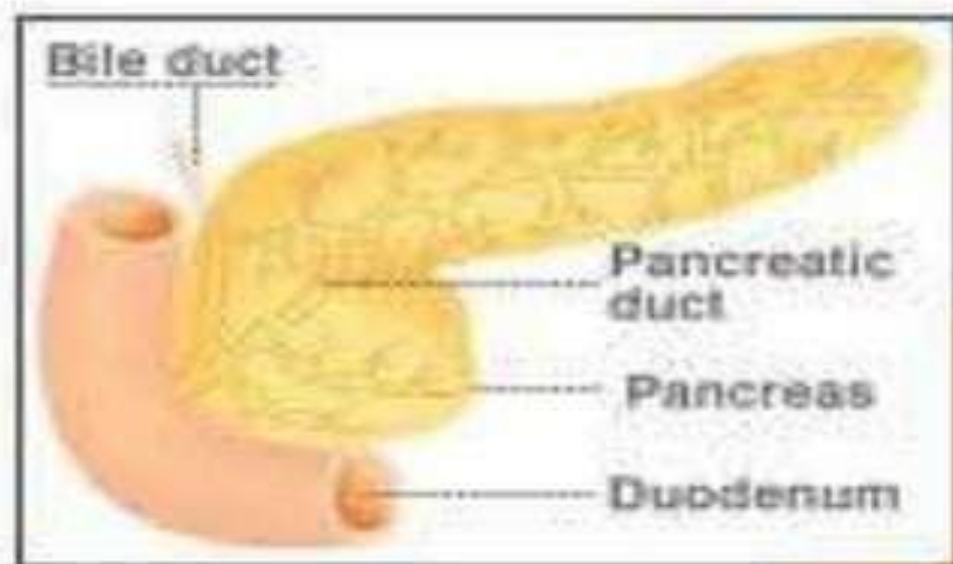
- Phaeochromocytoma, is a neuroendocrine tumor of the medulla of the adrenal glands (originating in the chromaffin cells),
- It secretes excessive amounts of catecholamine, usually adrenaline (epinephrine) if in the adrenal gland and not extra-adrenal.
- Up to 25% of pheochromocytomas may be familial.

SYMPTOMS

- Skin sensations
- Flank pain
- Elevated heart rate
- Elevated blood pressure
- Inhibition of glucose uptake by muscle cells.
- Anxiety often resembling that of a panic attack.



Pancreas

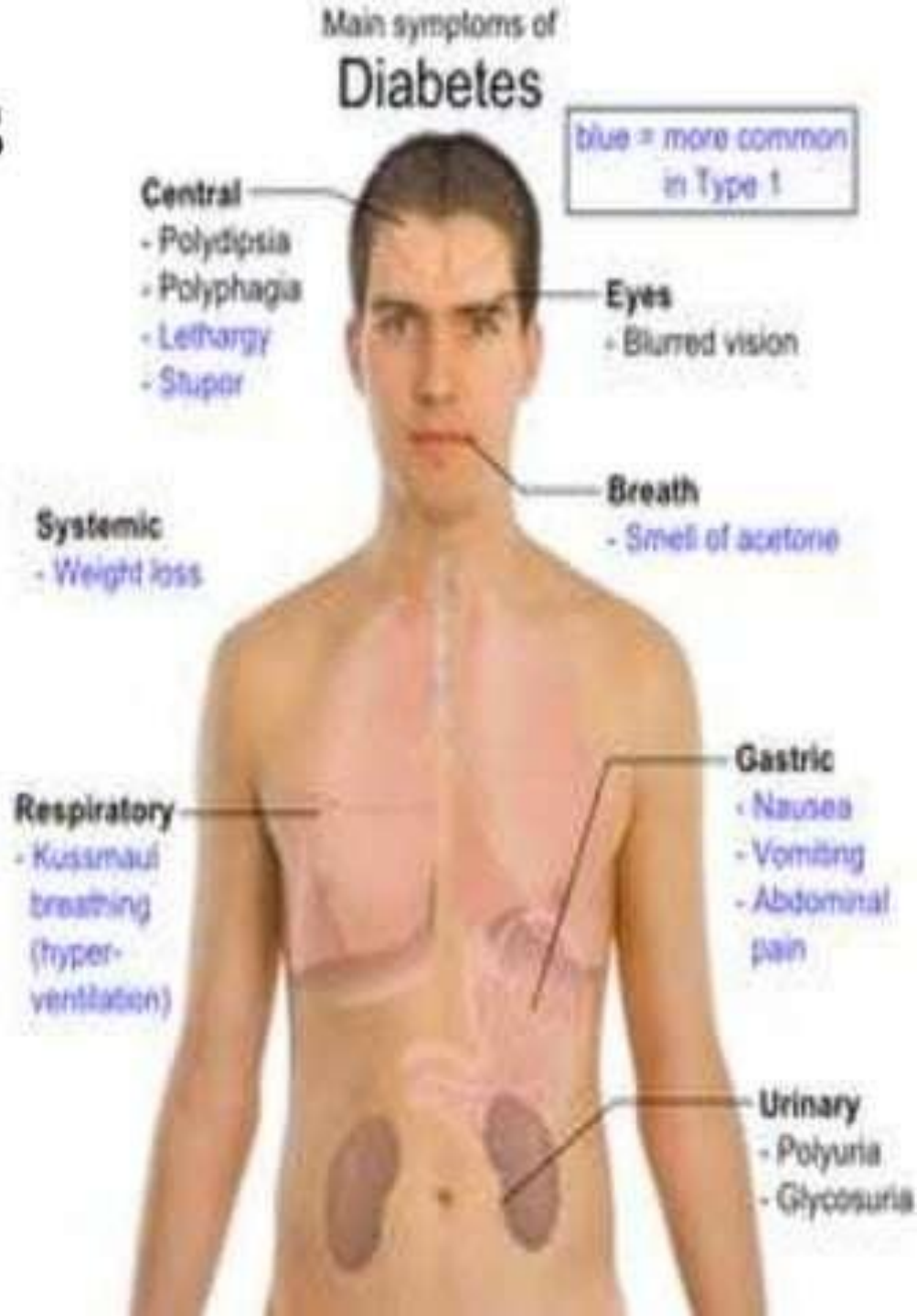


PANCREAS

- 2nd largest gland.
- Consists of exocrine & endocrine parts.
- Endocrine part consists of Islets of Langerhans.
- The hormones secreted are
Insulin, Glucagon, Somatostatin & Pancreatic polypeptide.
- The major disorders related to pancreas are : Diabetes mellitus, Hypoglycemia, Pancreatitis & Pancreatic cancer

DIABETES MELLITUS

- Relatively a common disease
- Characterized by increased blood glucose level.
- Caused by the deficiency in secretion of insulin.
- Three main types are :
 - ❖ Type- 1
 - ❖ Type- 2
 - ❖ Gestational diabetes



- ❖ Type-1 diabetes results from the body's failure to produce insulin, and presently requires the person to inject insulin. (Also referred to as insulin-dependent diabetes mellitus, IDDM for short, and juvenile diabetes.)
- ❖ Type -2 diabetes results from insulin resistance, a condition in which cells fail to use insulin properly, sometimes combined with an absolute insulin deficiency.
- ❖ Gestational diabetes is when pregnant women, who have never had diabetes before, have a high blood glucose level during pregnancy. It may precede development of type 2 DM.

HYPOGLYCEMIA

- It is a state produced by a lower than normal level of blood glucose.
- The cause is excessive insulin produced in the body due to inborn errors, medications or hormone deficiencies.
- SYMPTOMS
 - Hunger, Nausea, vomiting, abdominal discomfort
 - Staring, "glassy" look, blurred vision, double vision
 - Paralysis
 - abnormal breathing
 - Generalized or focal seizures

PANCREATITIS

- It is inflammation of pancreas.
- Can be caused by gallstones in the pancreas.
- Can be also caused by alcohol abuse.

- SYMPTOMS
 - Nausea, vomiting, fever, etc.
 - Swelling in upper abdomen.
 - Ascites i.e. fluid accumulation in abdominal cavity.
 - Severe abdominal pain.



PANCREATIC CANCER

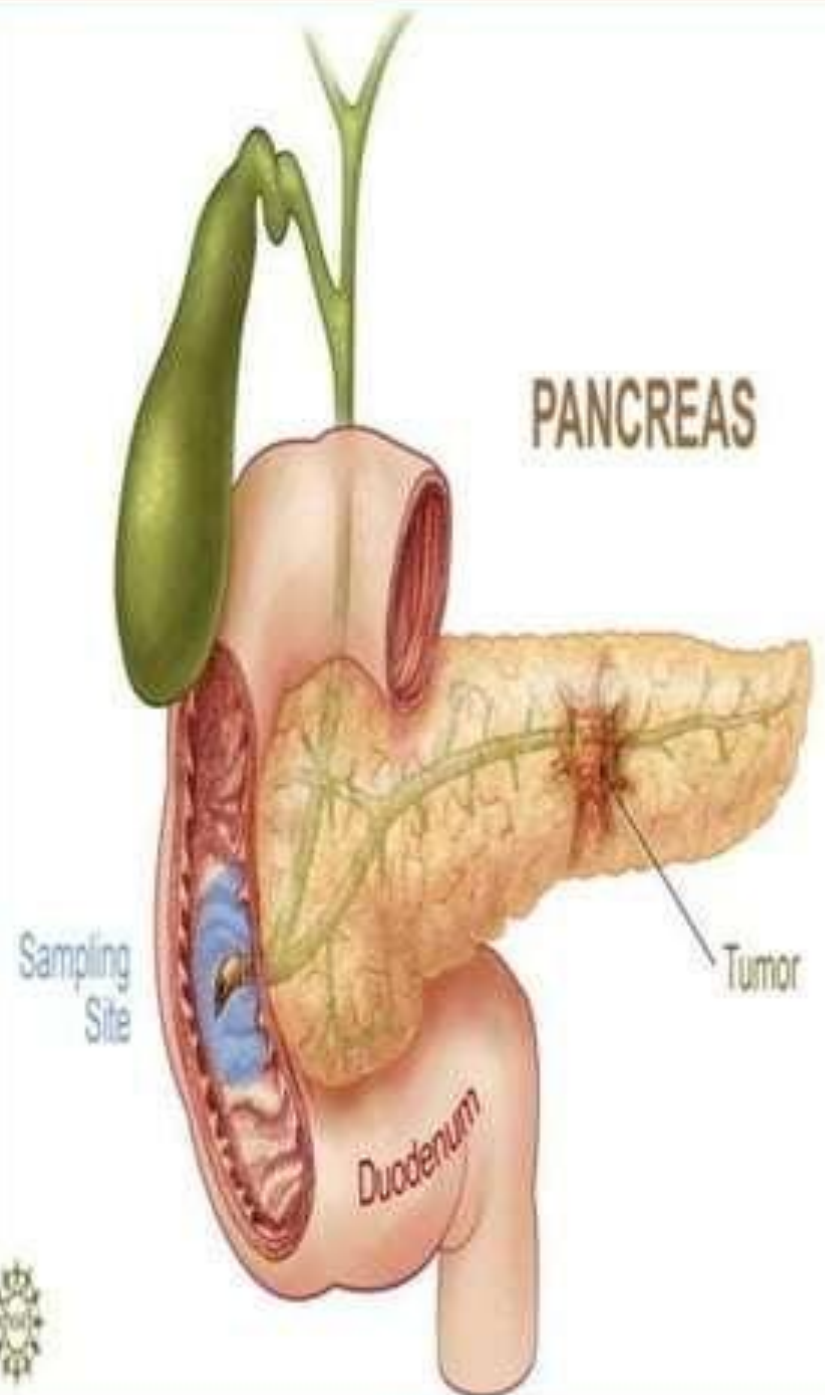
- It is a malignant neoplasm of the pancreas.
- Also called a "silent killer".
- Caused by a variety of reasons.

TYPES

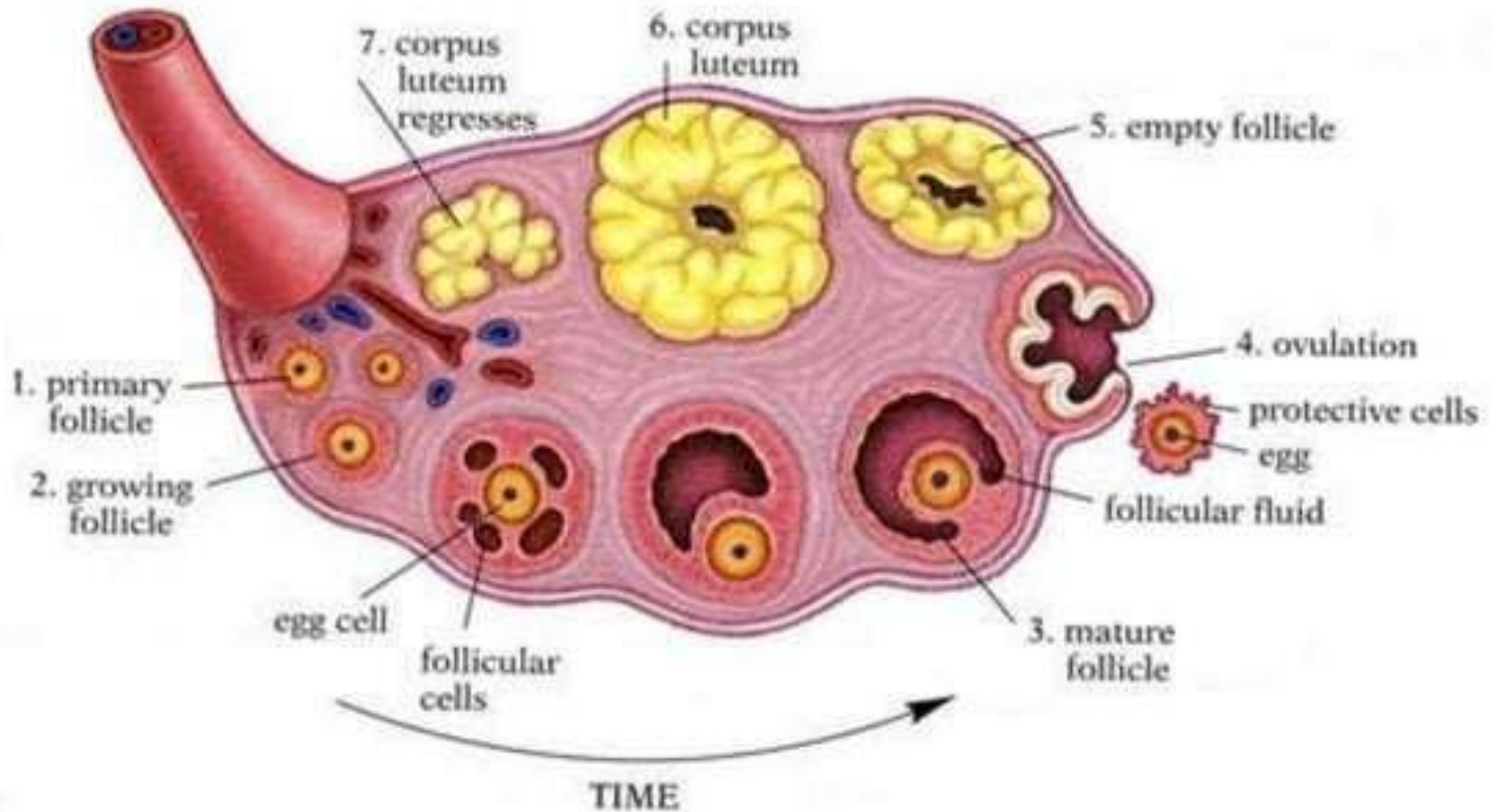
1. Adenocarcinoma
2. Adenosquamous carcinomas

SYMPTOMS

- Pain in the upper abdomen
- Loss of appetite
- Weight loss
- Painless jaundice



Ovary



OVARY

- The ovary is an ovum-producing reproductive organ, often found in pairs as part of the vertebrate female reproductive system.
- Ovaries secrete both estrogen and progesterone.

AMENORRHEA

- **Amenorrhea** is the absence of a menstrual period in a woman of reproductive age.
- **Primary amenorrhea** (menstruation cycles never starting) may be caused by developmental problems such as the congenital absence of the uterus, or failure of the ovary to receive or maintain egg cells.
- **Secondary amenorrhea** (menstruation cycles ceasing) is often caused by hormonal disturbances from the hypothalamus and the pituitary gland.

HYPOGONADISM

- This is caused by low levels of estrogen.
- SYMPTOMS:
 - Irritability/Aggressiveness
 - Infertility
 - Loss of, or failure to develop, menstruation
 - Loss of body hair
 - Loss of bone mass (osteoporosis)
 - Heart disease
 - Sleep disturbances
 - Urinary bladder discomfort
 - Shrinking of breasts

POLYCYSTIC OVARY

- **Polycystic Ovary Syndrome (PCOS)** is one of the most common female endocrine disorders affecting approximately 5%-10% of women of reproductive age (12–45 years old) and is thought to be one of the leading causes of female infertility.
- While the causes are unknown, insulin resistance, diabetes, and obesity are all strongly correlated with PCOS.
- With PCOS, the ovaries make the follicles, but the eggs do not mature or leave the ovary. The immature follicles can turn into fluid-filled sacs called cysts .
- Most women with PCOS have cysts. But women with ovarian cysts do not necessarily have PCOS

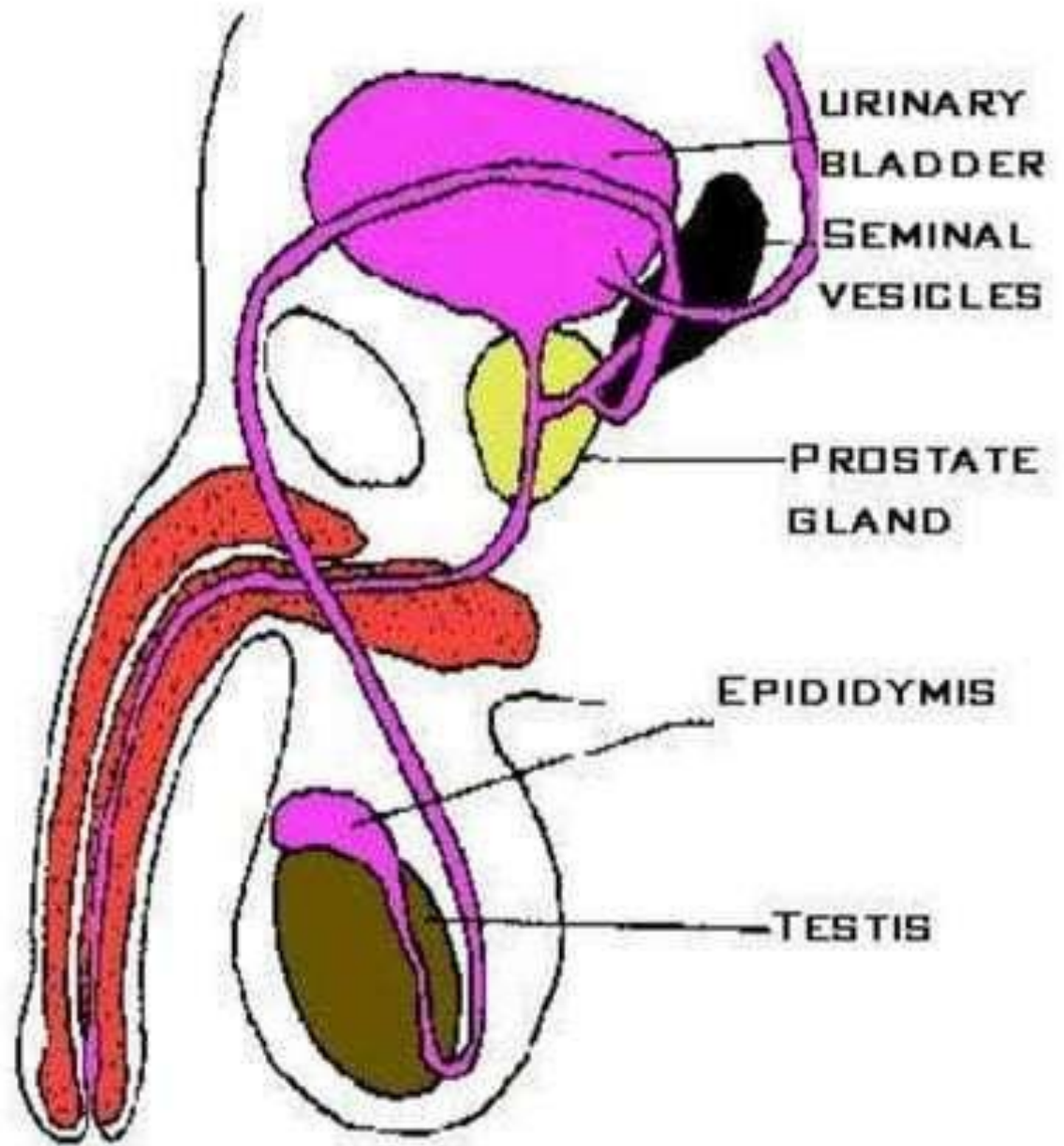
SYMPTOMS

- Amenorrhea - irregular, few, or absent menstrual periods.
- Infertility, generally resulting from chronic anovulation.
- Hirsutism — excessive mild symptoms of hyperandrogenism, such as acne or hypermenorrhea, are frequent in adolescent girls and are often associated with irregular menstrual cycles.

- High levels of ovarian androgens.
- Obesity
- Dark patches of skin on neck, groin, and arm pit
- High blood pressure ,Heart disease
- A combination of obesity, insulin resistance, high blood pressure can lead to Metabolic Syndrome i.e. increased tendency to blood clotting and inflammatory states .

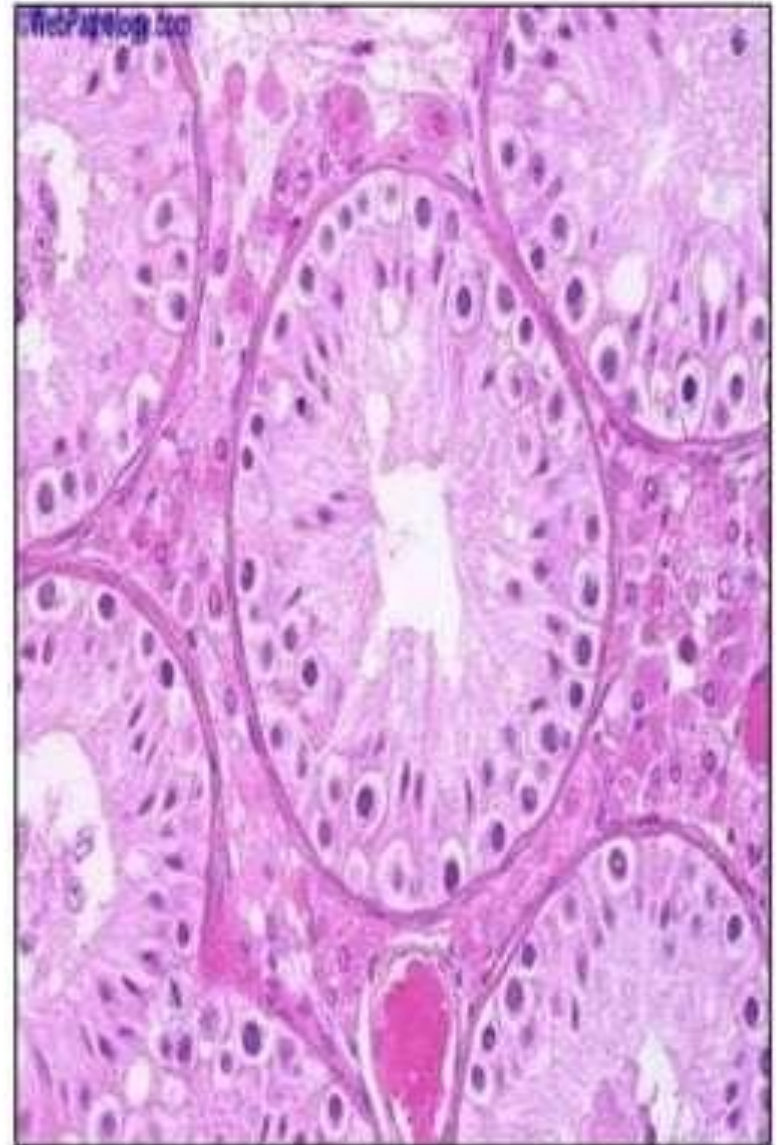


Testes



TESTES

- The **testicle** is the male generative gland in animals.
- The main function of testicle is to produce spermatozoa & to secrete male sex hormone.
- The chief male sex hormone produced is the testosterone.

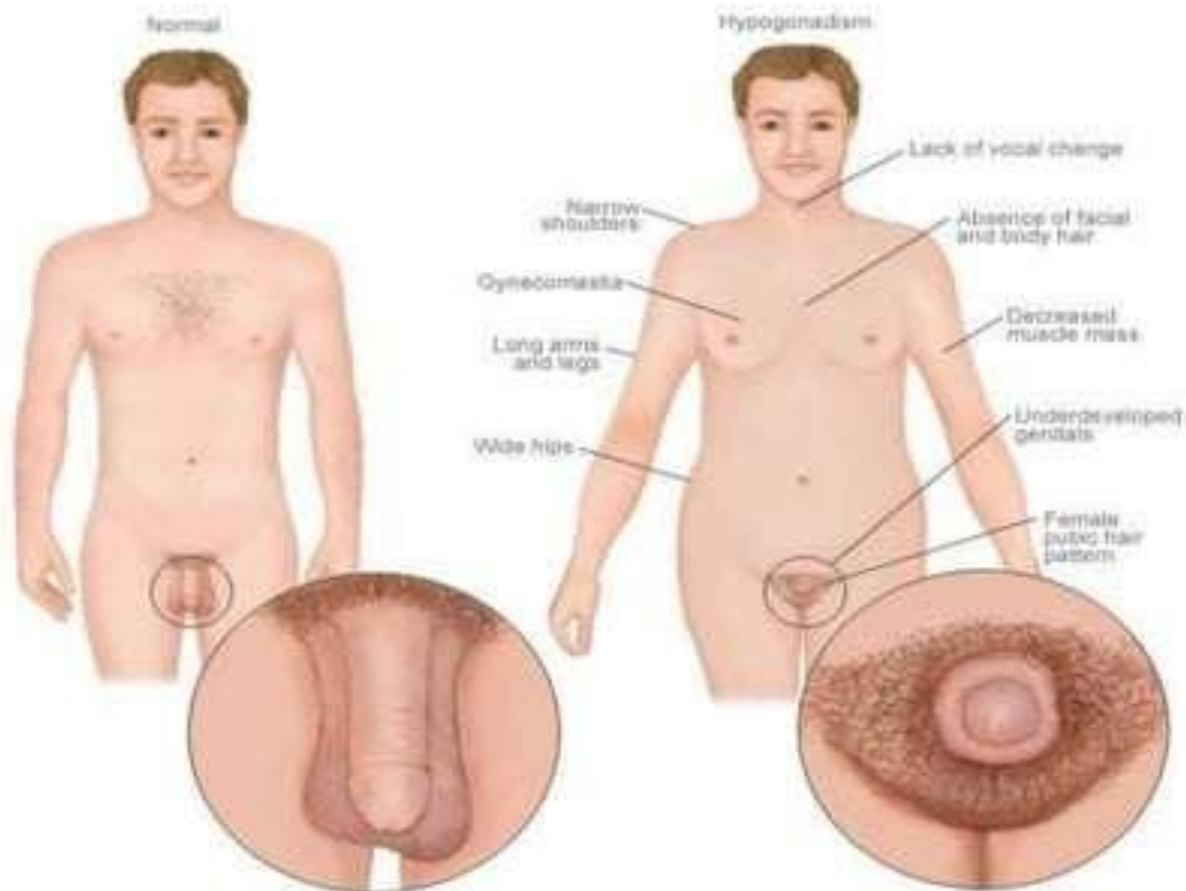


HYPOGONADISM

- Hypogonadism in men is a disorder that occurs when the testicles (gonads) do not produce enough testosterone.
- Primary hypogonadism occurs when there is a problem or abnormality in the testicles themselves.
- Secondary hypogonadism occurs when there is a problem with the pituitary gland in the brain, which sends chemical messages to the testicles to produce testosterone.
- **SYMPTOMS**
 - Erectile dysfunction (the inability to achieve or maintain an erection)
 - Infertility
 - Decreased sex drive
 - Decrease in beard and growth of body hair
 - Decrease in size or firmness of the testicles
 - Decrease in muscle mass and increase in body fat
 - Enlarged male breast tissue

Primary Hypogonadism

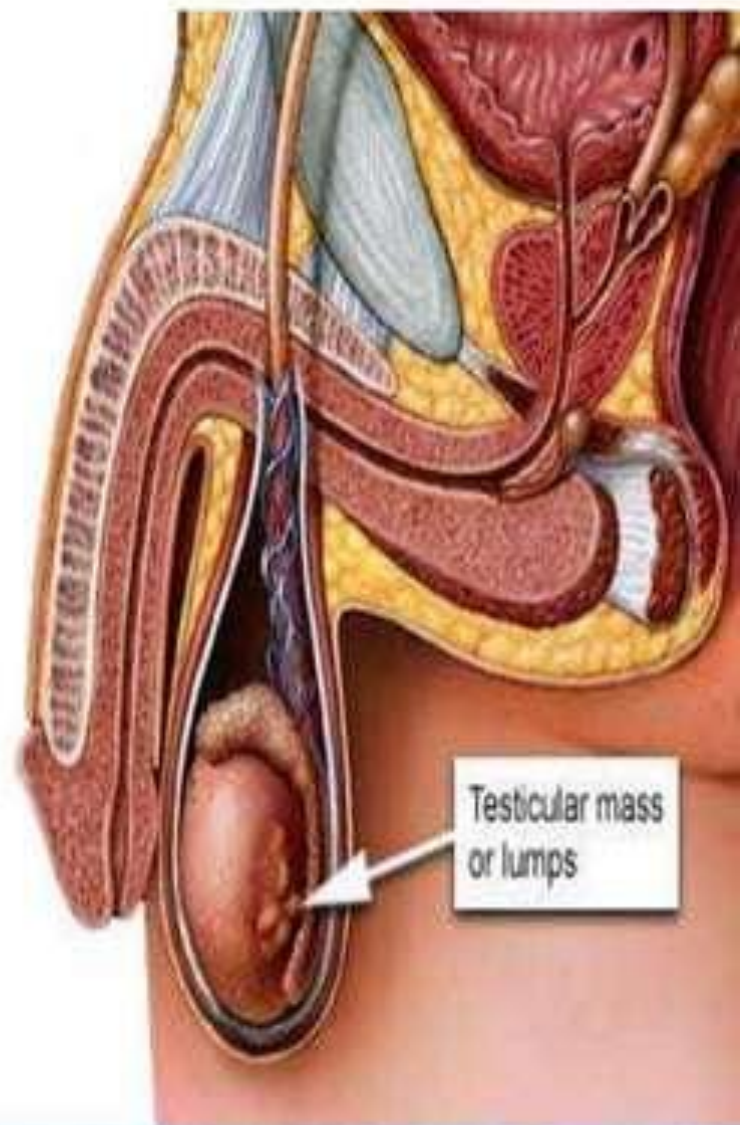
Testosterone is a hormone that plays a critical role in several aspects of sexual development in males. Testosterone is also important during adulthood. When the level of testosterone in the body is too low to regulate all of its functions, the condition is called "testosterone deficiency," or "hypogonadism."



Hypogonadism can occur during fetal development, puberty or adulthood. Depending on when it develops, the signs and symptoms differ. If the body doesn't produce enough testosterone during fetal development, the result may be underdeveloped genitalia. During puberty, male hypogonadism may slow normal growth and affect development, causing impaired growth of the penis and testicles, a lack of muscle mass, a lack of deepening of the voice, impaired growth of facial and body hair, excessive growth of the arms and legs in relation to the trunk and enlargement of breast tissue (gynecomastia).

TESTICULAR CANCER

- Testicular cancer occurs when abnormal cells in the testicles divide and grow uncontrolled.
- Testicular cancer can develop in one or both testicles in men or young boys.
- SYMPTOMS
 - a lump, irregularity or enlargement in either testicle
 - a pulling sensation or feeling of unusual heaviness in the scrotum
 - a dull ache in the groin or lower abdomen; and pain or discomfort (which may come and go) in a testicle or the scrotum.



Conclusion

- Human body is made in such a way that it functions accurately, but still minor or major alterations can lead to disastrous lifelong deformities.
- Many of the diseases are genetically transmitted.
- So it is important to know about these diseases as it will help us in future to find better measures against them.

References

- Books
- Endocrinology by Hadley
- Clinical endocrinology
- General endocrinology by Bagrara & Tumer



Thank you