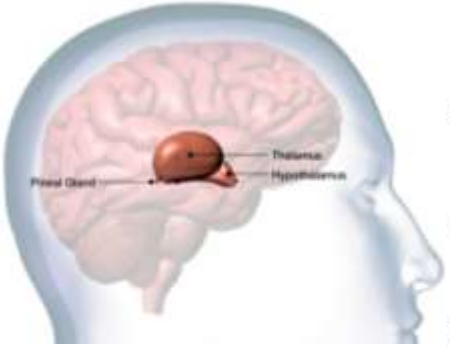
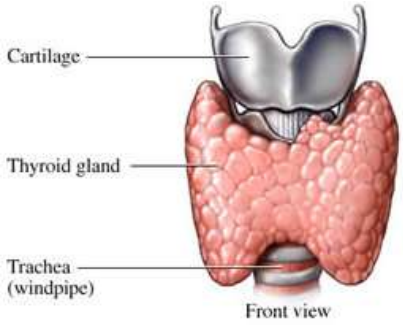
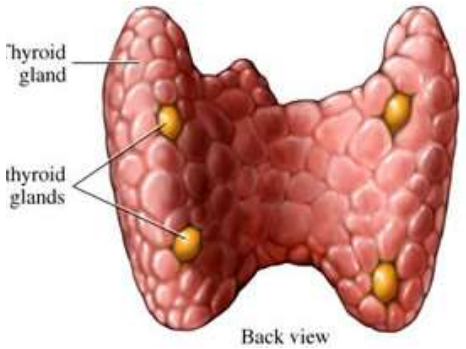
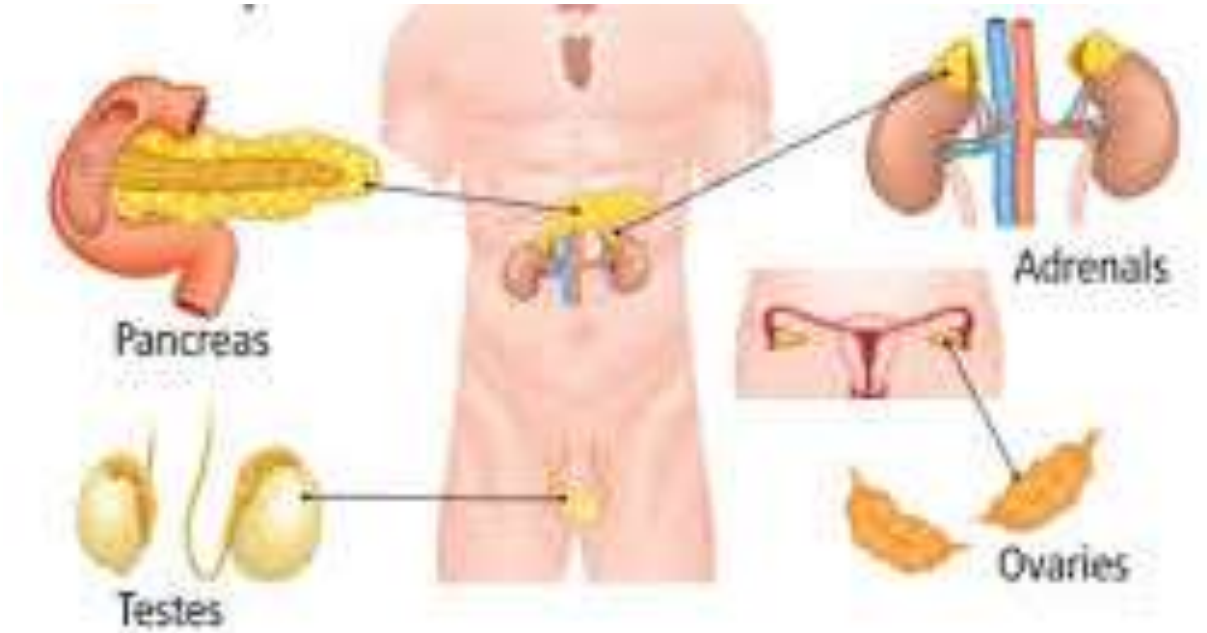
Endocrine Disorders of Pineal, Thyroid, Parathyroid, Pancreas, Adrenal, and Reproductive Glands









Dr. Amit Ranjan, Assistant Professor,
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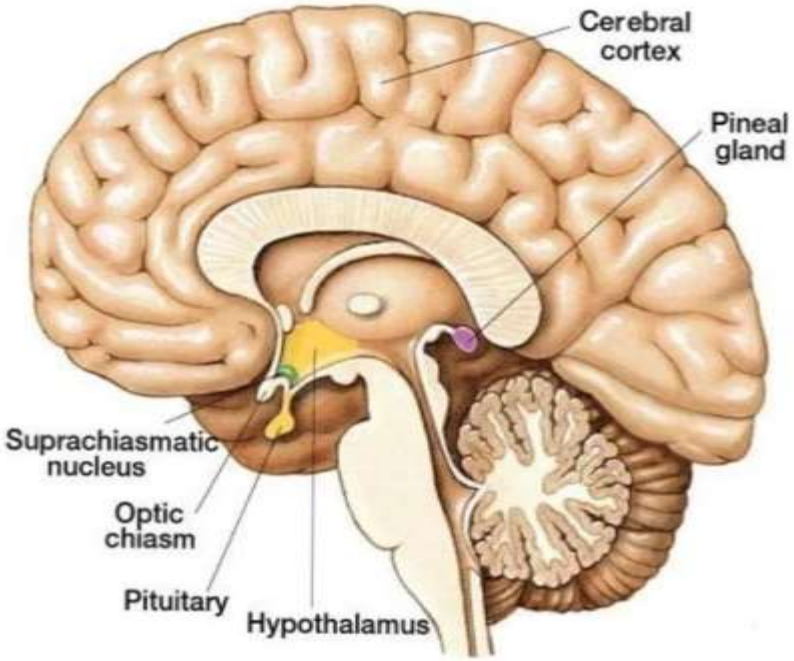
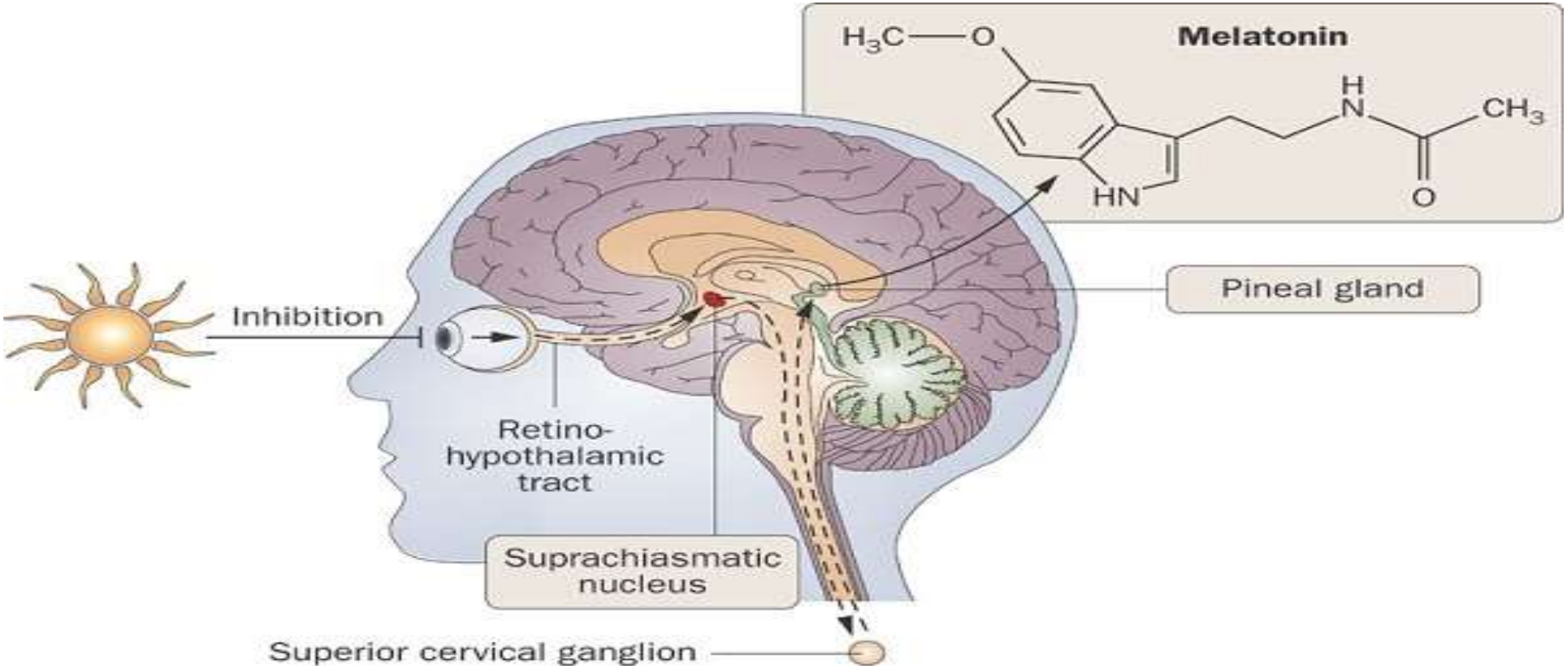
Pineal Gland (also known as the Third **Eye)**



- Pineal gland --- pinecone shaped
- Mass -- 0.1 to 0.2 g
- It is attached to the roof of the 3rd ventricle of the brain
- It is covered by a capsule formed by the **pia mater**
- **The gland consists of masses of neuroglea and secretory cell Called pinealocyte.**



- **Pinealocyte or neuroglea secretes Melatonin (derivative of serotonin).**
- **Secretion of melatonin is regulated by SCN (supra chiasmatic nulceus).**
- **SCN set the biological clock of the body.**
- **Light and dark----acts on SCN and SCN stimulates sympathetic post ganglionic neuron of the superior cervical ganglion (SCG).**
- **SCG stimulates pineal gland (pinealocyte) and secretes melatonin.**
- **In light secretion will be less and in dark secretion will be high.**

Pineal gland secretes less melatonin during abnormal condition, which may result in:

- **Insomnia**
- abnormal thyroid function
- anxiety, intestinal hyperactivity
- Menopause.

If more melatonin secretion, it may cause:

- low blood pressure,
- Seasonal Affective Disorder,
- abnormal adrenal functions.

✓Pineal gland dysfunction is disturbance in **circadian rhythms**. Sleeping too much or little or feeling active or restless in the night due to abnormal pineal gland function.

Jet Lag (Temporary Disorder)

❖Jet lag, also known as time zone change syndrome or desynchronosis, occurs when people travel rapidly across time zones or when their sleep is disrupted, for example, because of shift work.

❖It is a physiological condition that results from a disruption in the body's circadian rhythms, also known as the body clock.

❖ It is seen as a circadian rhythm disorder.

❖ When we travel from one time zone to another, e.g. America.

❖ At 12:00 in India will be night, then at the same time there will be day in America

❖ According to Indian time zone our body will be trying to sleep due to the secretion of melatonin.

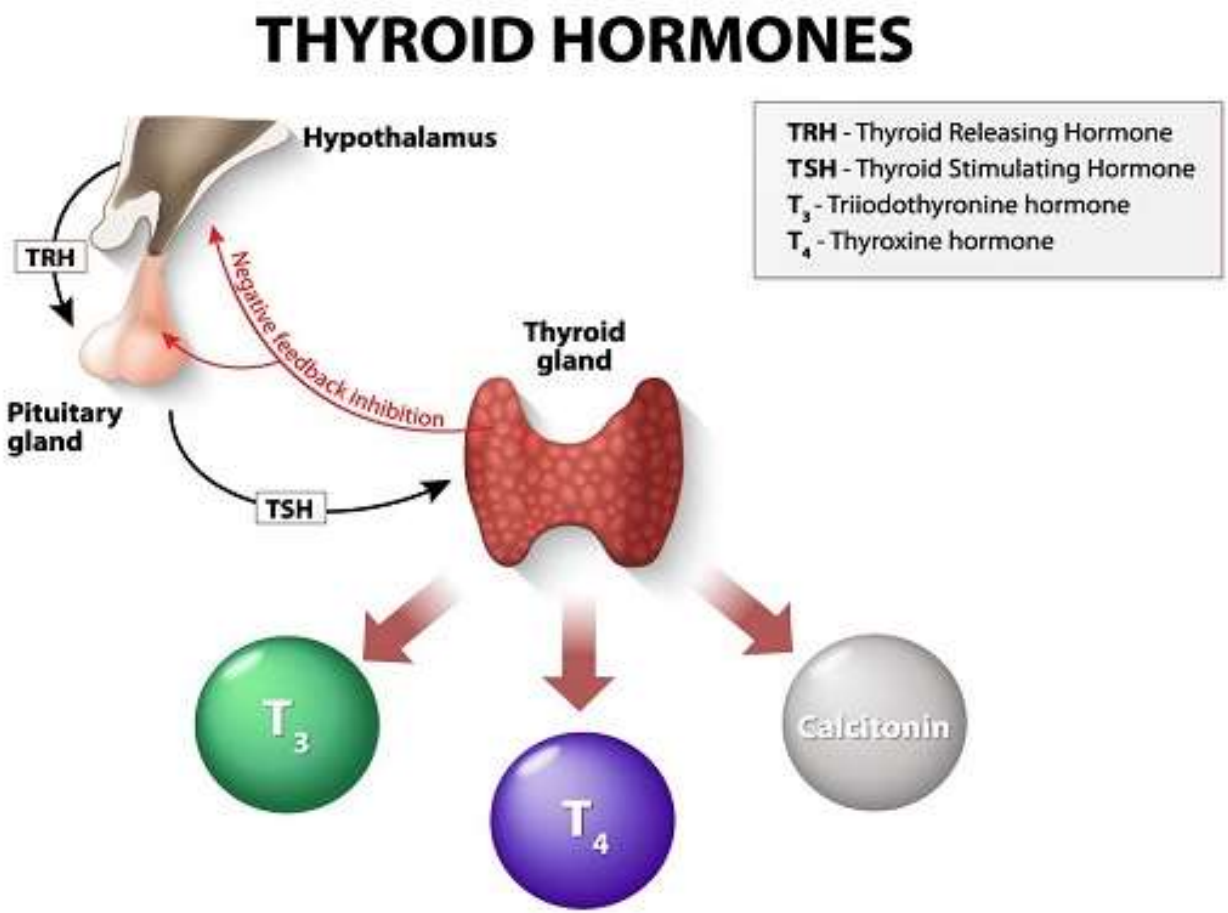
❖ However in America, it is day time and its time to work, hence we feel headache, fatigue and uneasy.

❖ **Our body take at least, 1 week to acclimatize. it vary from person to person.**

THYROID GLAND

It a butterfly shaped gland which is located at the front of trachea at the base of the throat and is integral part of your endocrine system. It regulates:

- Heart rate
- Blood pressure
- Metabolism
- Body temperatur
- Growth and development

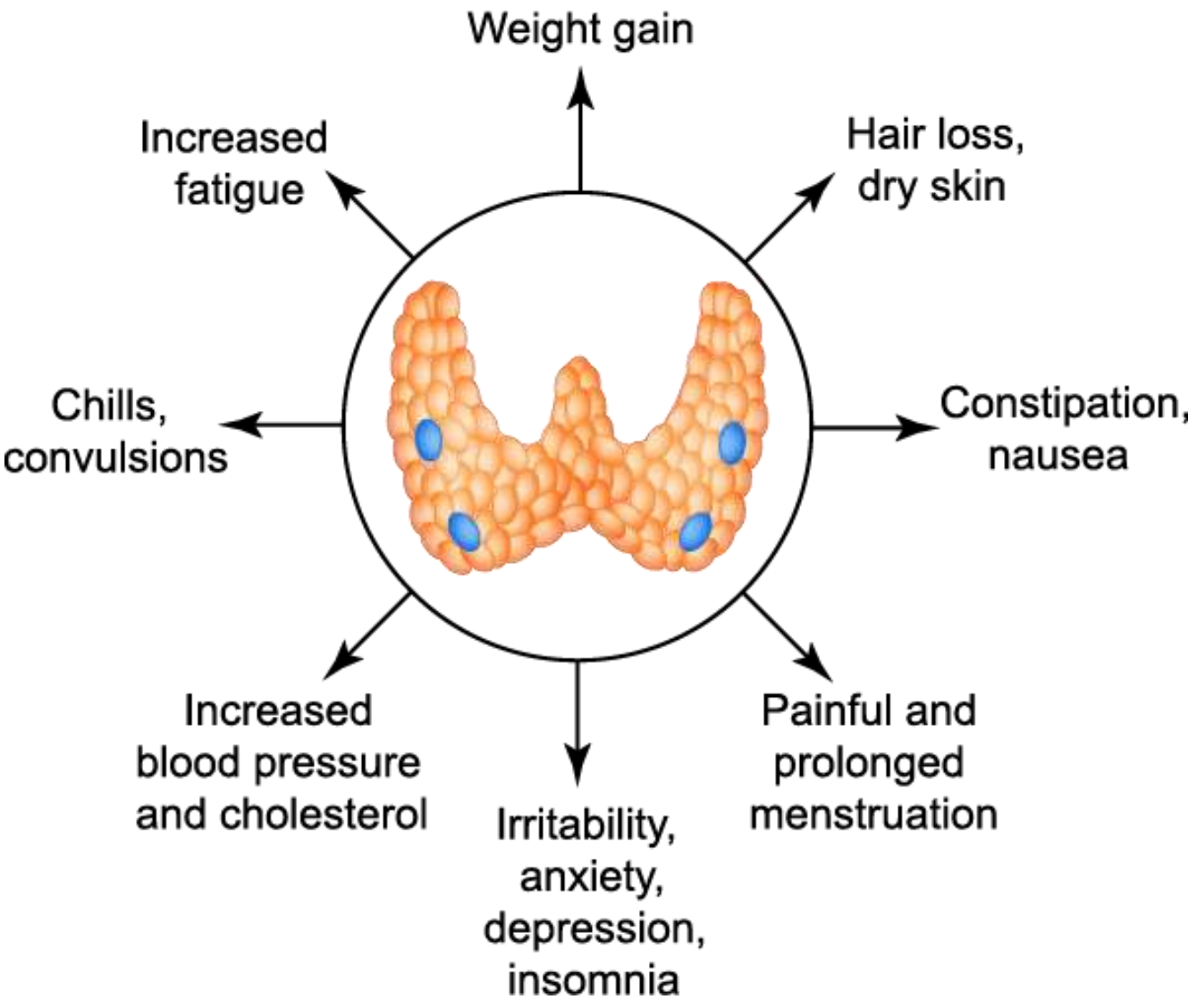


Two reasons for THYROID GLAND disorders.

- Hypoactivity
- Hyperactivity

Glands	HYPO	HYPER
Thyroid	1.Cretinism 2.Myxedema 3.Hashimoto's	1.Graves 2.Goitre

SYMPTOMS OF HYPOTHYROIDISM



Hypothyroidism or Underactive Thyroid

- It occurs when the thyroid gland does not produce a sufficient amount of thyroid hormones.
- Hypothyroidism can occur due to a physiological problem or can result from certain medical treatments or therapies.

Common cause of hypothyroidism includes :

- Deficiency of the iodine in diets
- Undeveloped thyroid gland
- Expose to radiation thyroid gland
- Pituitary dysfunction

Treatments

- Increase the sufficient amount of iodine in diet

cretinism

- lack of thyroxine from birth
- or before birth
- could be from lack of thyroid gland
- or lack of iodine in mother
- severe and irreparable mental defects
- stunted growth
- reduced growth and function of many organs

https://in.pinterest.com/pin/461478293065594290/

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.

HASHIMOTO'S THYROIDITIS SYMPTOMS

Findatopdoc.com

Hashimoto's Thyroiditis is characterized by the immune system attacking the thyroid. This could lead to the body not making enough hormones, also known as hypothyroidism. Symptoms of Hashimoto's Thyroiditis include:

For women, irregular or heavy menstrual periods and difficulty getting pregnant

Hair loss or sudden thinning and brittle hair

Paleness and puffiness of the face along with weight gain

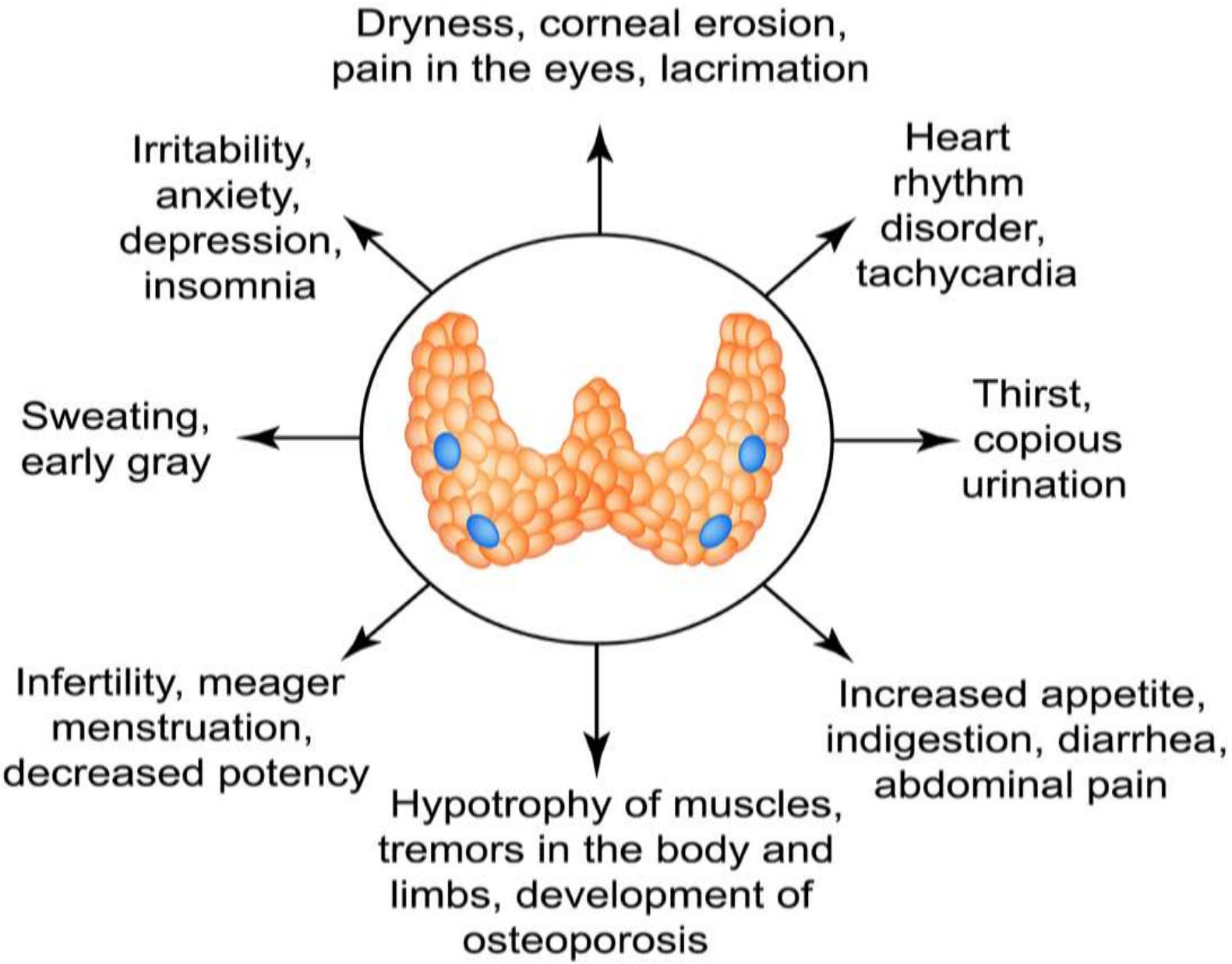
Depression, anxiety, and altered mood

Joint and muscle pain that doesn't appear to have a source

Inability to get and stay warm, along with extreme fatigue

Glands	HYPO	HYPER
Thyroid	1.Cretinism 2.Myxedema 3.Hashimoto’s	1.Graves 2.Goitre

SYMPTOMS OF HYPERTHYROIDISM



Hyperthyroidism or overactive thyroid

- It is the result of the thyroid gland overproducing thyroid hormone.

Hyperthyroidism occurs due to –

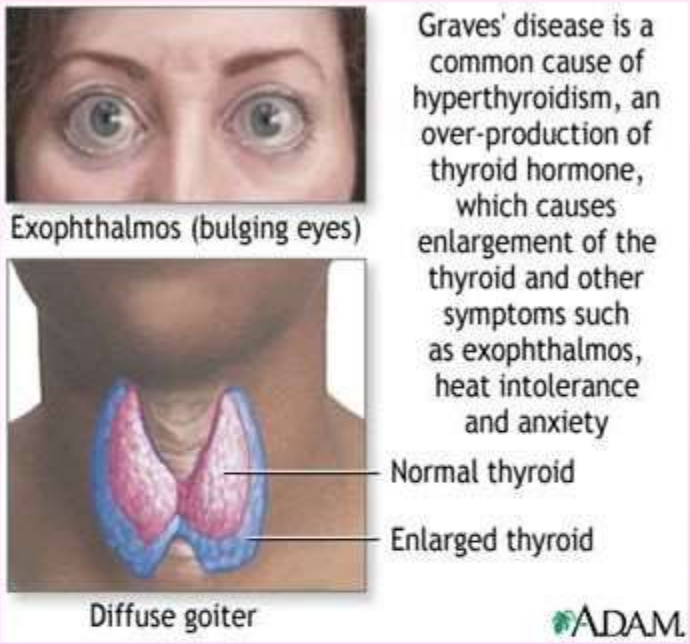
- Goiter – enlargement of the thyroid gland
- Thyroid nodules – common condition in which a small nodule or cyst forms on the thyroid gland
- Thyroid adenoma
- Increase amount of iodine in diet

Thyroid disease can affect anyone, but women are more likely to be affected than men

Treatment

- Sufficient amount of iodine in diet
- Surgically remove the enlarge part of thyroid gland
- By anti- thyroid medication

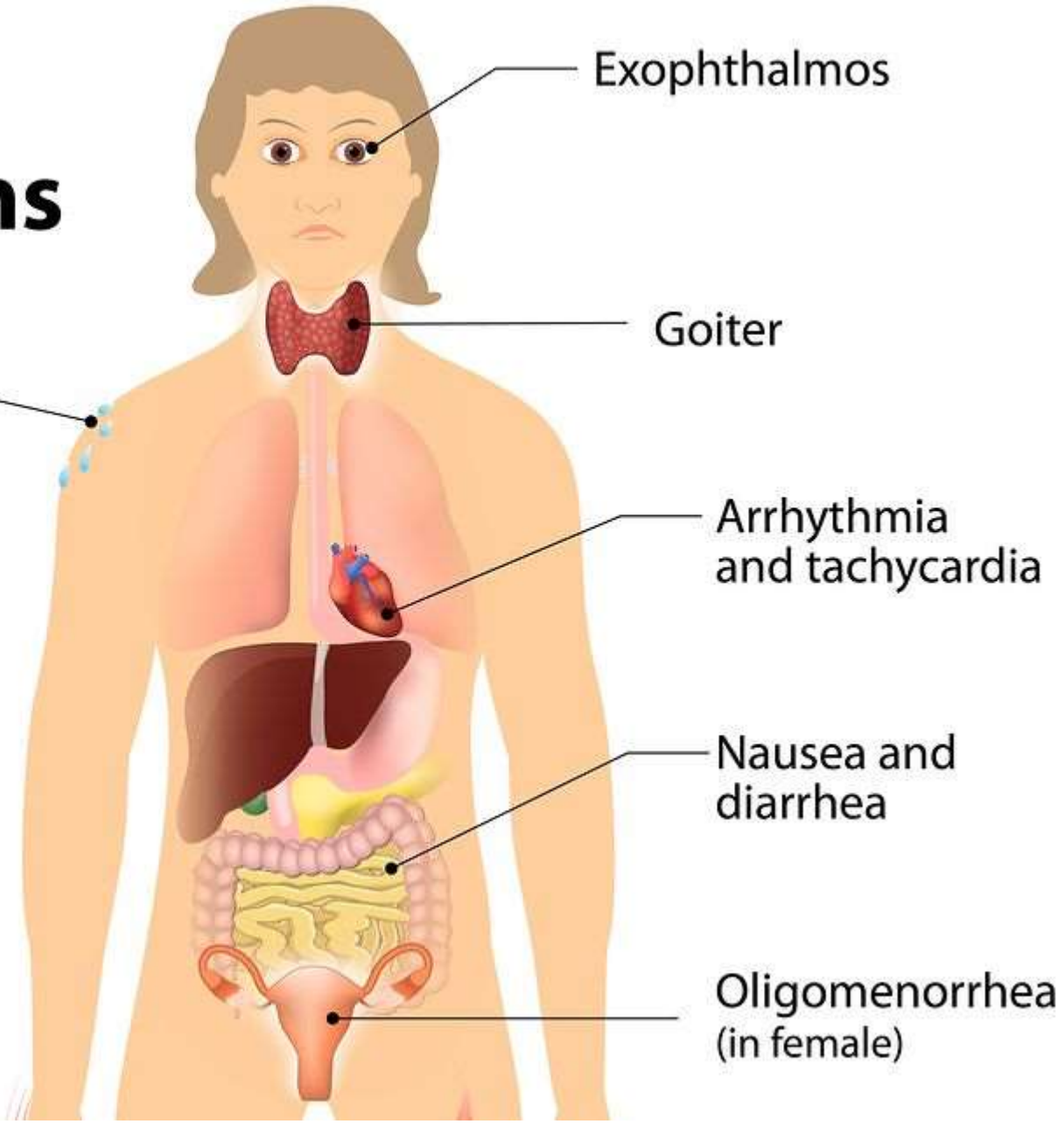
Graves Disease



Runaway Bride

- Graves disease is the most common form of hyperthyroidism. It occurs when the immune system mistakenly attacks your thyroid gland and causes it to overproduce the hormone thyroxine.
- This abnormal immune response can also affect the tissue behind the eyes as well as the skin, usually on your lower legs and feet.
- The body's metabolism can increase 60 to 100%, because thyroxine regulates the body's metabolism.
- Graves' disease is rarely life threatening. It may develop at any age in either men or women. Graves disease is more common in women and usually begins after age 20.

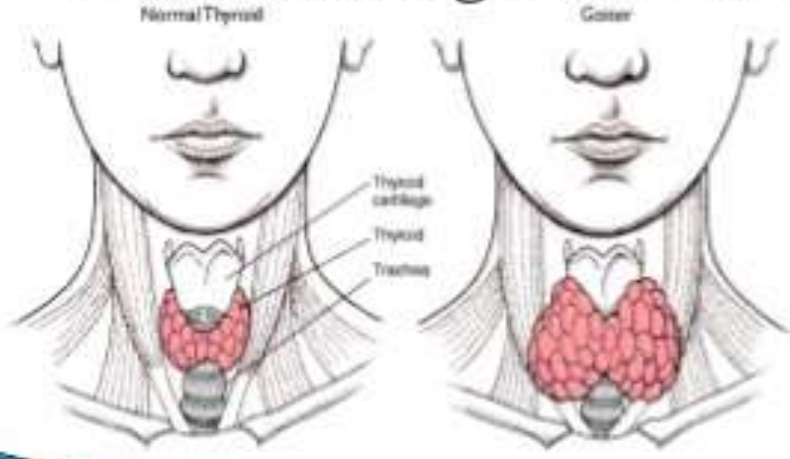
Graves' disease symptoms



- Headache
- Weight loss
- Nervousness
- Emotional instability

WHAT IS GOITER?

GOITER, disease of the thyroid gland, characterized by an enlargement of the gland, visible externally as a swelling on the front of the neck. In simple goiter the basal metabolic rate(the least amount of energy necessary to maintain the vital involuntary activities) is somewhat lowered, and in toxic goiter it is elevated.



CLASSIFICATION GOITER DISEASE

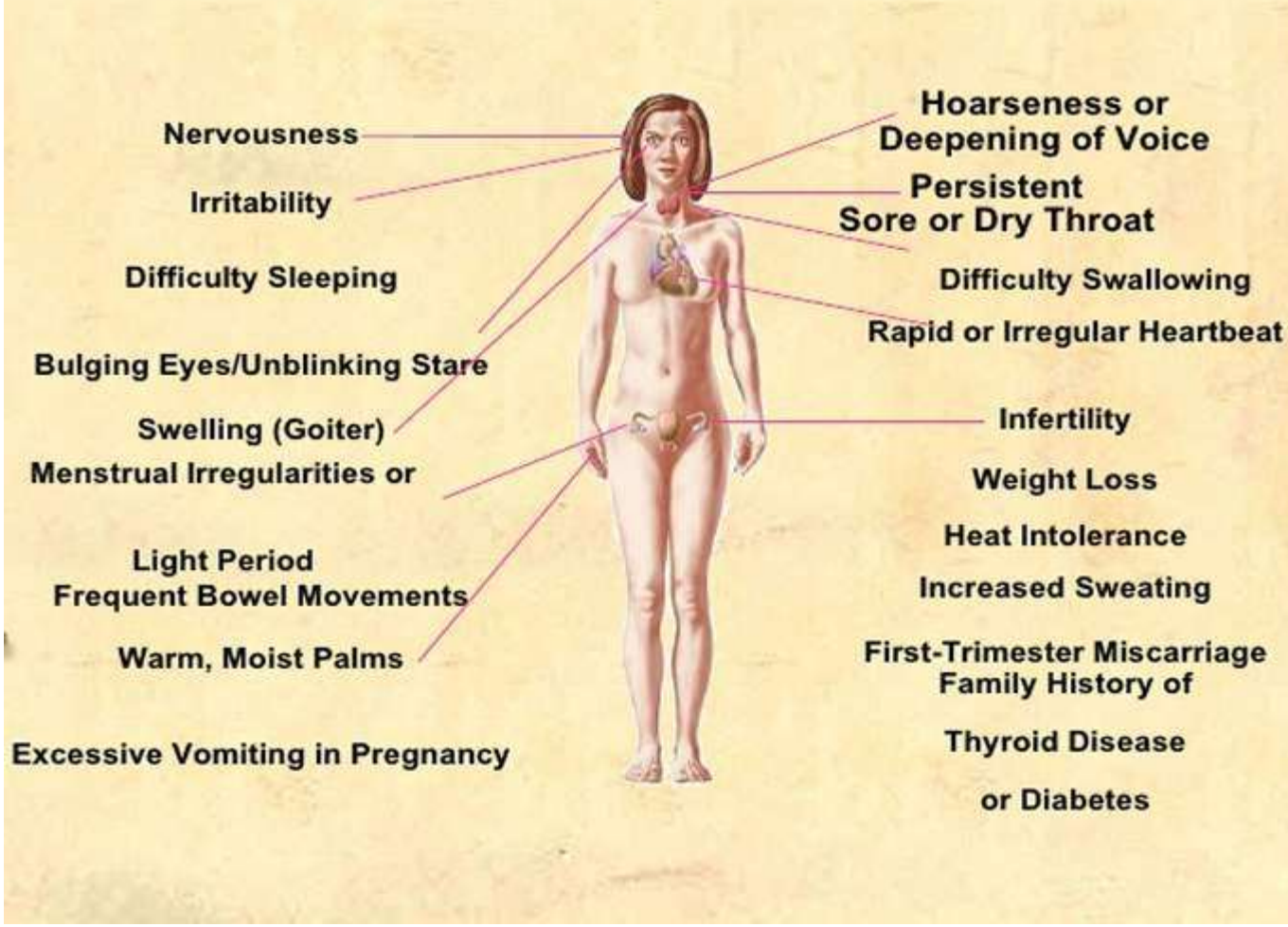
GOITER IS CLASSIFY INTO TWO:

1. Simple goiter
2. Toxic goiter

SIMPLE GOITER is characterized by an enlargement of the entire thyroid gland or one of its two lobes. It is associated with hypothyroidism, a condition caused by insufficient production of thyroid hormone. Simple goiters may be classified as either **endemic** or **nontoxic**.

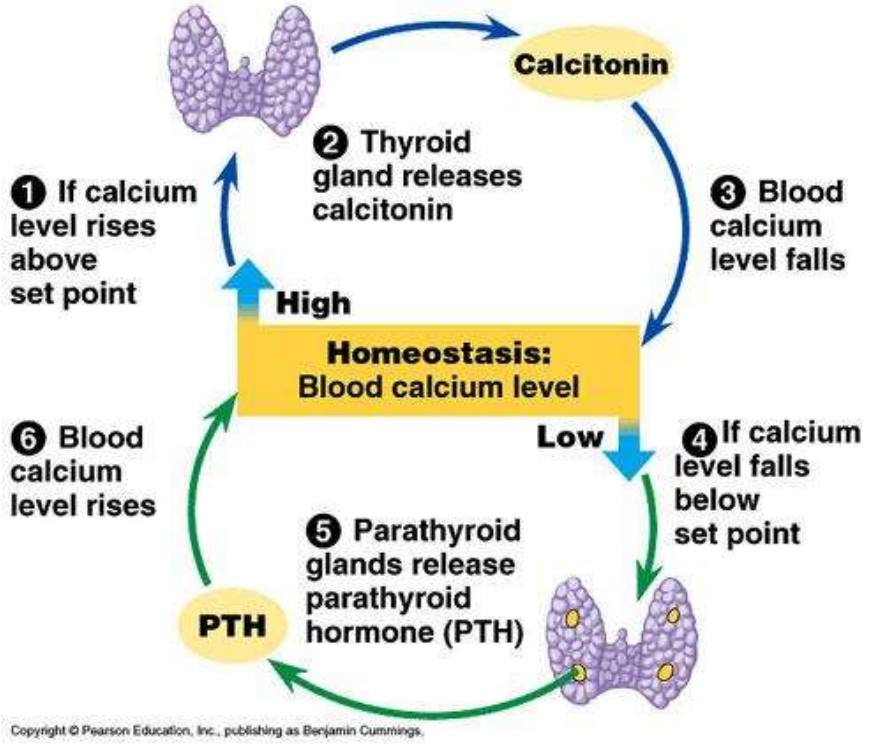
TOXIC GOITER This disease, also called exophthalmic goiter, hyperthyroidism, thyrotoxicosis, or Graves' disease, for the Irish physician Robert James Graves, is caused by an excess of thyroxine secretion. The cause of the excessive secretion is obscure.

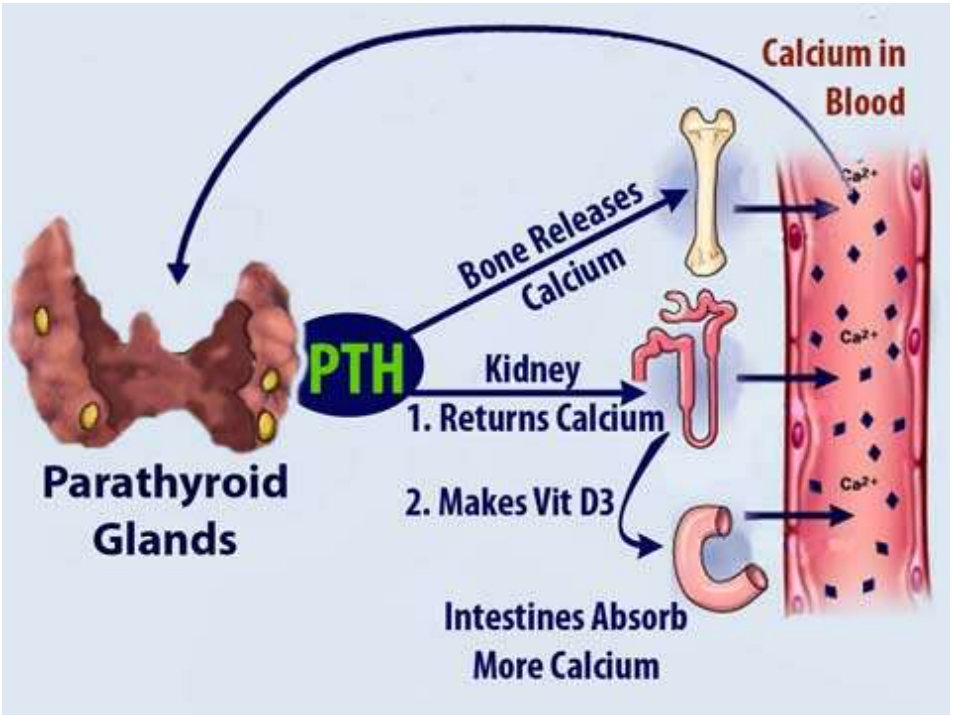
Symptoms of Thyroid Goiter



Parathyroid gland

- It is pea shaped endocrine gland located behind the thyroid gland
- It maintain the calcium and minerals level in the blood
- Any damage or interruption in parathyroid gland can leads to dysfunction of its hormone secretion





Parathyroid disorders

Hypoparathyroidism

Causes

- Parathyroid gland secrets insufficient amount of PTH
- Due to undeveloped parathyroid gland
- Low secretion of PTH in case of autoimmune disease
- Low level of Mg in blood

Symptoms

- Hypocalcemia – low level of calcium in blood
- Tetany
- Sensitive nerves

Treatment

Daily calcium and vitamin D supplements

PRIMARY CAUSES OF HYPOPARATHYROIDISM

AUTOIMMUNE DESTRUCTION

ABSENT PARATHYROID GLANDS

SECONDARY CAUSES OF HYPOPARATHYROIDISM

RADIATION OR SURGERY DAMAGE

LOW MAGNESIUM LEVE

Reviewers: Natalie Lafferty, Annie Camp
Content experts: Professor John A. Pete

Hyperparathyroidism

Causes

- Primary – adenoma

  Secondary-

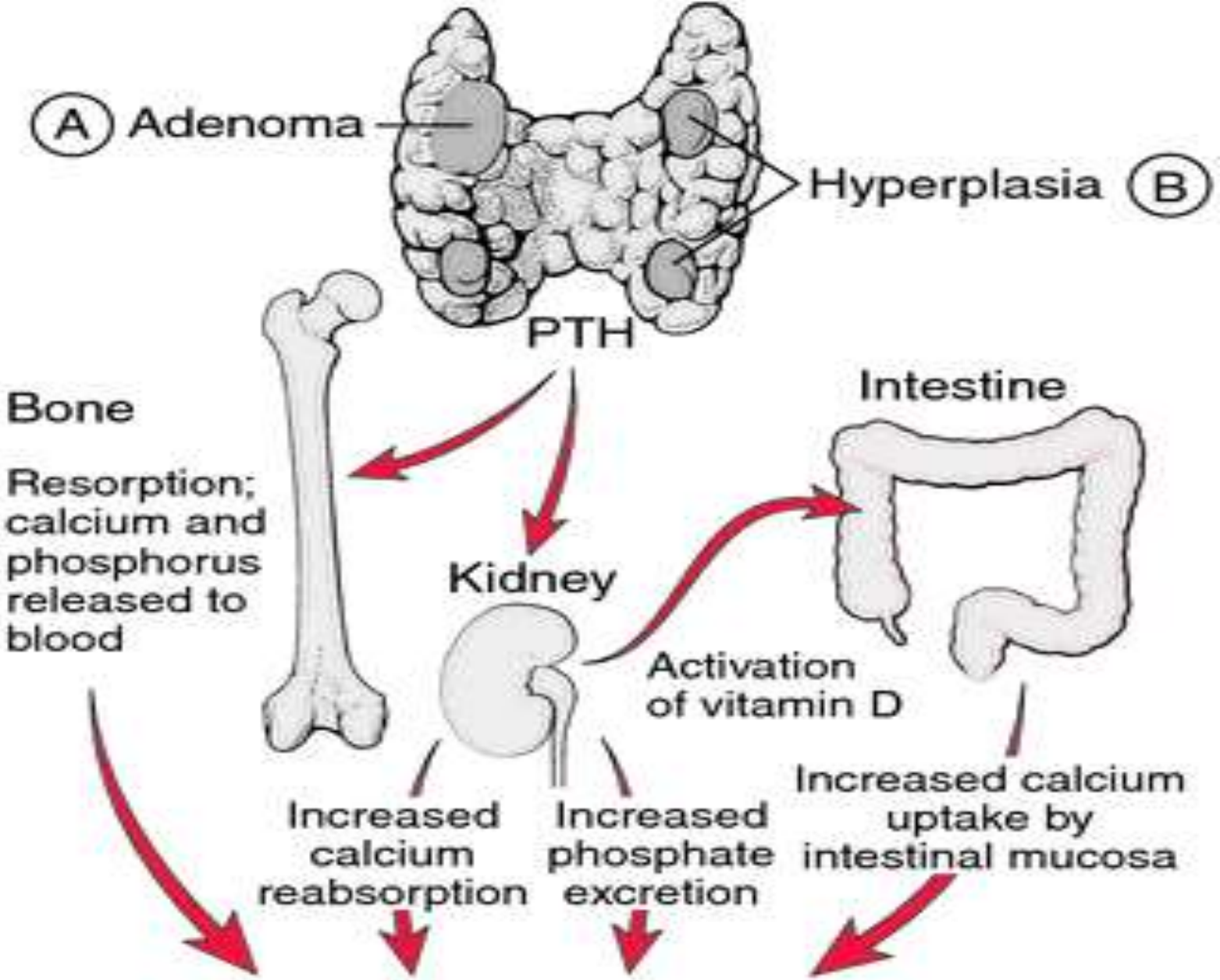
- Chronic renal complications
- Vitamin D deficiency
- Intestinal malabsorption

Hypercalcemia due to

- Increase bone resorption – calcium taken from bones leads to osteoporosis
- Increase renal reabsorption leads to calcification in kidney
- Increase intestinal calcium absorption

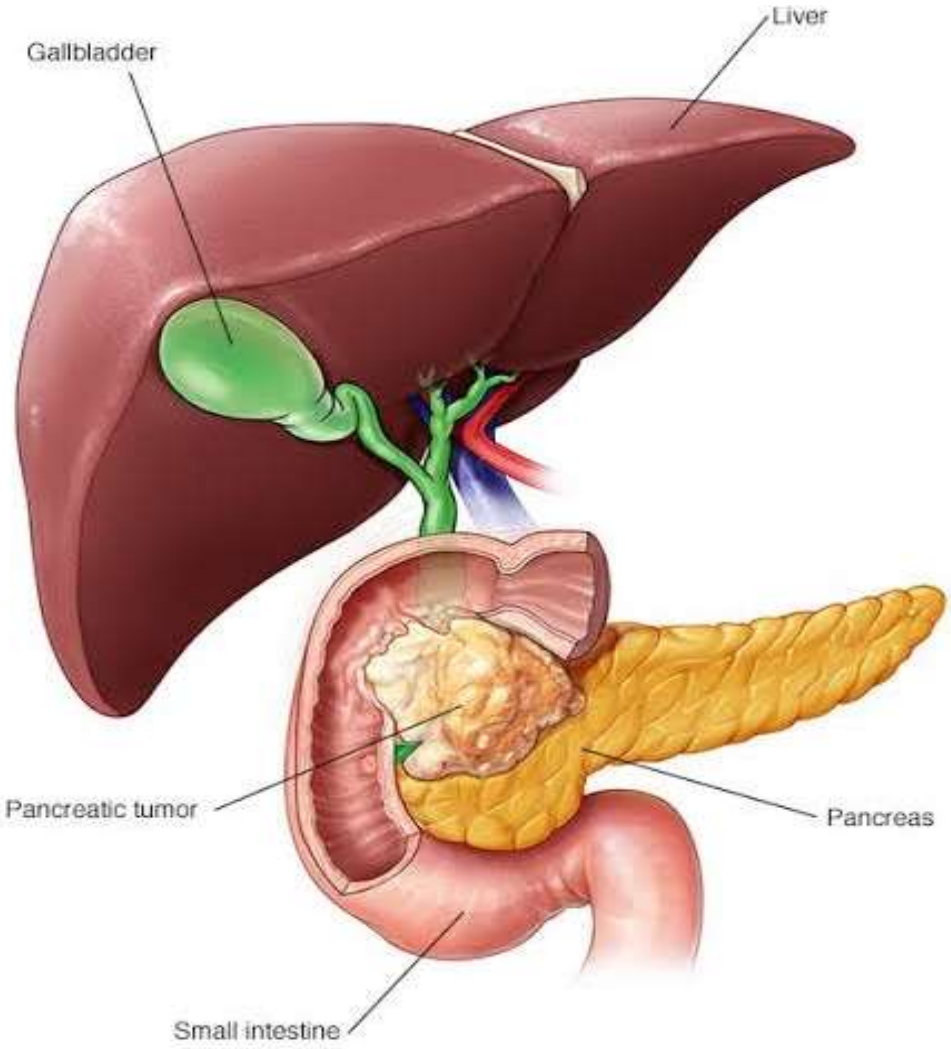
Symptoms

- ✓ Bone pain , depression , frequent urination
- ✓ Treatment – remove the tumor surgically
- ✓ Anti PTH drugs are given



HYPERCALCEMIA / HYPOPHOSPHATEMIA

Disorder of Pancreas

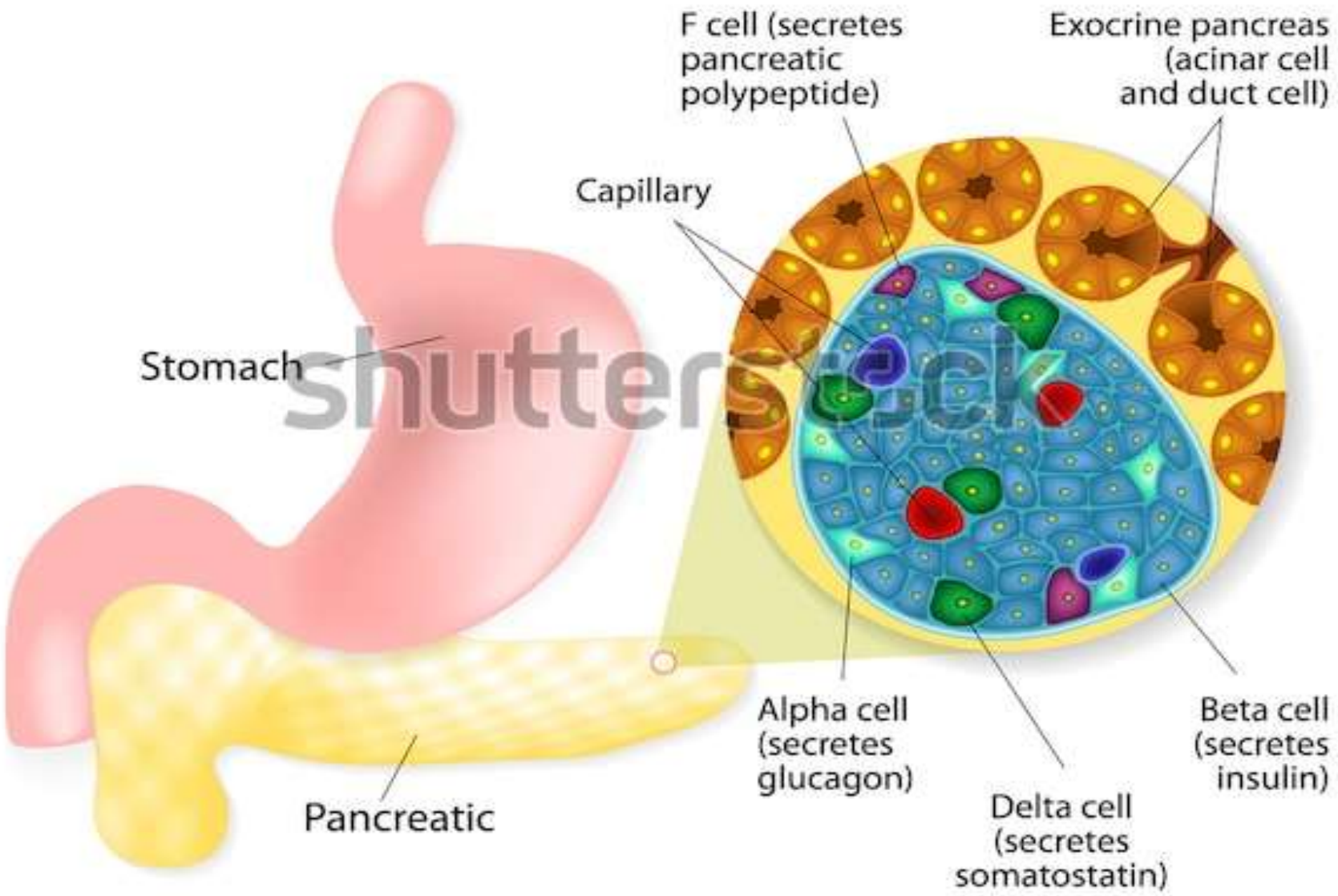


❖**The pancreas (pan=all; creas=flesh) is both an endocrine and exocrine gland .**

❖***pancreas is a flattened organ which measures about 12.5-15cm in length.**

❖**The pancreas is located in the curve of duodenum.**

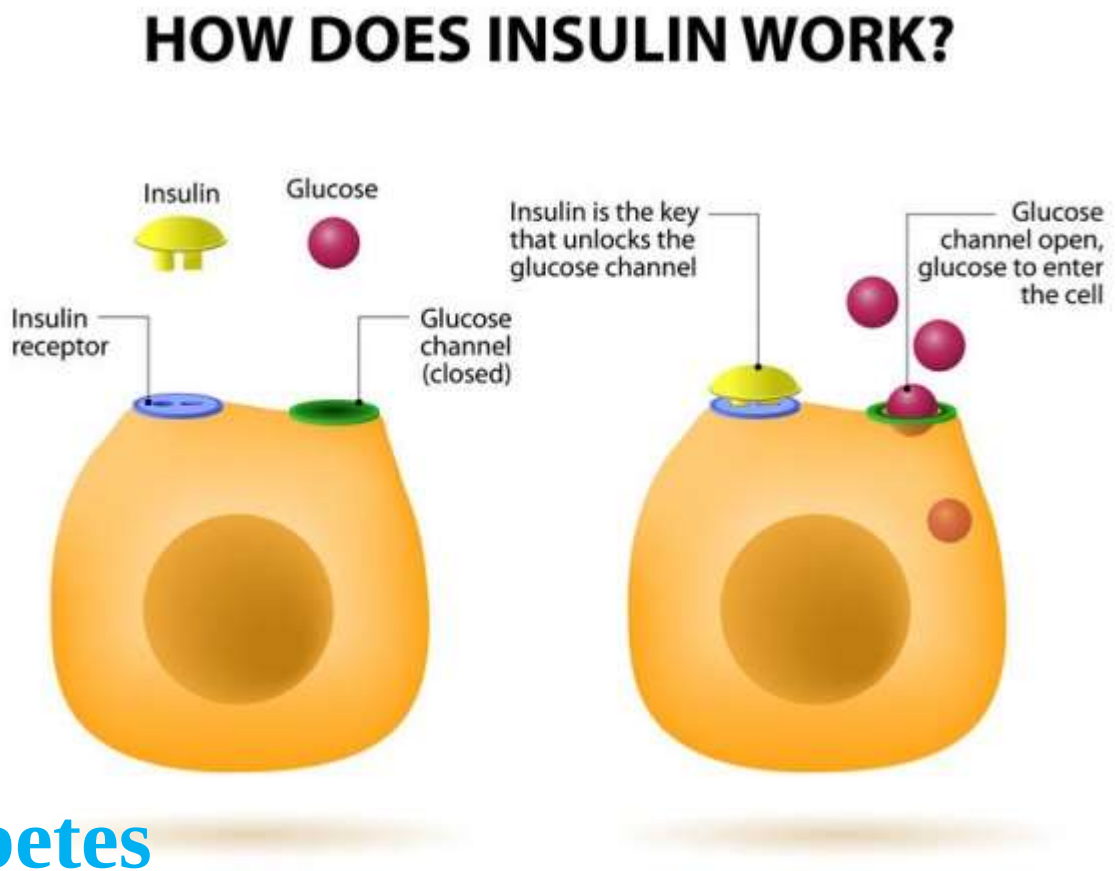
ISLETS OF LANGERHANS



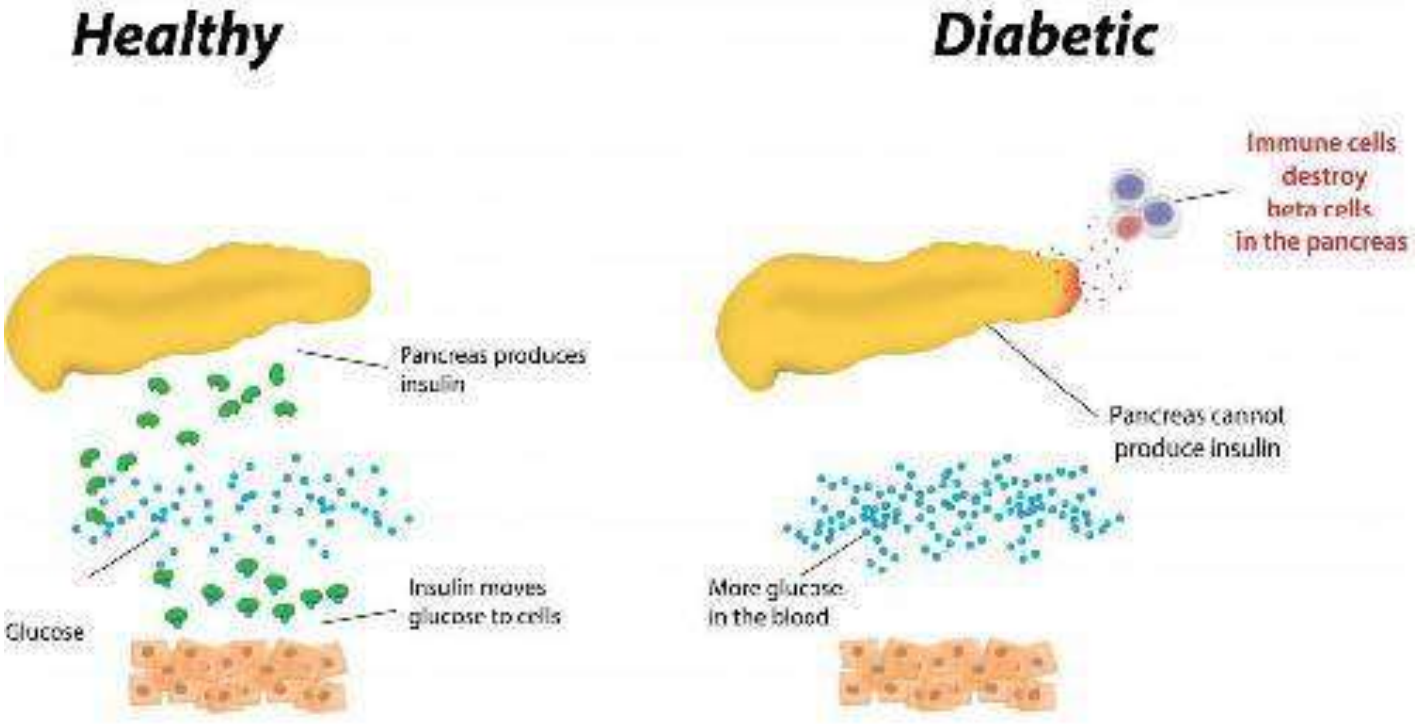
Disorder of pancreas

Diabetes mellitus

- Type 1 diabetes
- Type 2 diabetes
- Prediabetes
- Gestational diabetes



Type 1 Diabetes

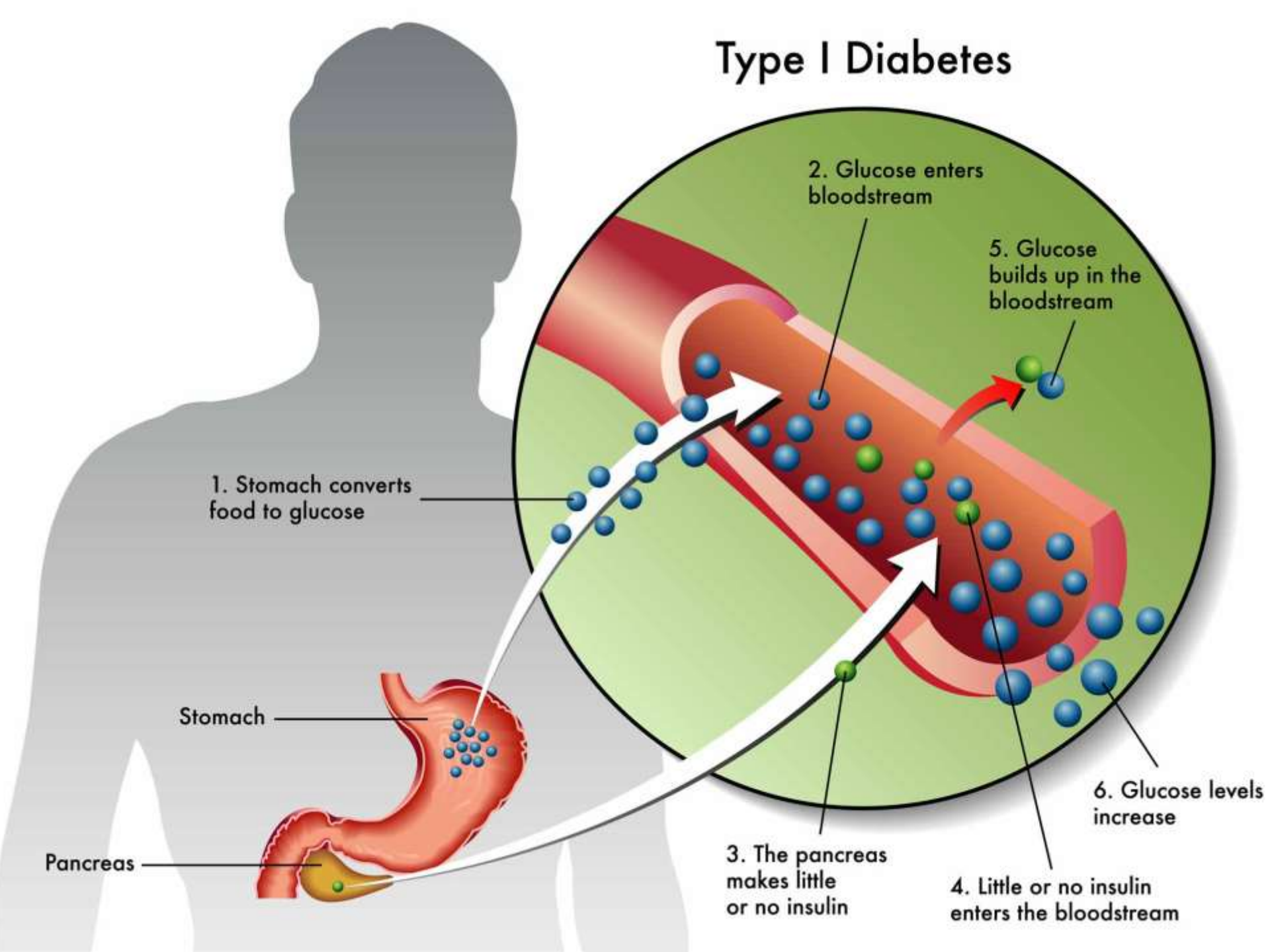


❖**In type 1 diabetes, the pancreatic cells are completely non-functional and thus they stop producing insulin. It is often associated with young age people .**

❖**It generally affects 10% of the population.**

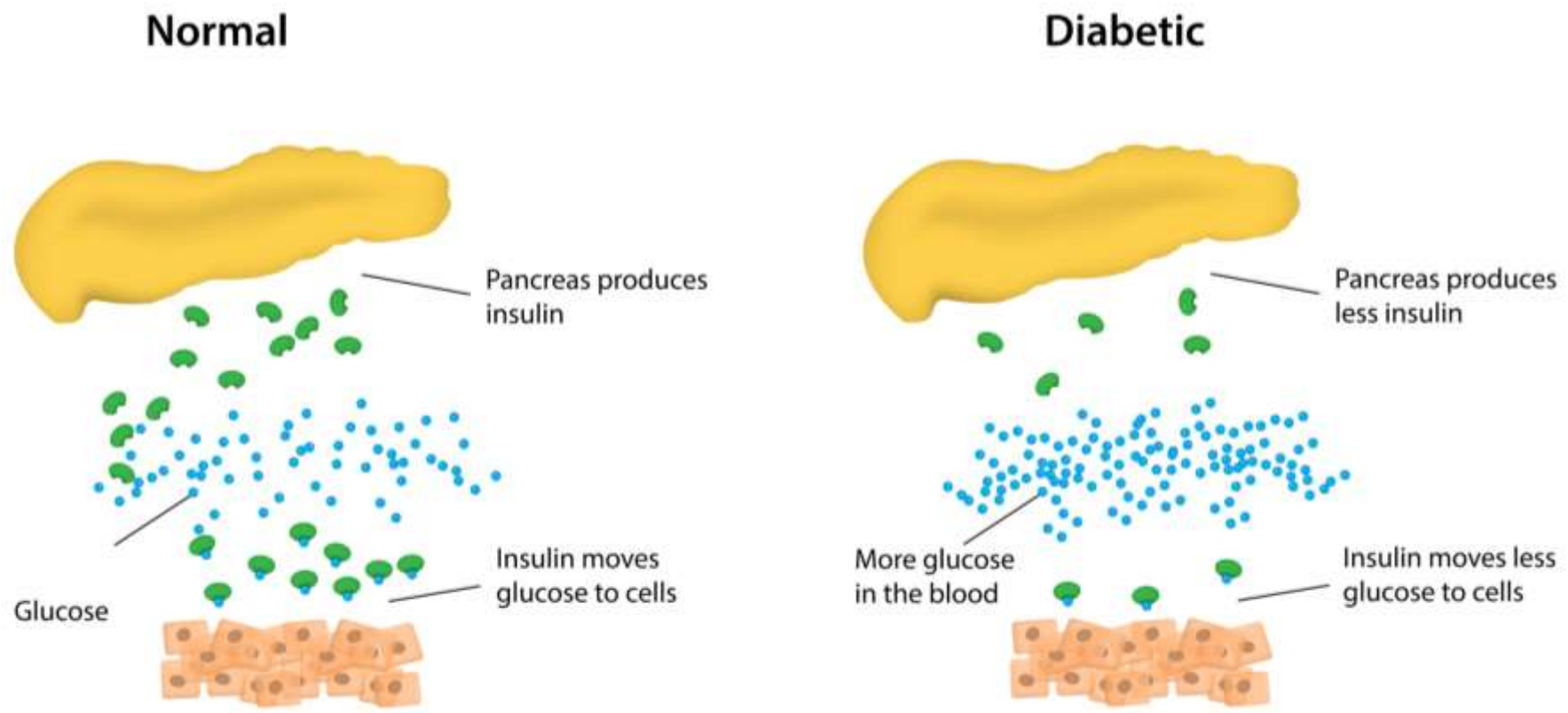
❖**It is genetic .**

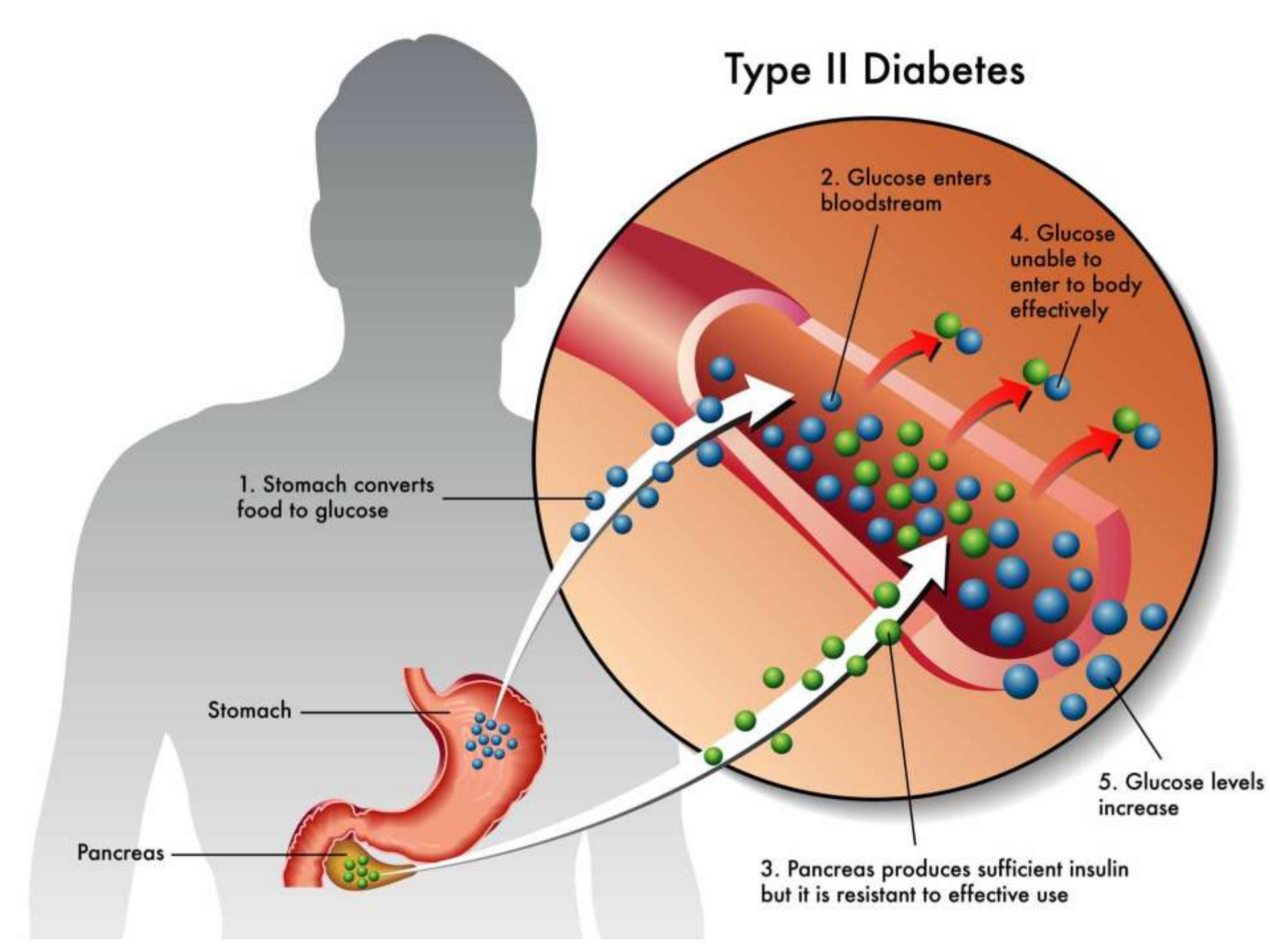
❖**It is also called insulin dependent.**


Type I Diabetes
2. Glucose enters bloodstream
5. Glucose builds up in the bloodstream
1. Stomach converts food to glucose
Stomach
Pancreas
3. The pancreas makes little or no insulin
4. Little or no insulin enters the bloodstream
6. Glucose levels increase

Type 2 diabetes

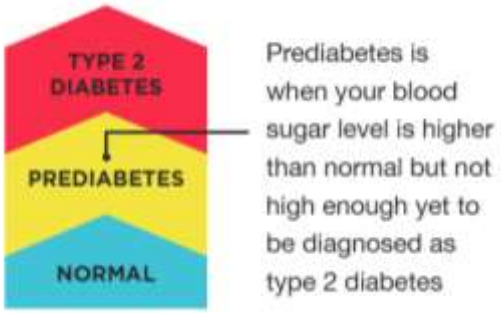
- In this condition pancreas secretes more insulin bu something goes wrong with either receptor binding o signaling pathways inside target cells .
- Cells are not able to respond to insulin therefore canno import glucose.



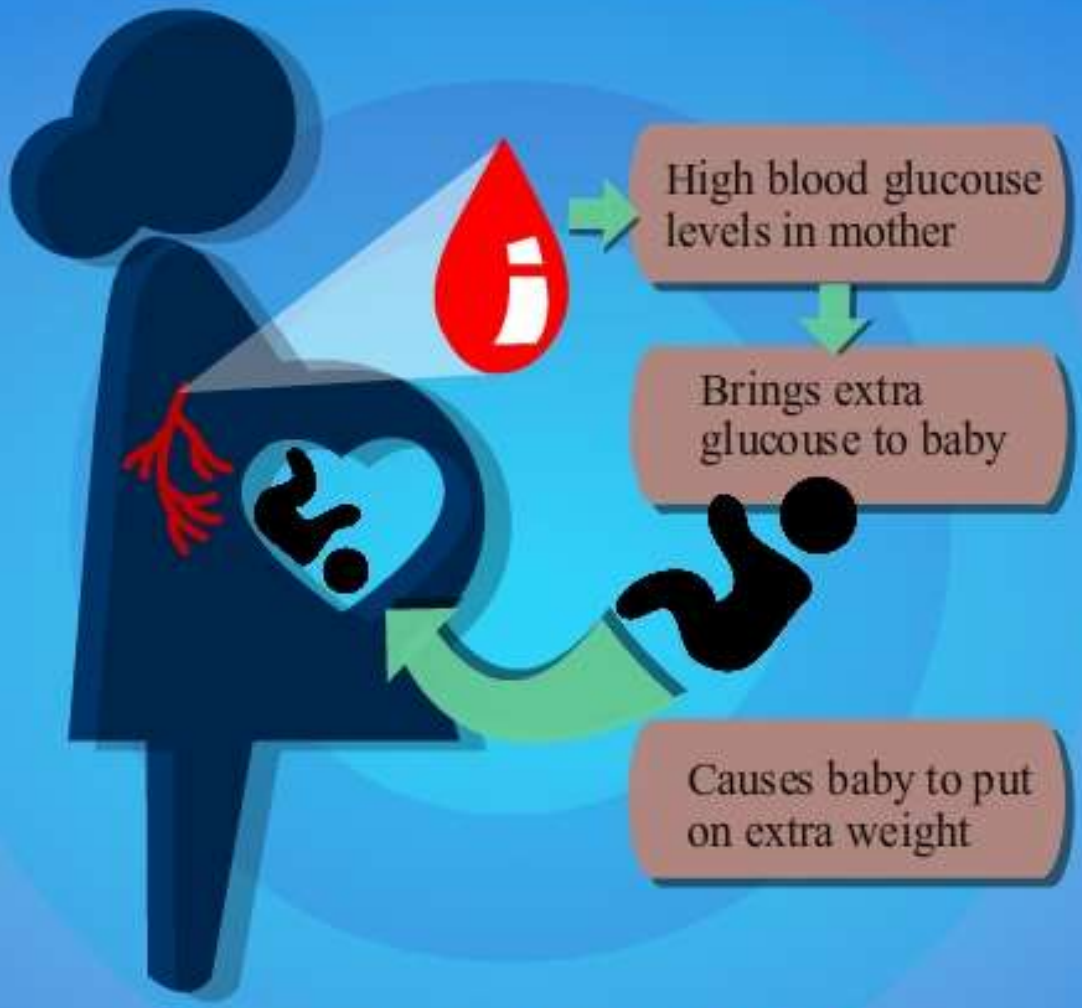

Type II Diabetes
2. Glucose enters bloodstream
4. Glucose unable to enter to body effectively
1. Stomach converts food to glucose
Stomach
Pancreas
5. Glucose levels increase
3. Pancreas produces sufficient insulin but it is resistant to effective use

Prediabetes

It is a serious health condition where blood sugar levels are higher than normal, but not high enough yet to be diagnosed as type 2 diabetes. Approximately 88 million American adults—more than 1 in 3—have prediabetes. Of those with prediabetes, more than 80% don't know they have it. Prediabetes puts you at increased risk of developing type 2 diabetes, heart disease, and stroke.



Gestational diabetes



RISK FACTORS

- **Sedentary lifestyle**
- Obesity
- Large waist size
- Poor diet
- Age
- Family history

Not entirely clear, but genetics is a major risk factor. Type 1 diabetes is commonly **diagnosed in children**.

Same as prediabete

SYMPTOMS

No obvious symptoms

- Increased hunger
- Increased thirst
- Frequent urination
- Fatigue
- Weight loss
- Blurred vision
- Mood changes

- Largely the with type 1
- Slow-heali sores
- Darkened some area body

TREATMENTS

- Lose weight
- Eat more fruits, vegetables and whole grains
- Engage in 150 minutes of moderate aerobic

- **Insulin therapy**
- Patients may need to check blood sugar levels multiple times a day
- Low-fat, high-fiber diet; monitor carbs

- Improve yo
- Lose weigh
- **Exercise**
- Monitor your blood sugar
- Insulin

Symptoms of diabetes

- Excessive urination (polyuria)
- Excessive thirst (polydpsia)
- Excessive hunger
- Weakness,drowsiness
- Blurr vision due to imbalancemen of glucose
- Wound cannt get easily healed

Precautions

- Change your life style
- Take low carbohydrate diet

lark

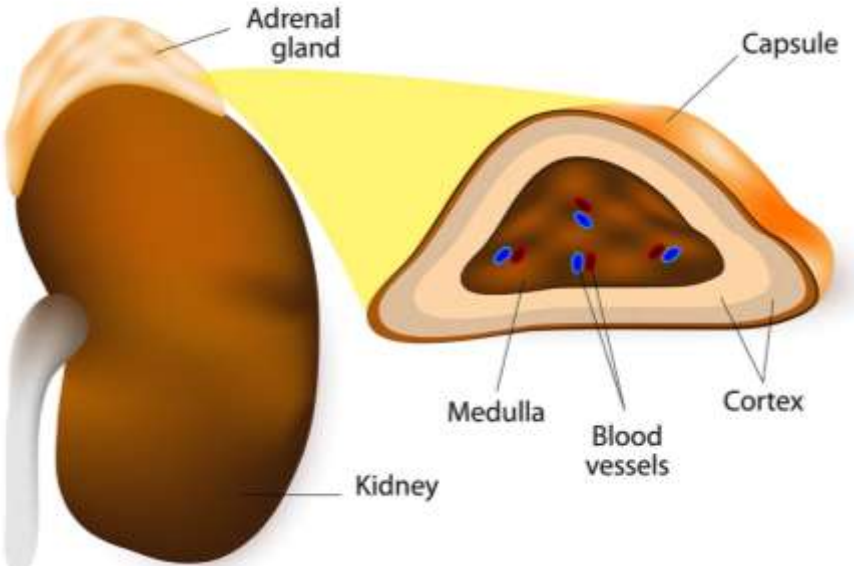
ARE YOU ON THE PATH TO DIABETES?

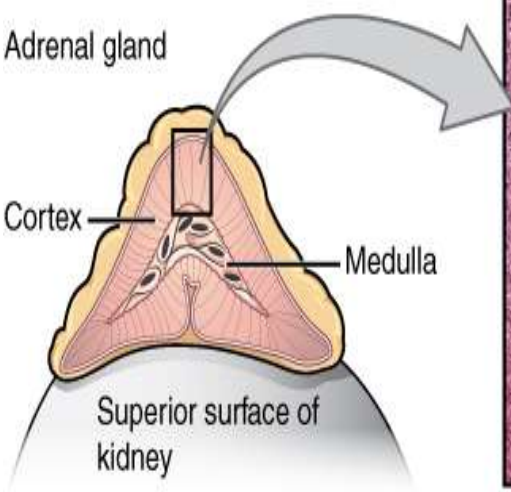
When there are higher than normal levels of sugar in the

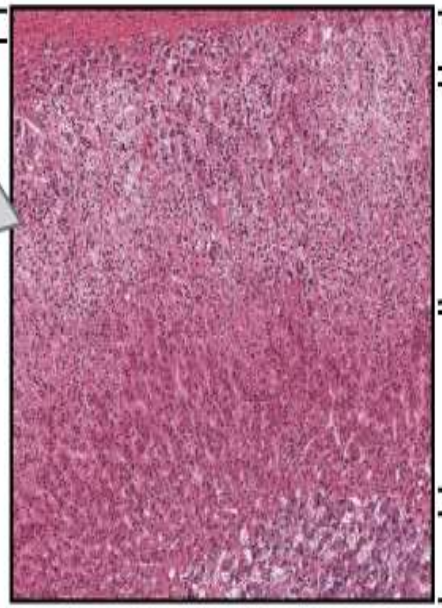
The early, reversible stage of diabetes. Damage is already occurring in the body, but there is still time to change course.

The disease becomes increasingly aggressive. Overall health deteriorates rapidly.

ADRENAL GLAND







Tissue area	Hormones released	Examples
Zona glomerulosa (adrenal cortex)	Mineralcorticoids (regulate mineral balance)	Aldosterone
Zona fasciculata (adrenal cortex)	Glucocorticoids (regulate glucose metabolism)	Cortisol, Corticosterone, Cortisone
Zona reticularis (adrenal cortex)	Androgens (stimulate masculinization)	Dehydroepian-drosterone
Adrenal medulla	Stress hormones (stimulate sympathetic ANS)	Epinephrine, Norepinephrine

Two reasons for Adrenal disorders

- ❖ Hypoactivity
- ❖ Hyperactivity

Parts	HYPO	HYPER
Adrenal Cortex	1. Addison disease 2. Congenital Adrenal Hyperplasia	1. Cushing Syndrome 2. Hyper Aldosteronism 3. Adrenogenital Syndrome

Addison's disease

- Occurs when adrenal cortex (Zona fasiculata) don't produce enough cortisol .
- It is also called hypocortisolism.
- It occurs in all age group and develop slowly.

Causes

Primary adrenal insufficiency (Cortisol low)

- Adrenal cortex is damaged & doesn't produce enough cortisol

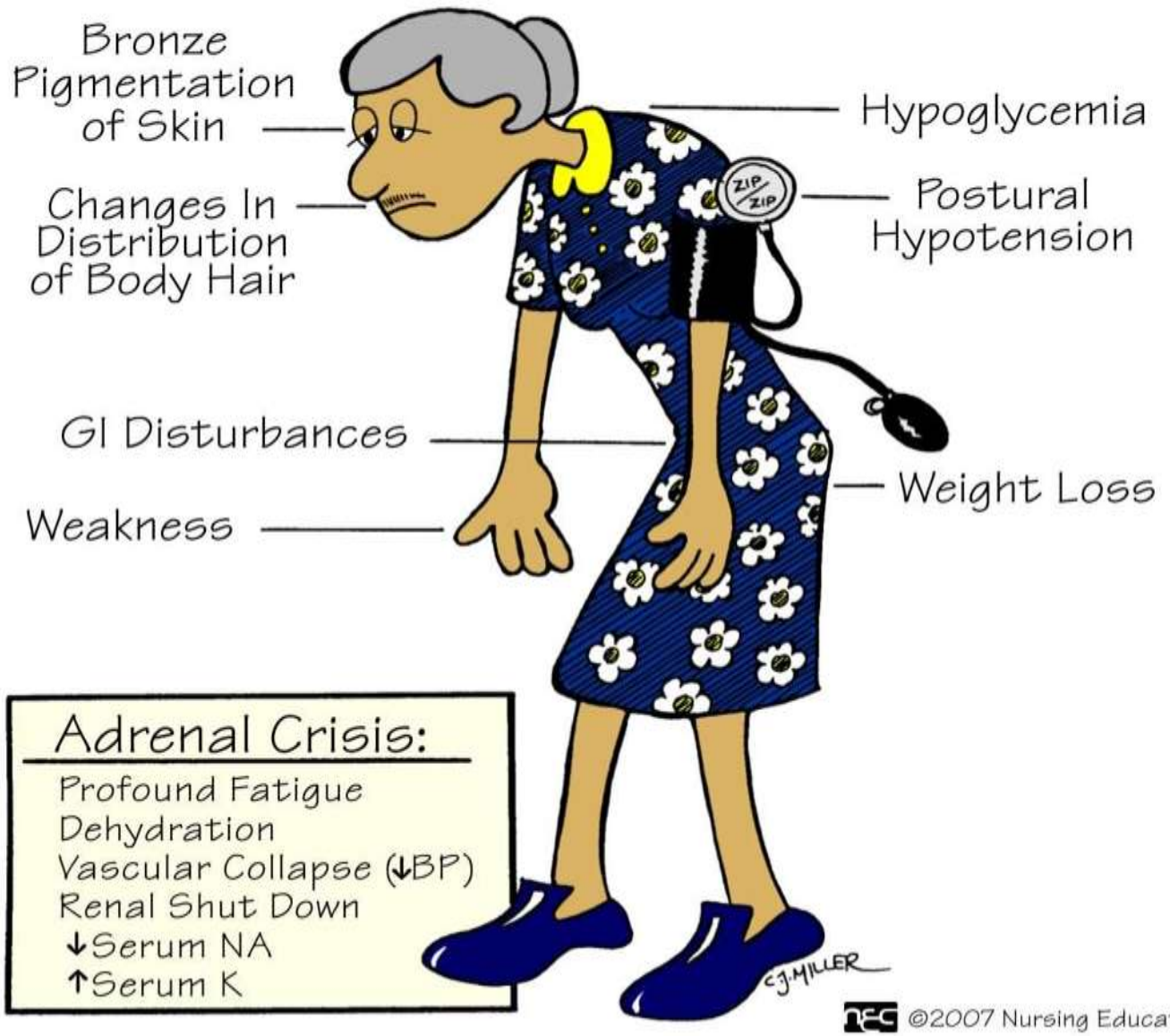
Secondary adrenal insufficiency(ACTH low so cortisol low)

- Benign tumor in PITUITARY
- Prior Pituitary surgery

Symptoms

- Extreme fatigue
- Weight loss and decreased appetite
- Darkening of skin(hyper pigmentation)
- Low B.P
- Low blood sugar (hypoglycemia)
- Nausea
- Vomiting
- Abdominal pain

ADDISON'S DISEASE



Adrenal Crisis:

- Profound Fatigue
- Dehydration
- Vascular Collapse (↓BP)
- Renal Shut Down
- ↓Serum NA
- ↑Serum K

Crisis occurs if Addison's disease is not treated

It is a life threatening situation that results:

- low B.P
- low Blood sugar levels
- High blood levels of potassium (Hyerkalemia) and low sodium (Hypnonatremia)

It may be treated by taking corticosteroids medications to maintain cortisol level in body.

Congenital Adrenal Hyperplasia

❖ A congenital disorder, characterized by increase in size of adrenal cortex.

❖ Size increases due to abnormal increase in the number of steroid-secreting cortical cells

❖Even though the size of the gland increases, cortisol secretion decreases.

❖It is because of the congenital deficiency of the enzymes necessary for the synthesis of cortisol, particularly, 21-hydroxylase.

❖Hence, Lack of this enzyme reduces the synthesis of cortisol, resulting in ACTH secretion from pituitary by feedback mechanism. ACTH stimulates the adrenal cortex causing hyperplasia, with accumulation of lipid droplets.

❖ it is also called congenital lipid adrenal hyperplasia.

❖Cortisol cannot be synthesized because of lack of 21-hydroxylase.

❖ Therefore, due to the constant simulation of adrenal cortex by ACTH, the secretion of androgens increases.

❖It results in sexual abnormalities such as virilism.Thus in girls, adrenal hyperplasia produces masculinization.

Parts	HYPO	HYPER
Adrenal Cortex	1. Addison disease 2. Congenital Adrenal Hyperplasia	1. Cushing Syndrome 2. Hyper Aldosteronism 3. Adrenogenital Syndrome

Cushing's Syndrome

❖It describes the signs and symptoms associated with prolonged exposure to inappropriately high levels of the hormone cortisol.

❖This can be caused by taking glucocorticoid drugs, or diseases that result in excess cortisol, (ACTH), or CRH levels

Hypersecretion of Glucococoticoids (Cortisol)

It may be either due:

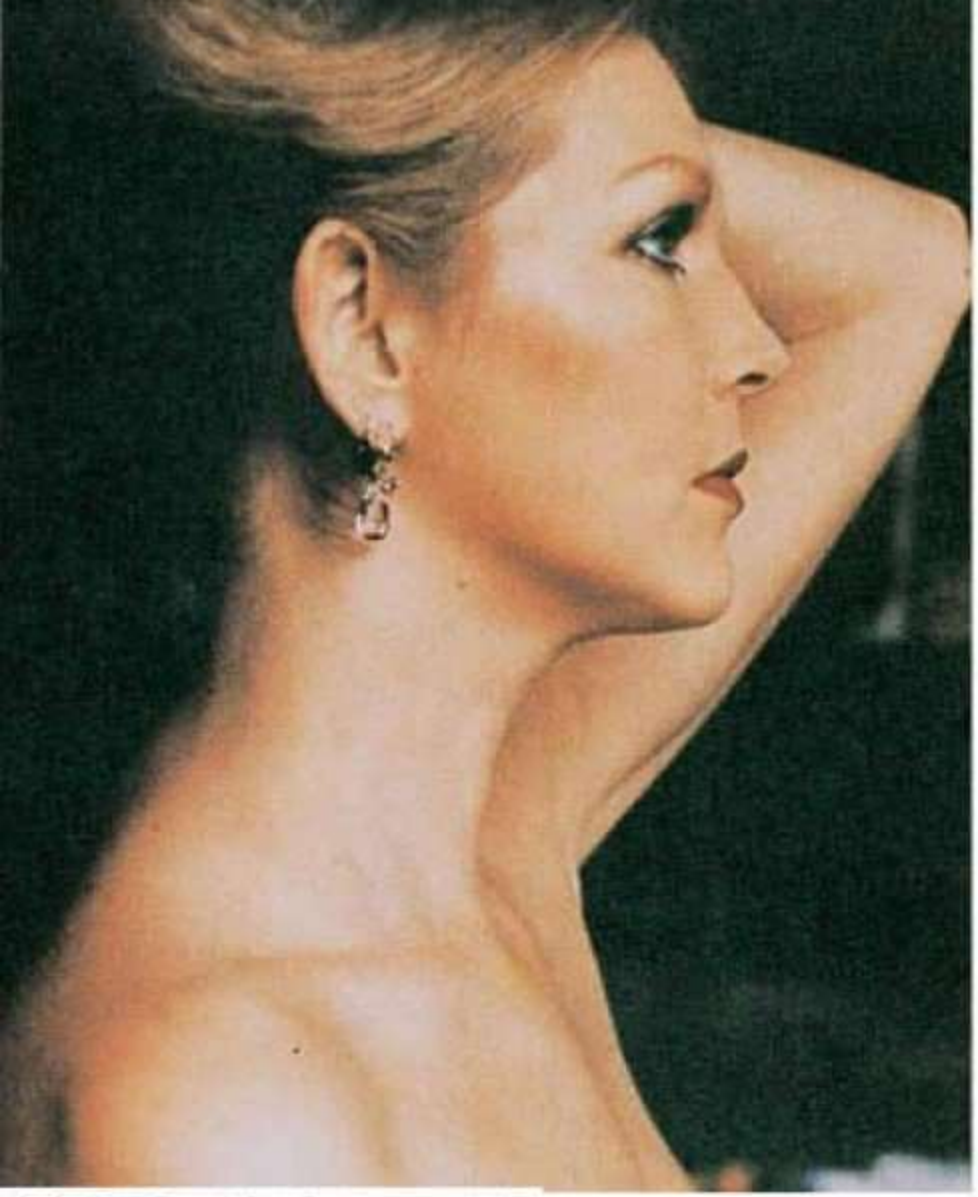
- ❖ Pituitary origin (Cushing Disease)

- ❖ Adrenal origin (Cushing Syndrome)

Adrenal Origin

Cortisol secretion is increased by:

- Tumor in zona fasciculata of adrenal cortex
- Carcinoma of adrenal cortex
- Prolonged treatment of chronic inflammatory diseases
- like rheumatoid arthritis, with high dose of exogenous glucocorticoids
- Prolonged treatment with high dose of ACTH, which stimulates adrenal cortex to secrete excess glucocorticoids



(a) Patient before onset.

(b) Same patient with Cushing's syndr
The white arrow shows the characterist
"buffalo hump" of fat on the upper back

Cushing's syndrome

- Cortisol level high
- Weight gain
- Pinky skin
- High blood sugar
- Corticosteroids medications is harmful

Addison's disease

- Cortisol level low
- Weight loss
- Darkening of skin
- Low blood levels
- Corticosteroids medications is useful

Hyper-Aldosteronism

❖ Increased secretion of aldosterone **(mineralocorticoids)** is called hyperaldosteronism.

❖**This disease is occurs in the zona glomerulosa layer.**

Types:-

❖**Primary Hyperaldosteronism (Conn's syndrome)**

❖**Secondary Hyperaldosteronism**

Primary Hyperaldosteronism

❖Also known as **Conn syndrome.**

❖It develops due to tumor in zona glomerulosa ofadrenal cortex.

❖In primary hyperaldosteronism, edema does not occur because of escape phenomenon

Secondary Hyperaldosteronism

❖Also called **Hyperreninism or Hyperreninimic aldosteronism.**

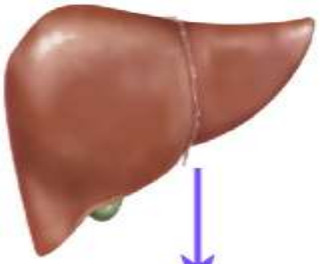
It occurs due to extra adrenal causes such as:

- Congestive Cardiac failure
- Nephrosis
- Toxemia of pregnancy
- Cirrhosis of liver.

Renin-angiotensin system

Drop in blood pressure
Drop in fluid volume

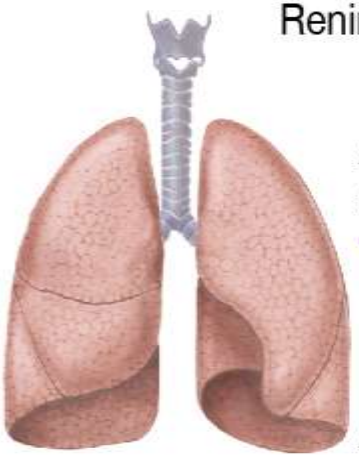
Renin release from kidney



liver

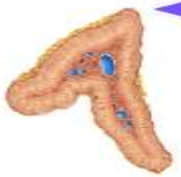
angiotensinogen

Renin acts on angiotensinogen to form **angiotensin I.**

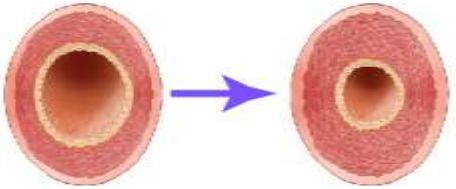


ACE (angiotensin-converting enzyme) release from lungs

ACE acts on angiotensin I to form **angiotensin II.**



Angiotensin II acts on the adrenal gland to stimulate release of **aldosterone.**



Angiotensin II also acts directly on blood vessels, stimulating vasoconstriction (narrowing).

NaCl
H_2O

Aldosterone acts on the kidneys to stimulate reabsorption of salt (NaCl) and water (H_2O).

Primary Aldosteronism or Conn's Syndrome

- Excessive aldosterone secondary to adrenal tumor
- retain sodium and excrete potassium
- Results in alkalosis
- Hypertension—universal sign of hyperaldosteronism
- Inability of kidneys to concentrate the urine
- Serum becomes concentrated
- Excessive thirst
- Hypokalemia interferes with insulin secretion

Etiologies of Mineralocorticoid Excess

	Etiologies	Renin	Aldosterone
Primary Hyperaldosteronism	Aldosterone-secreting tumor Congenital adrenal hyperplasia	Normal or Low	High
Secondary Hyperaldosteronism	Renovascular disease Renin-secreting tumor	High	High
Pseudohyperaldosteronism	Cushing's syndrome Exogenous mineralocorticoids	Normal or Low	Normal or Low

All forms of mineralocorticoid excess are associated with hypertension.

Adrenogenital Syndrome

❖Under normal conditions, adrenal cortex secretes small quantities of androgens which do not have any significant effect on sex organs or sexual function.

❖ However, secretion of abnormal quantities of adrenal androgens develops adrenogenital syndrome.

❖**Testosterone is responsible for the androgenic** activity in adrenogenital syndrome

❖It develops due to development of tumor (zona reticularis)in adrenal cortex

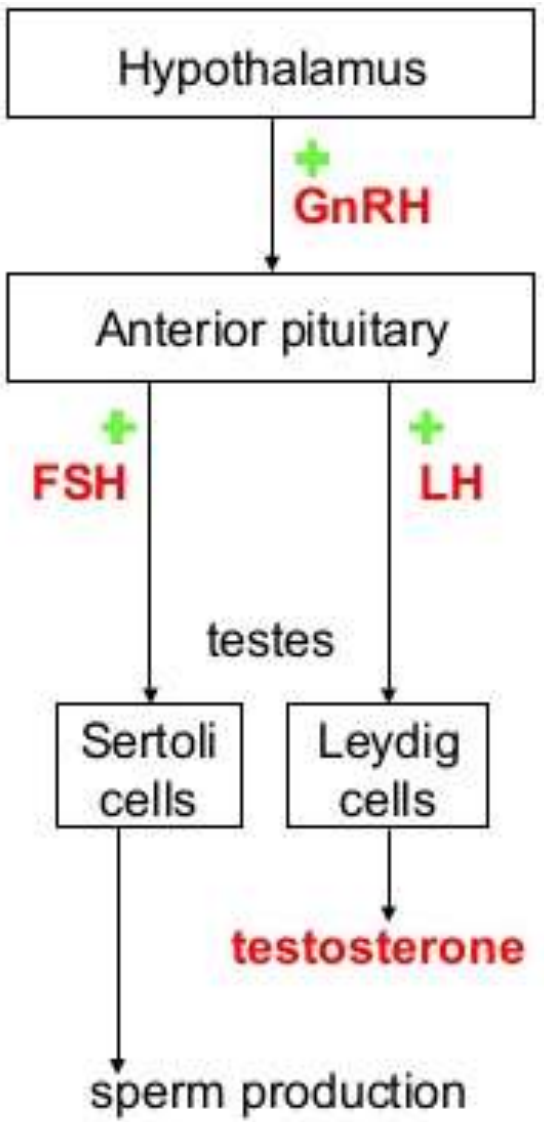
Symptoms in females

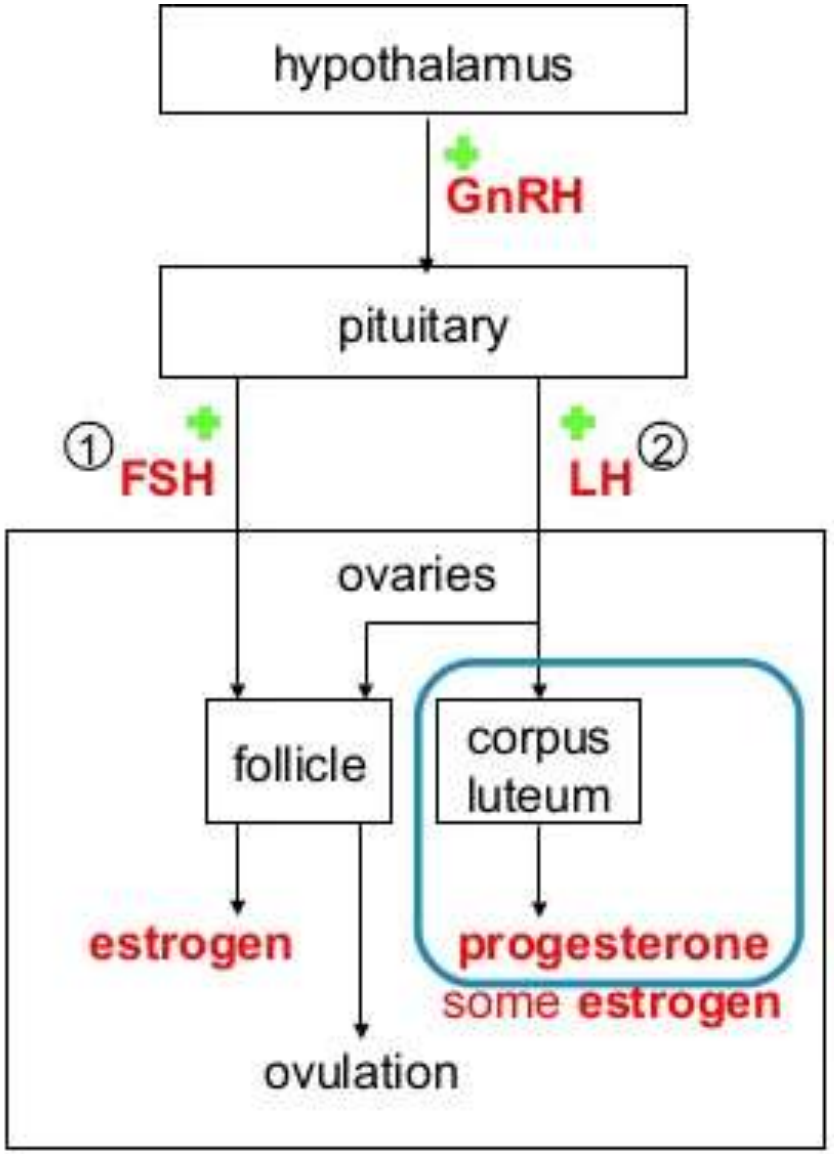
- Increased secretion of androgens causes
- development of male secondary sexual characters.
- The condition is called **adrenal virilism. Symptoms as:**
- Masculinization due to increased muscular growth
- Deepening of voice
- Amenorrhea
- Male type of hair growth.

Symptoms in Males:

- Sometimes, the tumor of estrogen secreting cells produces more than normal quantity of estrogens in males. Symptoms as:
- Feminization
- Gynecomastia (enlargement of breast)
- Atrophy of testis
- Loss of interest in women

Male and Female Reproductive Hormone control





Disorders of Reproductive Hormones

- Polycystic Ovarian Syndrome: Hormonal imbalance in women linked to excess production of male sex hormone

- Hirsutism: Condition in women in which too much hair grows on the face or body

- Late Onset Congenital Adrenal Hyperplasia: Genetic disorder in women Where the adrenal glands do not produce important sex hormone

- Testosterone Deficiency: Condition in men where there is insufficient Testosterone production

Polycystic Ovarian Syndrome

It is characterized by many cyst in ovary

❖It is the condition which affects hormonal level of female .

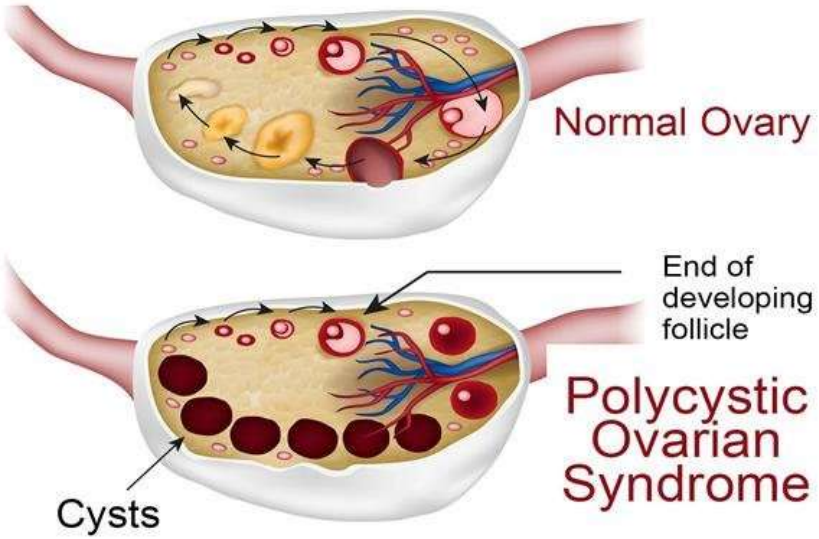
❖- women with PCOS produce higher amount of testosterone .

Main features of Polycystic ovary syndrome:

❖Cyst in ovaries

❖Higher level of testosterone

❖Irregular or skipped periods



Hirsutism

❖It is seen in female, which is characterized by excessive hair which grows on woman 's body and face which result a condition of hirsutism .

❖According to Indian journal of dermatology ,it affects 5%- 10%of women

Causes

- Due to **higher level of male sex hormone testesterone.**
- Polycystic ovary syndrome
- Adrenal gland disorder

Symptoms

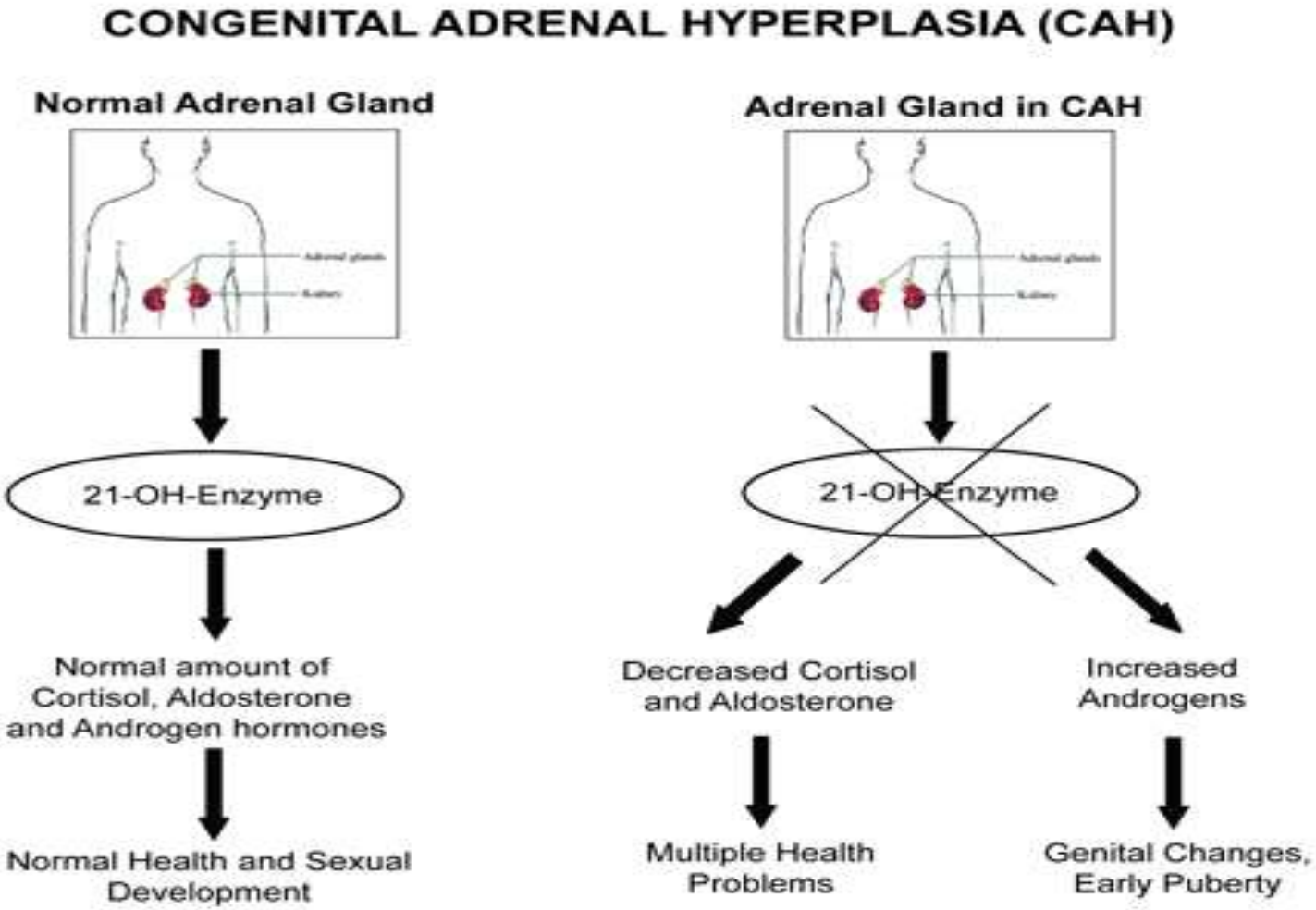
- Deepning in voice (male like voice)
- Infertility
- Pelvic pain
- Headache
- Moustache
- Insomnia

Treatment

- Minoxidii
- Cyclosporine
- Combination of birth pills

Late Onset Congenital Adrenal Hyperplasia

Genetic disorder in women ,where the adrenal glands do not produce important sex hormone



Symptoms of Low Testosterone for Both Men & Women

Men:

- Fatigue
- Loss of Muscle Mass
- Hair Loss
- An Increase in Body Fat
- Sexual Dysfunction
- Changes in Mood

Women:

- Fatigue
- Dry Skin
- Low Libido
- Poor Memory
- Anxiety or Depression
- Osteoporosis
- Gaining Weight Around the Abdomen
- Having a Hard Time Maintaining Muscle

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Thank
You