Lecture #8
First semester

Endocrine system Disorders

:by

lecturer

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Adult Nursing

The Endocrine System

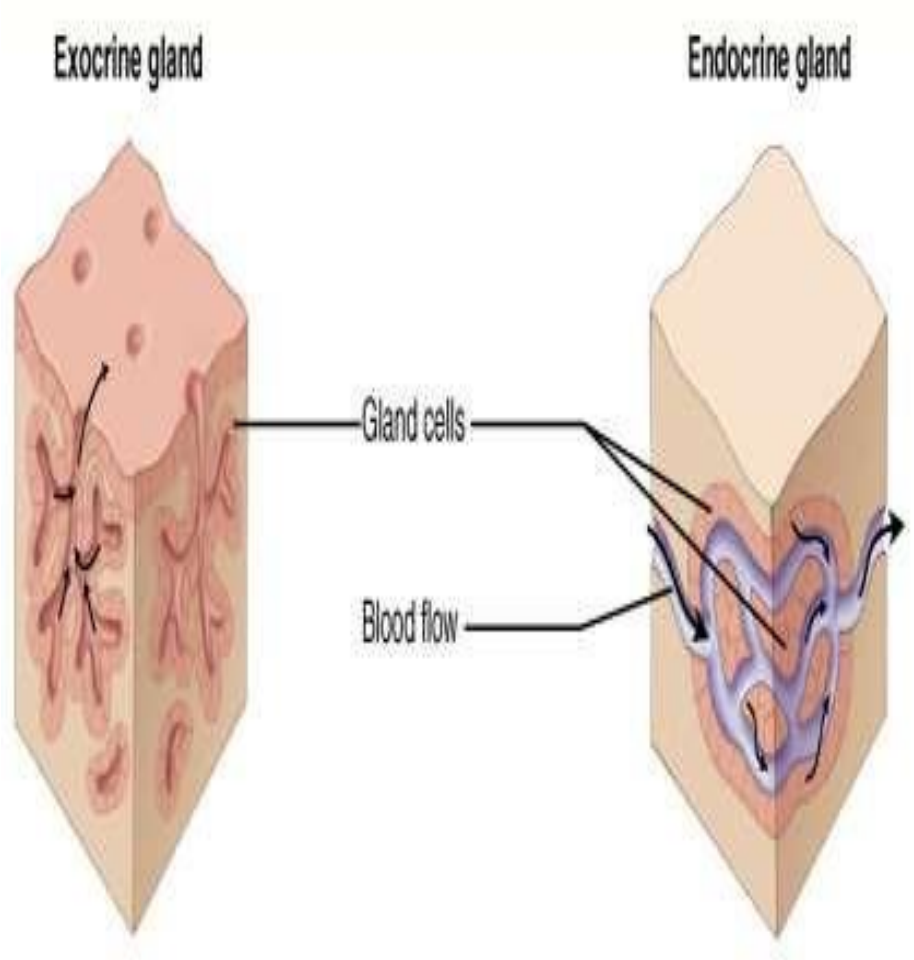
The endocrine system is a network of **glands** and **hormones** that regulate and control the activity of cells or organs and many important body functions.

- The **endocrine system** regulates body activities by releasing **hormones** (chemical messengers) into the bloodstream or through ducts , where they are carried throughout the entire body.
- Hormonal responses may be almost instantaneous (Sudden), or may occur days later. There is a wide variety of hormonal effects.

GLANDS

A group of cells (organ) that synthesizes substances (such as hormones) for release into the bloodstream (endocrine gland) or into cavities inside the body or its outer surface (exocrine gland)

- There are three types of glands in our body:
  - **Endocrine glands**
  - **Exocrine glands**
  - **Heterocrine glands**

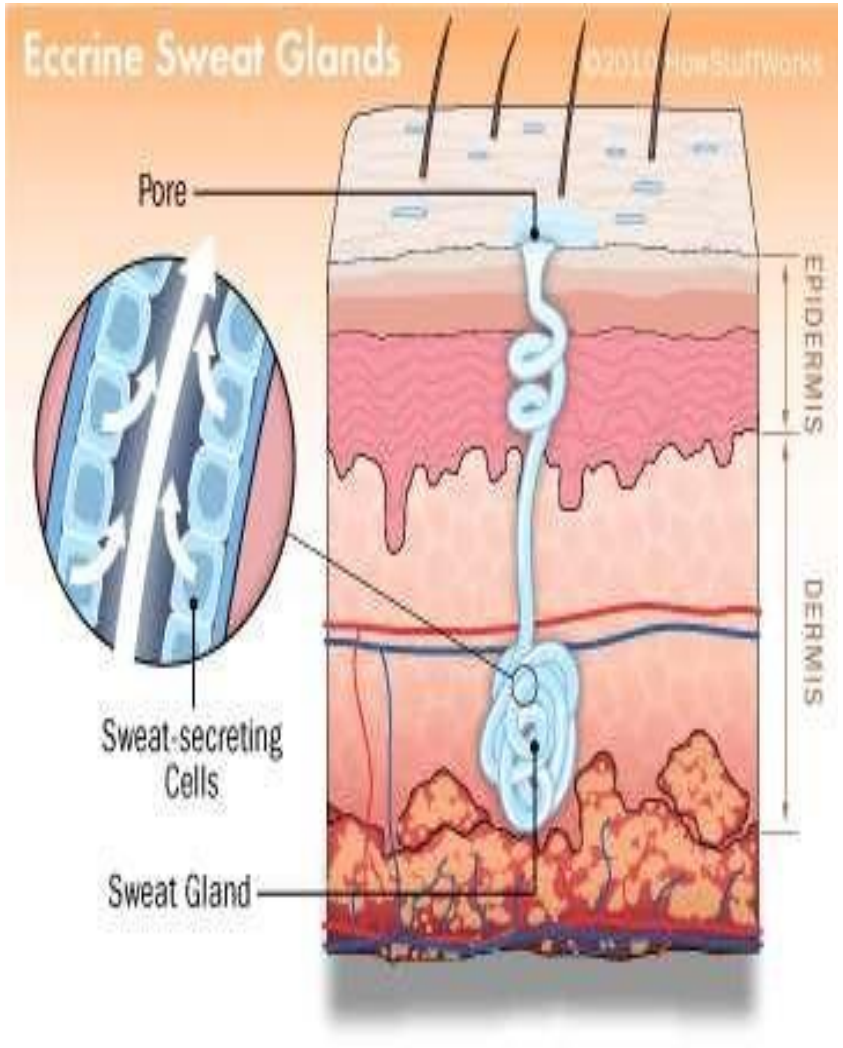


EXOCRINE GLANDS

Glands that secrete their products into body ducts, which carry the products into body cavities, the lumen of an organ, or the outer surface of the body.

EXAMPLE:

- Sweat glands
- Salivary glands
- Mammary glands
- Stomach
- Liver

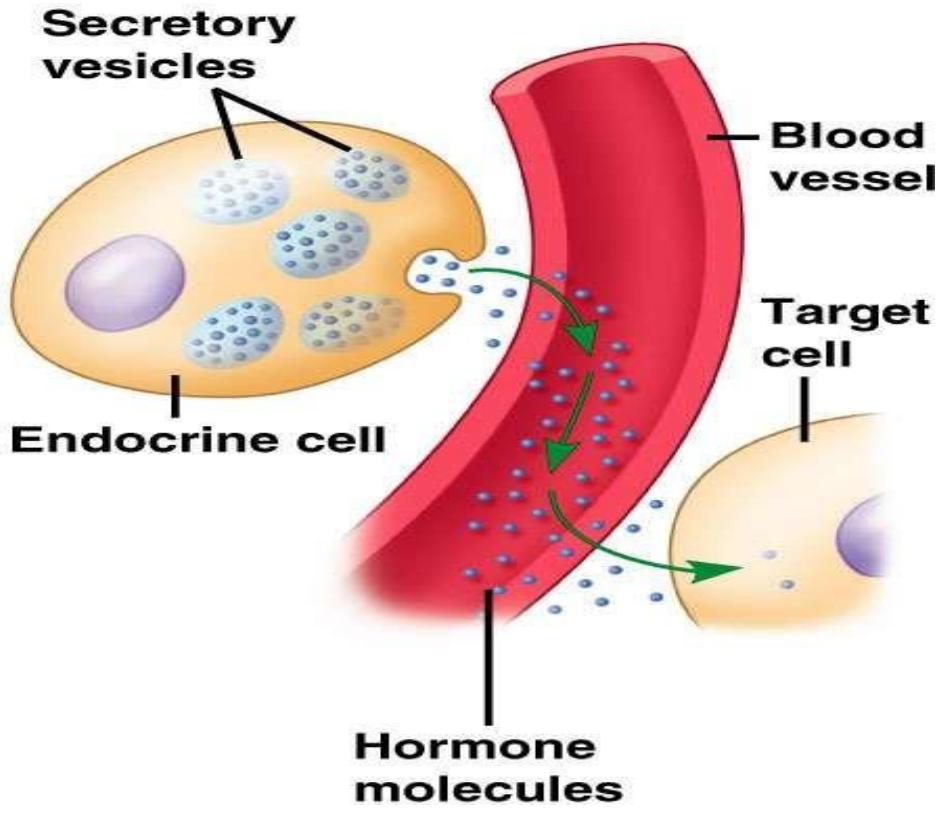


ENDOCRINE GLANDS

Glands that secrete their product (hormones) directly into the bloodstream rather than through a duct.

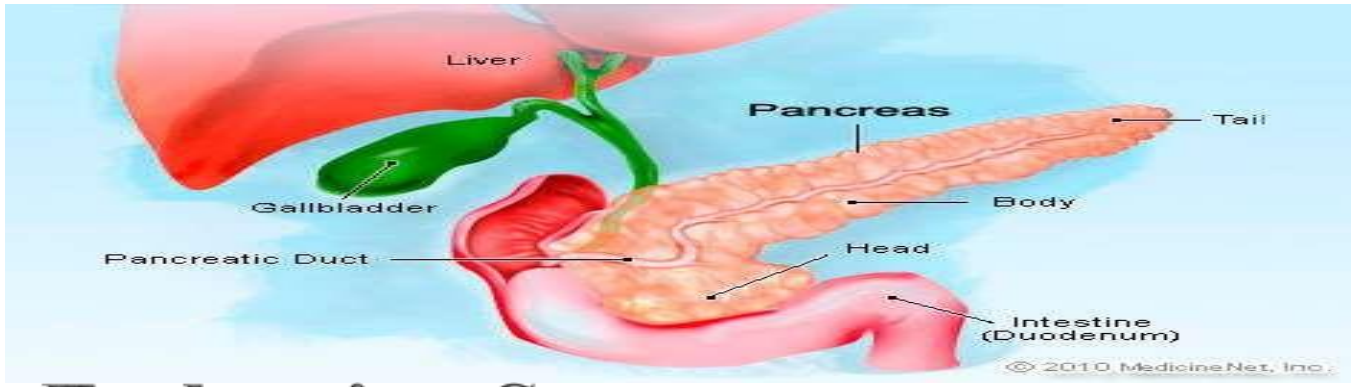
EXAMPLE:

- Pituitary gland
- Pancreas
- Thyroid gland
- Adrenal glands



HETEROCRINE GLANDS

These are glands that perform both exocrine and endocrine functions. For example ***pancreas***



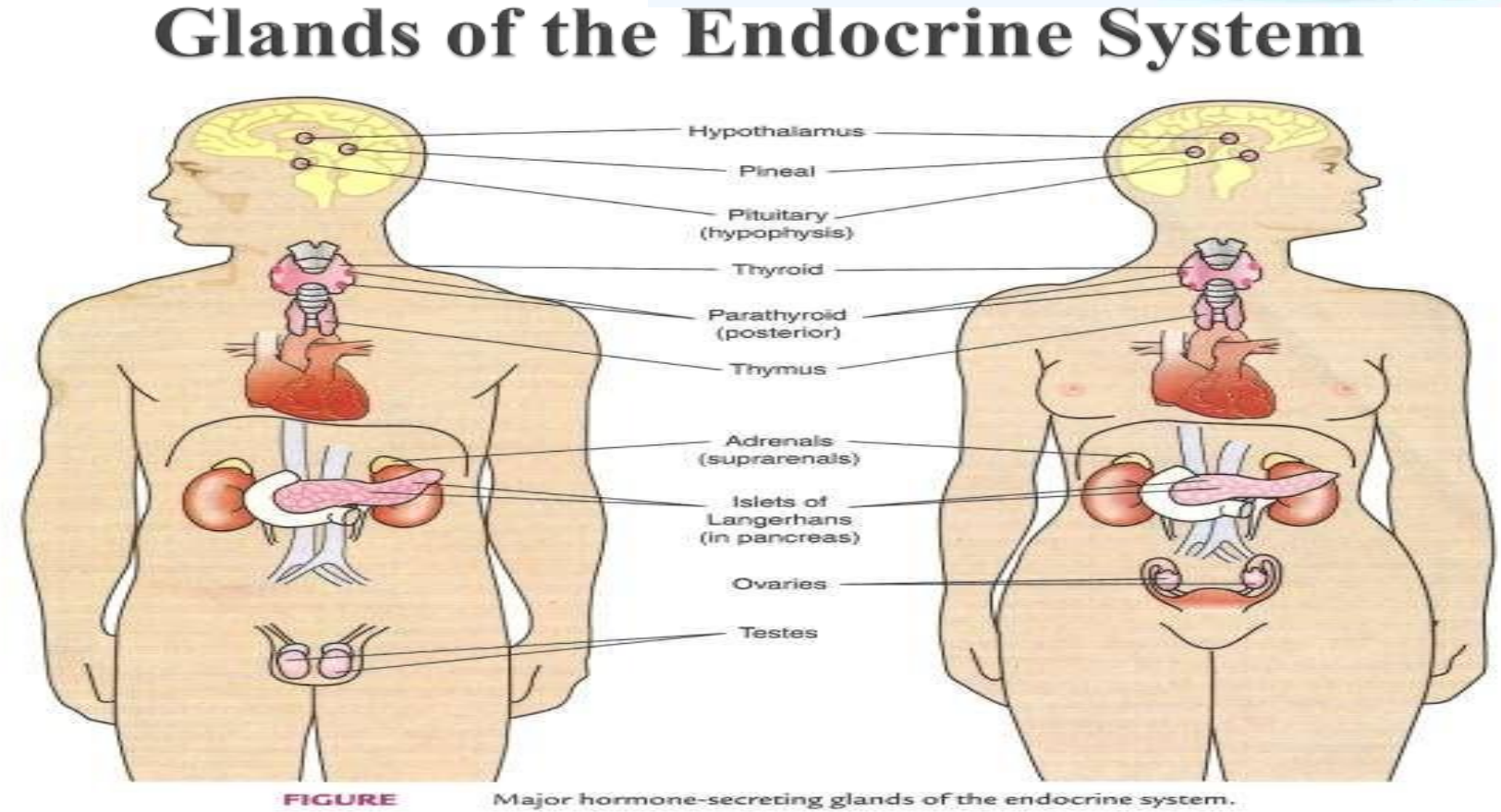
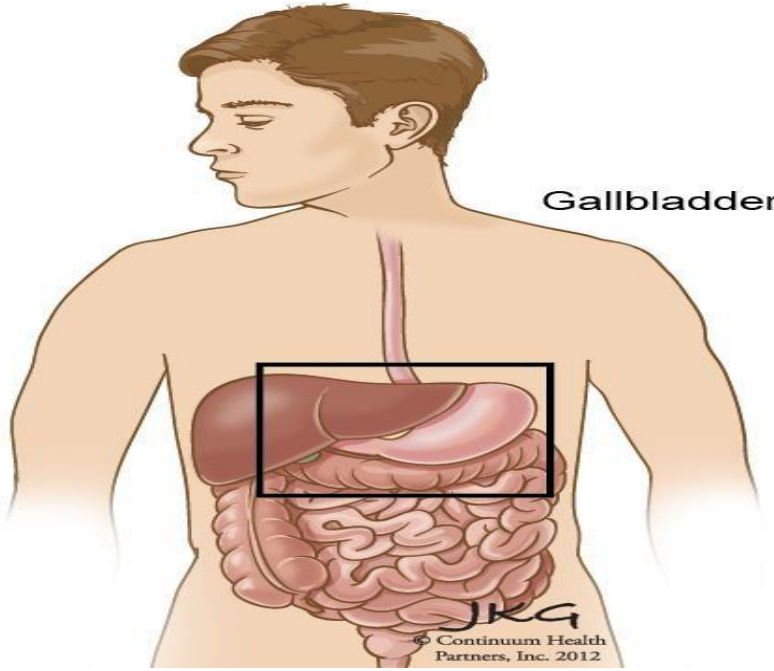


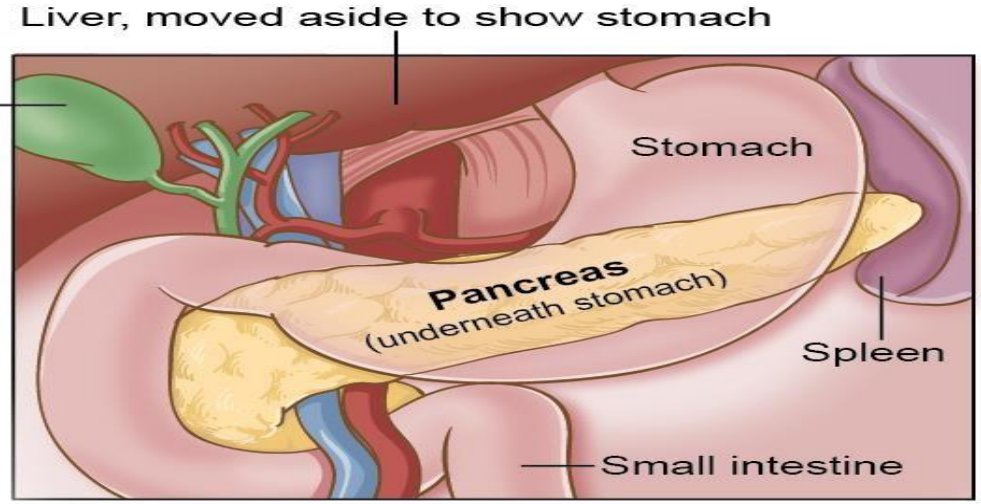
FIGURE Major hormone-secreting glands of the endocrine system.

THE PANCREAS

The **pancreas** is classified as both and endocrine organ and an exocrine organ.

- There are three main types of cells in the pancreatic islets:
  - (alpha) cells, which secrete ***glucagon (increases blood glucose levels)*** ⬆
  - (beta) cells, which are the most numerous, secrete ***insulin(reduces blood glucose levels)*** ⬇
  - (delta) cells, which secrete ***somatostatin(inhibits the secretion of both insulin and glucagon).***

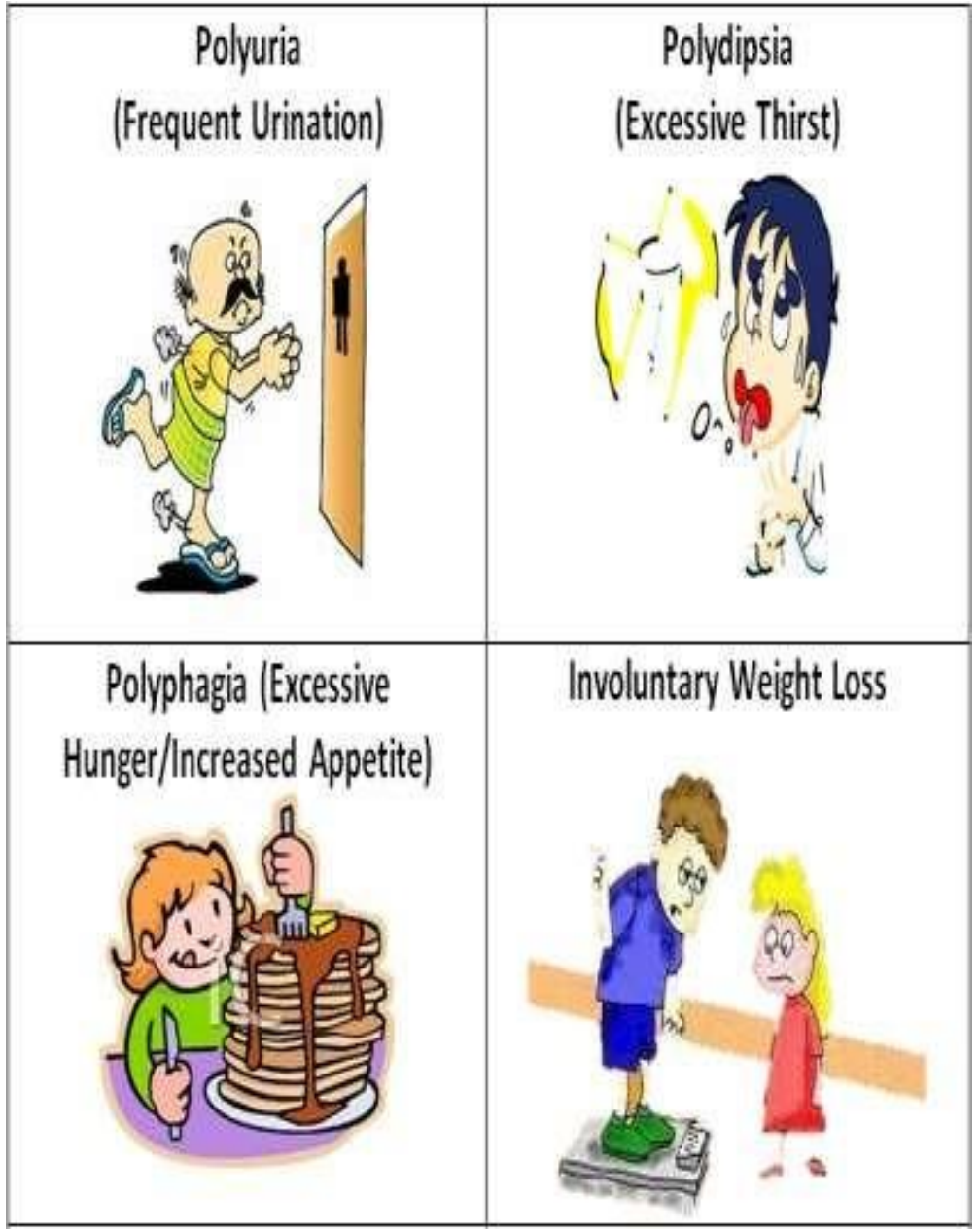




DISEASES RELATED TO INSULIN

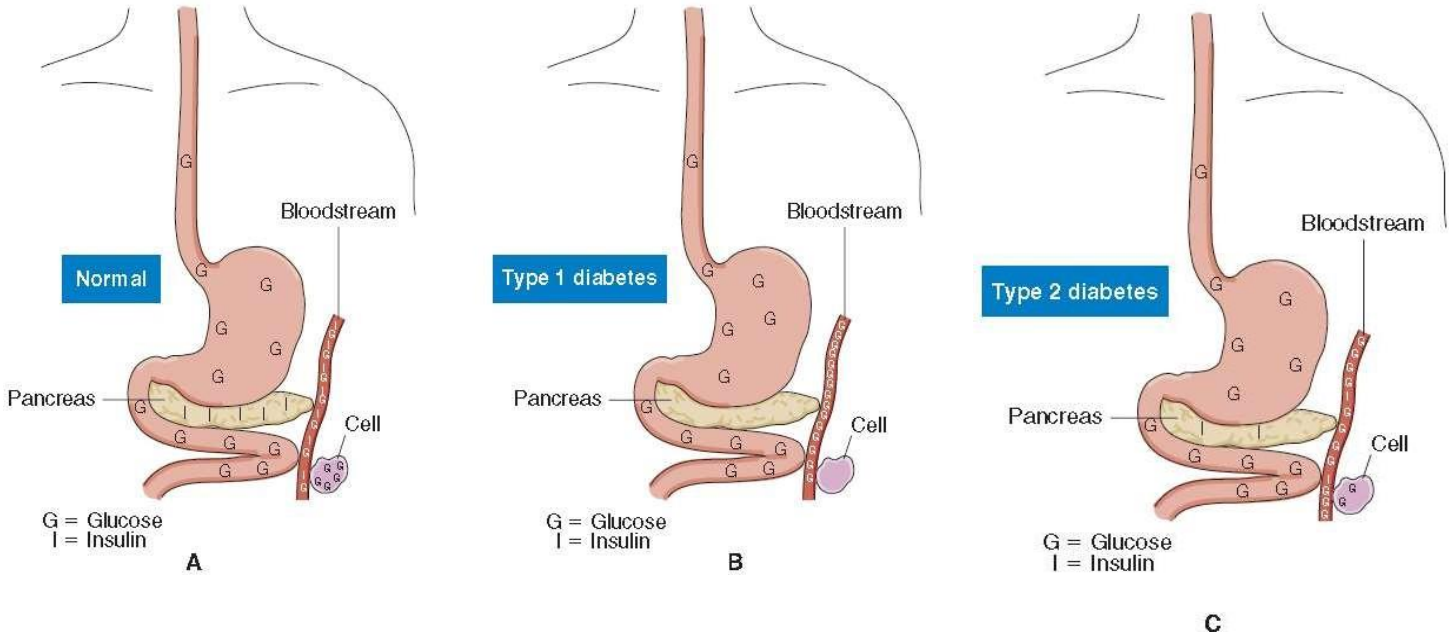
DIABETES MELLITUS

- It is a group of metabolic diseases in which there are ***high blood sugar*** over a prolonged period.
- This high blood sugar produces the symptoms of
  - ✓ frequent urination,
  - ✓ increased thirst, and
  - ✓ increased hunger.



Diabetes Mellitus

- Type I -“Insulin-Dependent Diabetes Mellitus“- IDDM (10% - onset 15 yo)
- Type II -“Non Insulin-Dependent Diabetes Mellitus"-NIDDM (90% - onset 40+)
  - 25-30% will require insulin eventually
- Gestational - GDM



Diagnosis

1- Fasting Plasma Glucose (FPG)

This test checks a fasting blood sugar levels. Fasting means after not having anything to eat or drink (except water) for at least 8 hours before the test. This test is usually done first thing in the morning, before breakfast.

Result	Fasting Plasma Glucose (FPG)
Normal	less than 100 mg/dl
Prediabetes	100 mg/dl to 125 mg/dl
Diabetes	126 mg/dl or higher

2- Random (also called Casual) Plasma Glucose Test

This test is a blood check at any time of the day when have a severe diabetes symptoms. Diabetes is diagnosed at blood sugar of greater than or equal to 200 mg/dl

3- A1C The A1C test measures average blood sugar for the past 2 to 3 months.

Result	A1C
Normal	less than 5.7%
Prediabetes	5.7% to 6.4%
Diabetes	6.5% or higher

TYPE 1 DM

INCIDENCE RATE:

10% general population

RISK FACTORS:

1. Age 2.Heredіy
3. Autoimmune reaction
4. Related to viruses
5. Drugs

a. Lasix

b. Steroids

TYPE 2 DM

INCIDENCE RATE:

•90% general population

- **RISK FACTORS:**
- 1. Age
- 2. Heredity
- **3. OBESITY** – because obese persons lack insulin receptor binding sites

4. Sedentary lifestyle (lack of exercise, increased intake of carbohydrates)
5. Hypertension
6. Triglyceride level of ≥250 mg/dL

TYPE 1 DM

SIGNS AND SYMPTOMS:

1. Polyuria
2. Polydypsia
3. Polyphagia
4. Glucosuria
5. **WEIGHT LOSS**
6. Anorexia, nausea and vomiting
7. Blurring of vision
8. Increase susceptibility to infection
9. Delayed/poor wound healing

TREATMENT:

1. Insulin therapy
2. Diet
3. Exercise

TYPE 2 DM

SIGNS AND SYMPTOMS:

1. Usually asymptomatic
2. Polyuria
3. Polydypsia
4. Polyphagia
5. Glucosuria
6. **WEIGHT GAIN**

TREATMENT:

1. Oral Hypoglycemic agents
2. Diet
3. Exercise

INSULIN ADMINISTRATION

A. SOURCES OF INSULIN

1.Animal sources

- Rarely used because it can cause severe allergic reaction
- Derived from beef and pork

2.Human Sources

- Frequently used type because it has less allergic reaction

3.Artificial Compound Insulin

INSULIN ADMINISTRATION

B. TYPES OF INSULIN

1. RAPID ACTING INSULIN (CLEAR)

- Regular acting insulin (IV only)
- Peak action is 2 – 4 hours

2. INTERMEDIATE ACTING INSULIN (CLOUDY)

- Non Protamine Hagedorn Insulin (NPH)
- Peak action is 8 – 16 hours

3. LONG ACTING INSULIN (CLOUDY)

- Ultra Lente
- Peak action is 16 – 24 hours

Table 41-3 CATEGORIES OF INSULIN

Time Course	Agent	Onset	Peak	Duration	Indications
Rapid-acting	Lispro (Humalog) Aspart (Novolog) Glulisine (Apidra)	10–15 min 5–15 min 5–15 min	1 h 40–50 min 30–60 min	2–4 h 2–4 h 2 h	Used for rapid reduction of glucose level, to treat postprandial hyperglycemia, and/or to prevent nocturnal hypoglycemia
Short-acting	Regular (Humalog R, Novolin R, Iletin II Regular)	½–1 h	2–3 h	4–6 h	Usually administered 20–30 min before a meal; may be taken alone or in combination with longer-acting insulin
Intermediate-acting	NPH (neutral protamine Hagedorn)	2–4 h	4–12 h	16–20 h	Usually taken after food
	(Humulin N, Iletin II Lente, Iletin II NPH, Novolin L [Lente], Novolin N [NPH])	3–4 h	4–12 h	16–20 h	
Very long-acting	Glargine (Lantus) Detemir (Levemir)	1 h	Continuous (no peak)	24 h	Used for basal dose

ORAL HYPOGLYCEMIC AGENTS

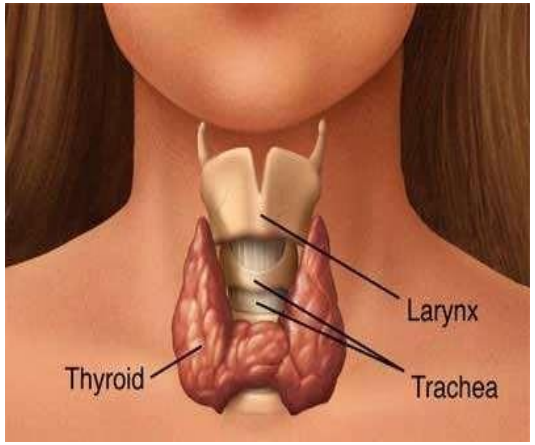
Table 41-6 ORAL ANTIDIABETIC AGENTS

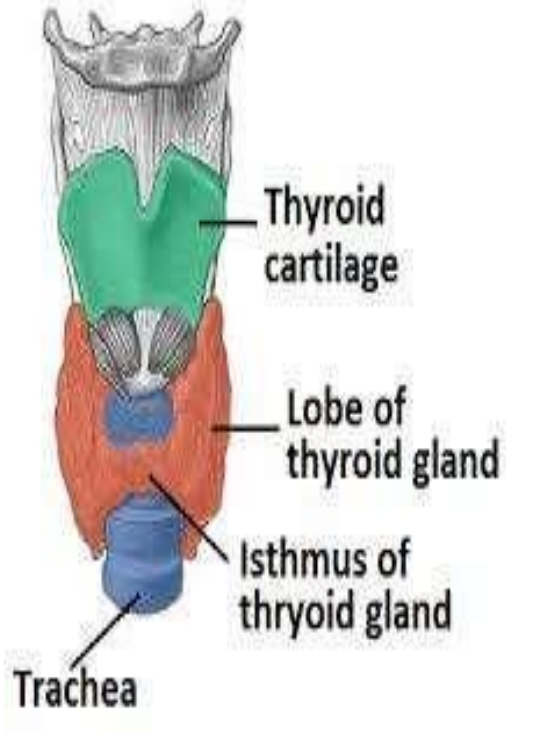
Generic (Trade) Name	Action/Indications	Side Effects	Contraindications	Nursing Considerations
First-Generation Sulfonylureas				
Acetohexamide (Dymelor) Chlorpropamide (Diabinese) Tolazamide (Tolinase) Tolbutamide (Orinase)	Used infrequently in U.S. today Used in type 2 diabetes to control blood glucose levels Stimulate beta cells of the pancreas to secrete insulin; may improve binding between insulin and insulin receptors or increase the number of insulin receptors	Hypoglycemia Mild GI symptoms Weight gain Drug–drug interactions (NSA warfarin, sulfonamides) Sulfa allergy Skin reactions		
Second-Generation Sulfonylureas				
Glipizide (Glucotrol, Glucotrol XL) Glyburide (Micronase, Glynase, Dia-Beta) Glimepiride (Amaryl)	Stimulate beta cells of the pancreas to secrete insulin; may improve binding between insulin and insulin receptors or increase the number of insulin receptors Used in type 2 diabetes to control	Hypoglycemia Mild GI symptoms Weight gain Drug–drug interactions (NSA warfarin, sulfonamides) Sulfa allergy		
Biguanides				
Metformin (Glucophage, Glucophage XL, Fortamet) Metformin with glyburide (Glucovance)	Inhibit production of glucose by the liver Increase body tissues' sensitivity to insulin Decrease hepatic synthesis of cholesterol Used in type 2 diabetes to control blood glucose levels	Lactic acidosis Hypoglycemia if metformin is used in combination with insulin or other antidiabetic agents Drug–drug interaction GI disturbances	Contraindicated in patients with impaired renal or liver function, respiratory insufficiency, severe infection, or alcohol abuse	Monitor for lactic acidosis and hypoglycemia Monitor renal function Patients taking metformin are at increased risk of acute renal failure and lactic acidosis with use of iodinated contrast material for diagnostic studies; metformin should be stopped 48 h prior to and for 48 h after use of contrast agent or until renal function is evaluated and normal Check for interactions with other medications
Alpha-Glucosidase Inhibitors				
Acarbose (Precose) Miglitol (Glyset)	Delay absorption of complex carbohydrates in the intestine and slow entry of glucose into systemic circulation Do not increase insulin secretion Used in type 2 diabetes to control blood glucose levels Can be used alone or in combination with sulfonylureas, metformin, or insulin to improve glucose control	Hypoglycemia (risk increased if used with insulin or other antidiabetic agents) GI side effects (abdominal discomfort or distention, diarrhea, flatulence) Drug–drug interactions		Must be taken with first bite of food to be effective Monitor for GI side effects (diarrhea, abdominal distention) Monitor for blood glucose levels to assess effectiveness of therapy Monitor liver function studies every 3 mo for 1 y, then periodically Contraindicated in patients with GI or renal dysfunction, or cirrhosis **Alert: Hypoglycemia must be treated with glucose, not sucrose**

Thyroid gland

ANATOMY OF THE THYROID GLAND: -

- The thyroid gland is situated in the **neck** in front of the **larynx** and **trachea**
- It weighs about **25g**
- It looks like butterfly in shape
- Consisting of ***two lobes***
- The lobes are joined by a narrow ***isthmus***





THYROID HORMONES

- **Tri-iodothyronine (T_3):** It affects almost every physiological process in the body:
  - Growth and development,
  - Metabolism,
  - Body temperature, and
  - Heart rate
- **Thyroxin (T_4):**
  - Controls ***development*** and ***maturation***
  - Excess thyroxin results rapid development
  - Deficiency of thyroxin results in delayed development

HYPOTHYROIDISM

- All body systems are **DECREASED** except **WEIGHT & MENSTRUATION**
- **DECREASED** CNS: drowsiness, memory losses (**FORGETFULNESS**)
- **DECREASED** VS: hypotension, bradypnea, bradycardia, hypothermia
- **DECREASED** GI motility:

CONSTIPATION

- **DECREASED** appetite but with **WEIGHT GAIN** results to **INCREASED SERUM CHOLESTEROL LEVELS** results to**, MI, CHF, STROKE**
- **DECREASED** metabolism causes decreased perspiration w/c results to **DRY SKIN** & **COLD INTOLERANCE**
- **INCREASED** menorrhagia

HYPERTHYROIDISM

- All body systems are **INCREASED** except **WEIGHT & MENSTRUATION**
- **INCREASED** CNS: tremors, insomnia
- **INCREASED** VS: hypertension, tachypnea, tachycardia, hyperthermia
- **INCREASED** GI motility: **DIARRHEA**
- **INCREASED** appetite but with **WEIGHT LOSS**
- **INCREASED** metabolism causes increased perspiration w/c results to **MOIST SKIN** & **HEAT INTOLERANCE**
- **DECREASED** amenorrhea

❖ **EXPOTHALMOS**

Pathognomonic Sign

HYPOTHYROIDISM

DIAGNOSTIC TESTS:

1. Serum T3 and T4 is **DECREASED**
2. Serum Cholesterol is **INCREASED**

NURSING MANAGEMENT:

1.Monitor vital signs and intake and output to determine presence of:

•**MYXEDEMA COMA** is a severe form of hypothyroidism is characterized by severe hypotension, bradycardia, bradypnea ,hyponatremia, hypoglycemia leading progressive to coma.

NURSING MANAGEMENT FOR MYXEDEMA COMA

- ✓ comfortable and warm environment
- ✓ Assist in mechanical ventilation
- ✓ Administer thyroid hormones as ordered
- ✓ IV fluids (isotonic)

HYPERTHYROIDISM

DIAGNOSTIC TESTS:

1. Serum T3 and T4 is **INCREASED**
2. Thyroid Scan - reveals an **ENLARGED THYROID GLAND**

NURSING MANAGEMENT:

1. Monitor vital signs and intake and output to determine presence of:

•**THYROID STORM** is a severe form of hyperthyroidism is characterized by severe hypertension, tachycardia, tachypnea, hyperpyrexia, altered neurologic or mental state, which frequently appears as delirium psychosis, coma

NURSING MANAGEMENT FOR THYROTOXICOSIS

- ✓ Cool quiet environment
- ✓ O2 inhalation
- ✓ IV fluids (hypertonic)
- ✓ Antithyroid agents