

Diabetes Mellitus

PART 1

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Learning Objectives:

1. Describe the pathophysiology of diabetes mellitus [DM].
2. Describe the etiology of DM.
3. Outline the types of DM
4. Outline the epidemiology and risk factors of DM.
5. Review & Illustration figures of the common general and oral complications of DM
6. Review the general medical management of patients with DM= [diagnosis and treatment] .



DIABETES

Etiology

- 1) In islets of Langerhans of pancreas = two main endocrine cells = **insulin-producing beta cells + glucagon secreting alpha cells.**
- 2) Beta and alpha cells are **continually changing their hormonal levels based on =glucose environment.**
- 3) **Without the balance between insulin and glucagon= the glucose levels become inappropriately skewed** [تزاوت نوب] [تینومروہلا =مدلا رکس توتسمب فارحنا]
- 4) In **DM= insulin = is either absent and/or has impaired action (insulin resistance)= leads to hyperglycemia.**

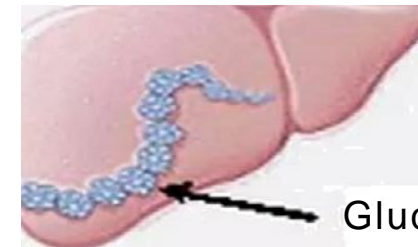
DATHOF'HYOIOLOGY

The body obtains glucose from three main places:

The intestinal absorption of food

The breakdown of glycogen, the storage form of glucose found in the liver

Gluconeogenesis, the generation of glucose from non-carbohydrate substrates in the body.



Liver

Glucose --> Glycogen



Insulin plays a critical role in balancing glucose levels in the body:

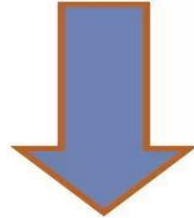
- › It can inhibit the breakdown of glycogen or the process of gluconeogenesis.

It can stimulate the transport of glucose into fat and muscle cells.

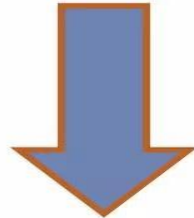
It can stimulate the storage of glucose in the,..
form of glycogen.

PATHOPHYSIOLOGY

- When the glucose concentration in the blood remains high over time, the kidneys will reach a threshold of reabsorption → Glycosuria.



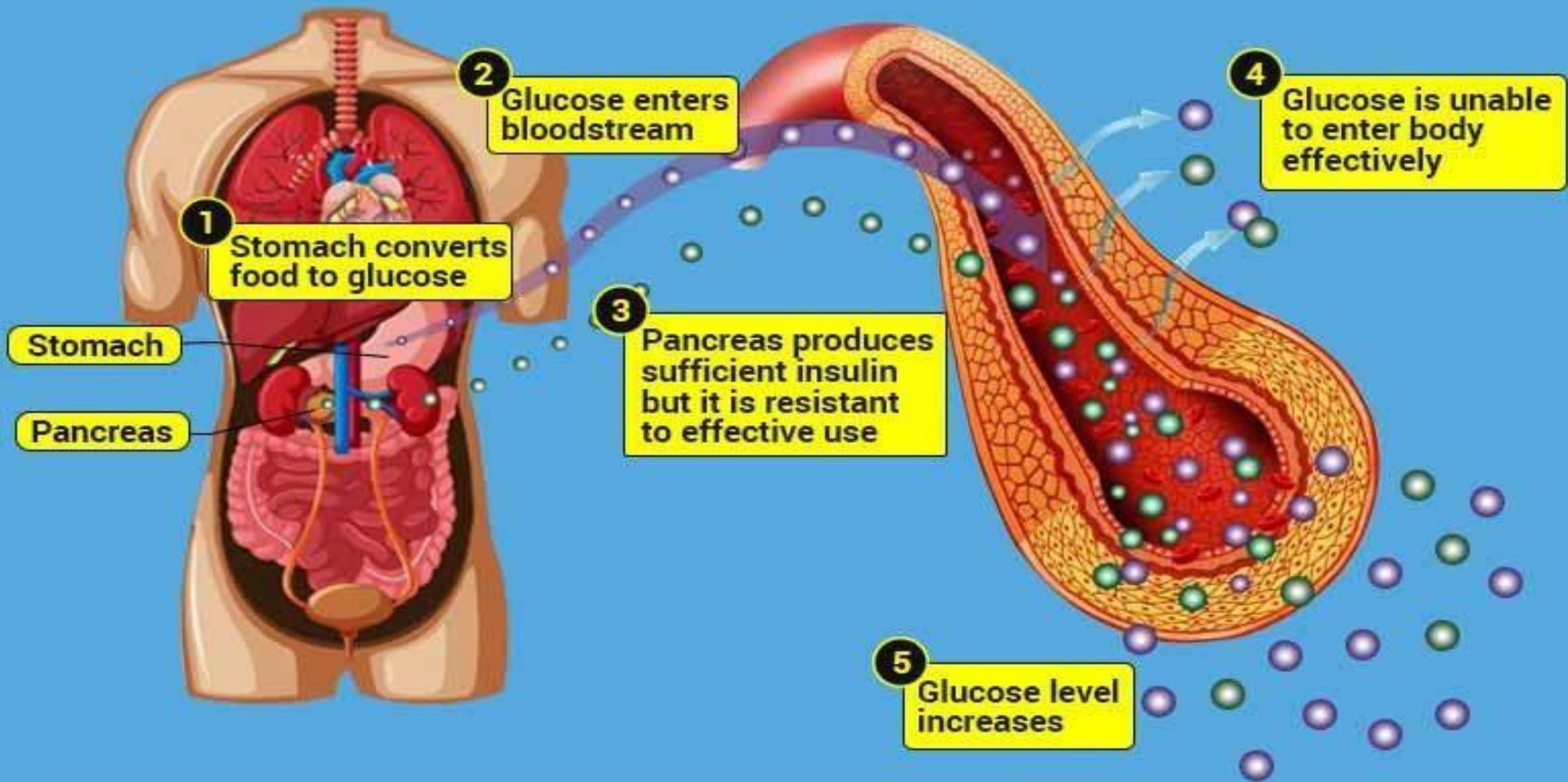
- This increases the osmotic pressure of the urine → polyuria → increased fluid loss

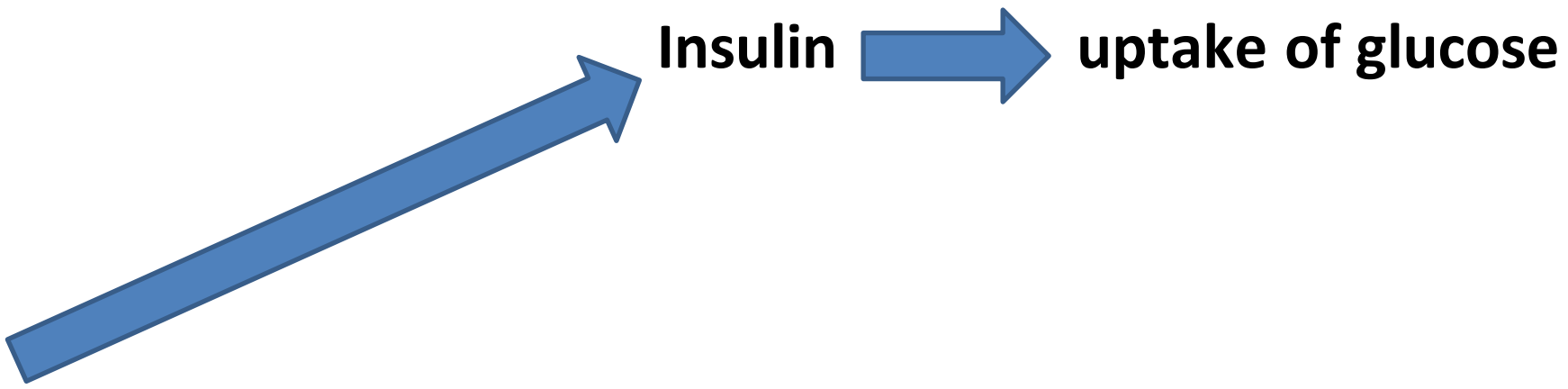


- Lost blood volume will be replaced osmotically from water held in body cells and other body compartments → dehydration → polydipsia



DIABETES





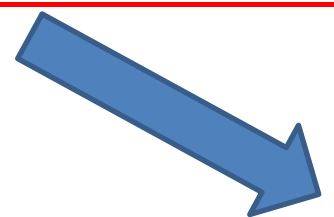
Normal Pathophysiology:-

Pancreas ← in response to rising level of blood glucose



insufficient amount of insulin available
insulin Resistance = respond poorly

Abnormal Pathophysiology:-



high level of blood glucose ===== **[Diabetes Mellitus]**

insulin

Diabetes Mellitus (DM):

❑ A metabolic disease = characterized by inappropriate elevations of blood glucose levels (= Hyperglycemia) .

❑ Primary categories of DM :

❑ Type 1 DM

❑ Type 2 DM

❑ Maturity-onset diabetes of the young (MODY)

❑ Gestational diabetes

❑ Neonatal diabetes

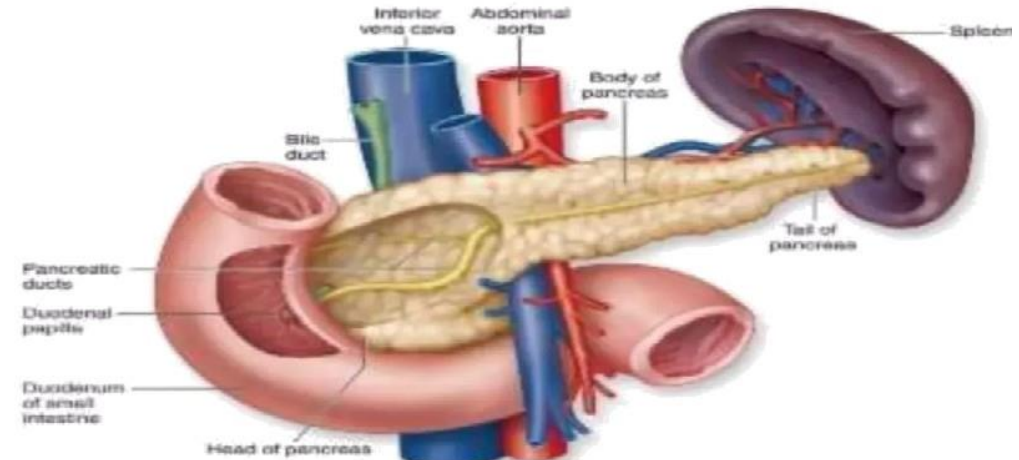
❑ Secondary causes : due to:

❑ Endocrinopathologies,

❑ Steroid use,

❑ Etc.

Diabetes is due to either the pancreas not producing enough insulin or the cells of the body not responding properly to the insulin produced.



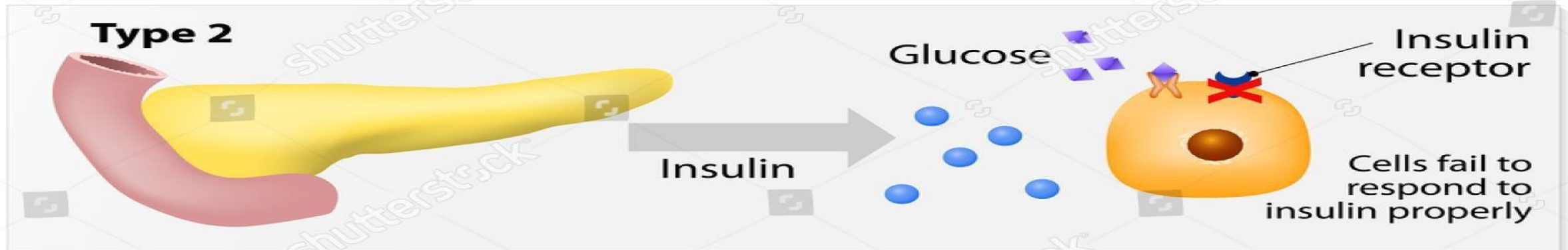
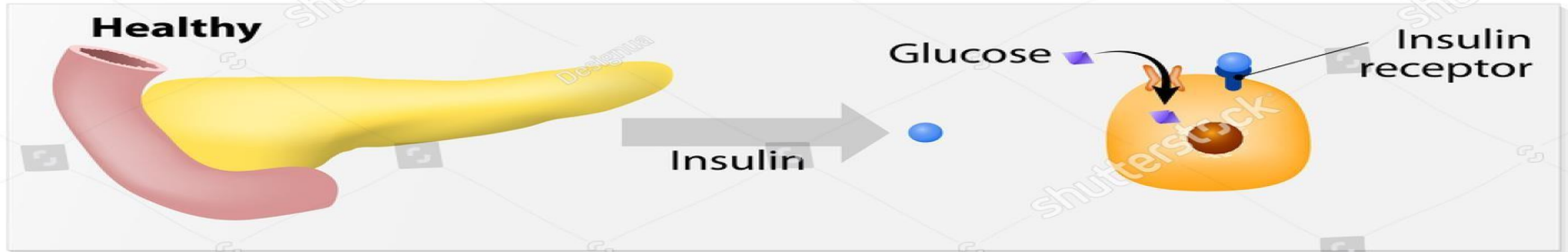
There are three main types of diabetes mellitus:

❑ Type 1 ❑M

❑ Type 2 ❑M

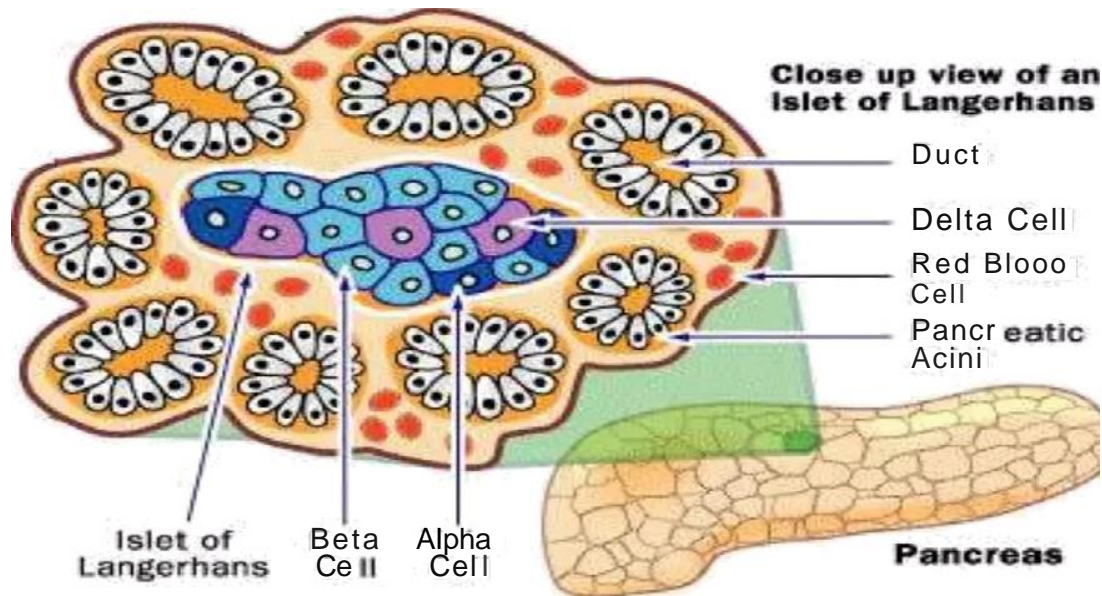
❑ Gestational Diabetes

DIABETES MELLITUS

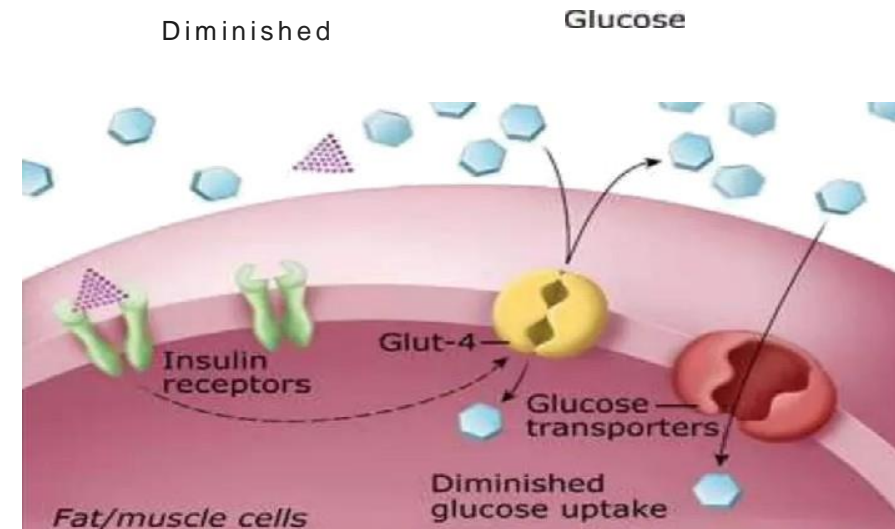


Typ

Results from the pancreas's failure to produce enough insulin.



Type 1 Diabetes: Insufficient Insulin



This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes".

The cause is unknown.

Type 1 DM=juvenile diabetes = insulin-dependent diabetes

- ❑ Genetic predisposition factors = **1/3th susceptibility to Type 1 DM.**
- ❑ Environmental predisposition factors = **uncertain nature =**
- ❑ **Could trigger:**
- ❑ direct toxicity to β cells
- ❑ stimulating an autoimmune reaction directed against β cells.

3 main Environmental categories:

- 1) **Viruses:** Mumps, cytomegalovirus and Epstein–Barr viruses.
- 2) **Specific drugs or chemicals.**
- 3) **Dietary constituents:** [**potentially diabetogenic toxins**]
 - A. **Nitrosamines** (smoked and cured meats and coffee)
 - B. **Bovine serum albumin** (a major constituent of cow's milk)

○ Type 2 DM

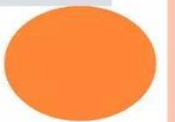
- Begins with insulin resistance, a condition in which cells fail to respond to insulin properly.



- This form was previously referred to as "non insulin-dependent diabetes mellitus" (NIDDM) or "adult-onset diabetes".
- The primary cause is excessive body weight and not enough exercise.

○ Gestational Diabetes

Is the third main form
and occurs in
pregnant women
without a previous
history of diabetes



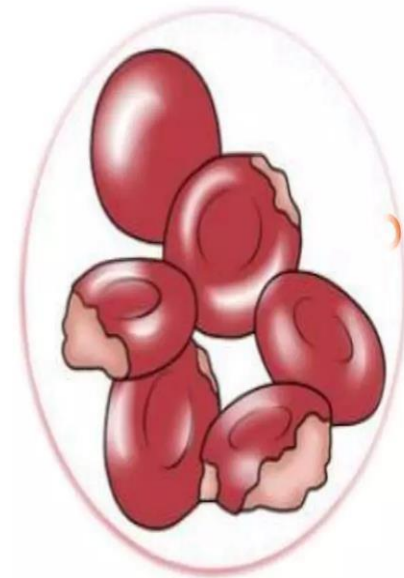
PATHOPHYSIOLOGY - GESTATIONAL DIABETES

- Gestational diabetes mellitus (GDM) resembles type 2 DM in several aspects.
- Involves a combination of relatively inadequate insulin secretion and responsiveness.
- It occurs in about **2–10%** of all pregnancies and may improve or disappear after delivery.



PATHOPHYSIOLOGY - GESTATIONAL DIABETES

- Increased levels of insulin in a fetus's blood may inhibit fetal surfactant production and cause respiratory distress syndrome.



- A high blood bilirubin level may result from red blood cell destruction.

□ Maturity-onset diabetes of the young (MODY)

- 1) Autosomal dominant inheritance caused by mutated glucokinase (GK) gene leading to increased glucose production
- 2) Child from Affected Parent have 50% chance to inherit DM
- 3) Hyperglycemia is subclinical at birth >>>> but clinically presented before age of 25 years

Diagnosis of MODY?

- 1) Onset before 25 years of age
- 2) Presence of diabetes in two consecutive family generations
- 3) Absence of autoantibodies to β -cell antigens
- 4) Pancreas continues to produce endogenous insulin secretion + Preserved serum C-peptide= level of >200 pmol/L [while In type 1 DM insulin production is very low].
[C-peptide links the A and B chains of insulin]



Neonatal Diabetes

=caused by: Mutations in the KCNJ 11 gene at chromosome 11p15.1. [30%]

OR ABCC 8 gene [20%] at chromosome 6q24 ...

= lead to Overexpression of genes= Overexpression of proteins from these genes

= Decrease insulin production

= Then...very high levels of blood glucose

Conditions lead to Secondary Diabetes:?

A. Other specific types of pancreatic diseases:

- 1) Cystic fibrosis** (a genetic disorder that causes thick, sticky mucus to block the lungs, pancreas, and other organs)
- 2) Hemochromatosis** (harmful levels of iron that damage liver, heart, pancreas, endocrine glands, and joints.)
- 3) Chronic pancreatitis**
- 4) Pancreatic cancer**
- 5) Pancreatectomy**
- 6) Glucagonoma**

B. Excess production of hormonal antagonists to insulin (= catecholamines)

C. Drug-induced (e.g. corticosteroids)=Cushing's syndrome

D. Polycystic ovary syndrome (PCOS)

E. Viral infections (e.g. congenital rubella)

F. Genetic syndromes (e.g. Down's syndrome).

Thank
You For
Your
Attention

Any
questions?

