Al-Rasheed University College Pharmacy Department

2nd Stage / 2nd Semester

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Glucose Metabolism & Oral glucose tolerance test (OGTT)

Physiology lab #3

Done by:

MSc Mohammed Akram Al-Mahdawi

Glucose Metabolism

- Glucose is simple sugar or monosaccharide derived from breakdown of carbohydrates.

- Glucose is the primary source of energy for most body cells.

- **Insulin;** a hormone secreted by pancreas, and promoting glucose entry into cells depending on the cells need

Glucose Metabolism

- Glucose may undergo anaerobic or aerobic metabolism to yield energy as (ATP).
- Alternatively, glucose may be converted to and stored as glycogen (Glycogenesis).
- liver and skeletal muscles store larger amounts of glycogen.
- Glucose also converted to protein and fat by action of insulin

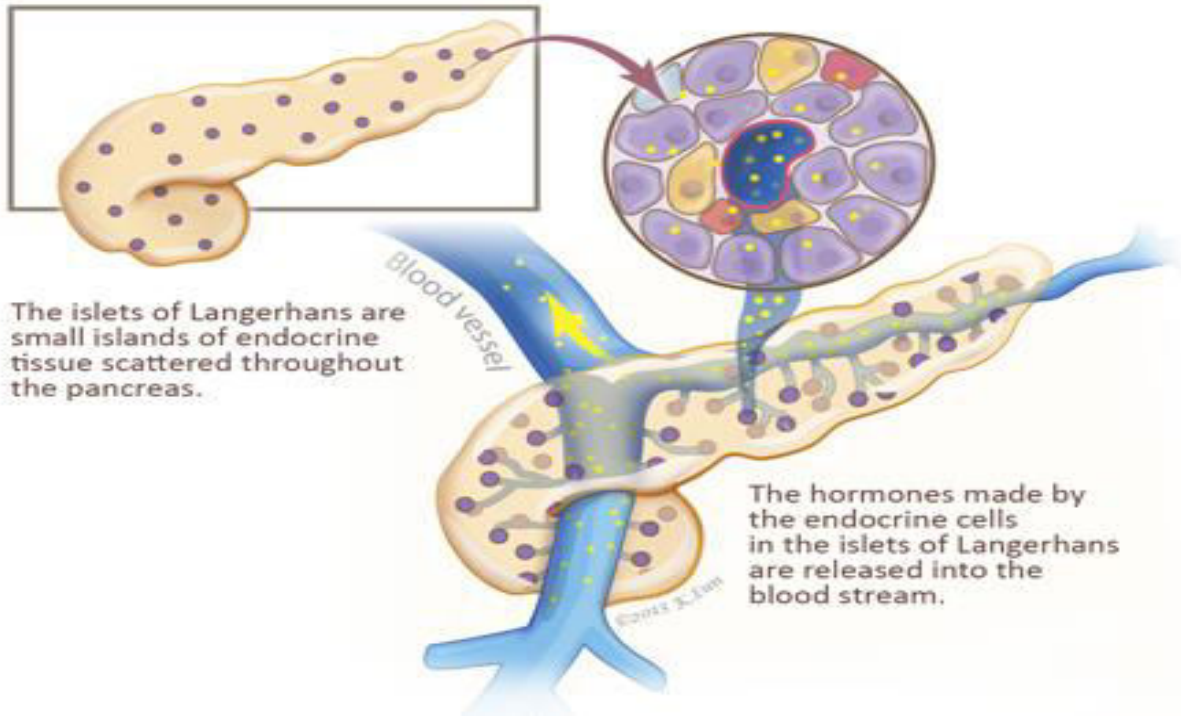
Terminology

- **Glycolysis:** is the metabolism of glucose to obtain energy in the form of ATP and pyruvate.
- **Glycogenesis:** is the conversion of glucose into glycogen which is then to be stored in the liver and muscle tissues.
- **Glycogenolysis:** is the breakdown and conversion of glycogen into glucose which is then utilized by cells as a source of energy.
- **Gluconeogenesis:** is the synthesis of glucose molecules from sources other than carbohydrates like proteins, amino acids and lipids.

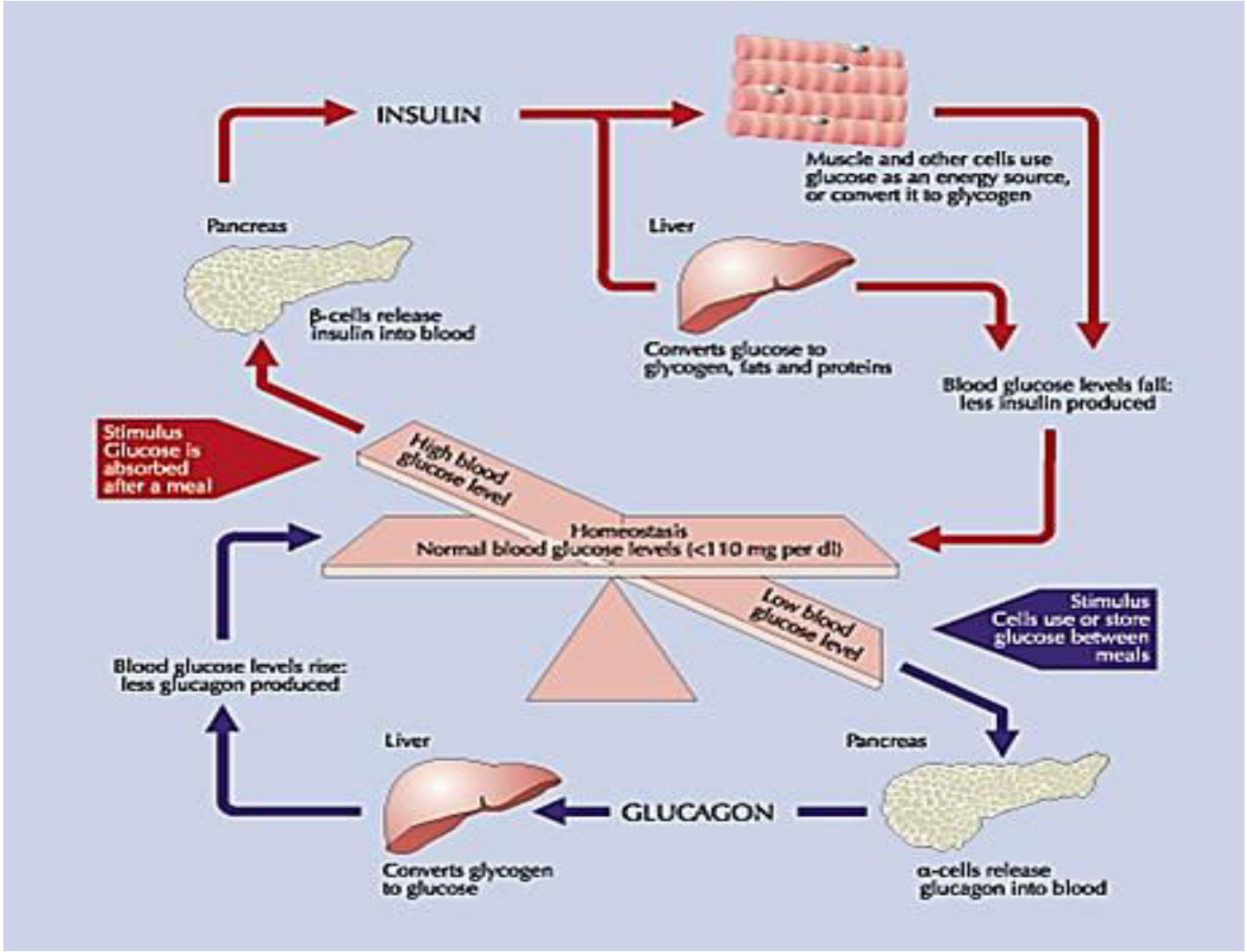
Function of Pancreas

- **Exocrine function:** important in digestion

- **Endocrine function:** secretion of different hormones
  - **Insulin**
  - **Glucagon**
  - **Somatostatin**



Glucose Homeostasis



Notes

- Many diseases alter normal glucose metabolism, the most frequent cause of an increase in blood glucose (hyperglycemia) is **diabetes**.

- Hypoglycemia defined as a blood glucose level less than 50mg/dl; and may have severe consequences.

- one cause of hypoglycemia in-diabetic patients is an excessive dose of insulin.

Diabetes Mellitus

- Is defined as an elevated blood glucose associated with absent or inadequate pancreatic insulin secretion, with or without impaired insulin action.
- Diagnosis of diabetes:

Type of test	Normal Range
Fasting glucose	90 – 110mg/dl
2hr post prandial	<140mg/dl
Oral glucose tolerance	<140mg/dl
Glycated hemoglobin Hb A1c	4-6%

Type 1 DM

- Its insulin dependent diabetes OR juvenile diabetes
- Happen in young age
- Usually there is no family history
- Caused by autoimmune disorders
- There is a complete absence of insulin secretion due to complete destruction of beta cells of the pancreas
- Short duration of symptoms (few weeks)
- There is a risk of diabetic ketoacidosis
- Treated only with insulin injections

Type 2 DM

- Also called non-insulin dependent diabetes
- Happen in older age and obese people
- Usually there is a strong family history
- There is insufficient insulin secretion or increased peripheral resistance to insulin action
- Long duration of symptoms (months or years)
- No diabetic ketoacidosis
- Treated with oral anti-diabetic medications
- In severe cases, insulin injections

Type 3 DM

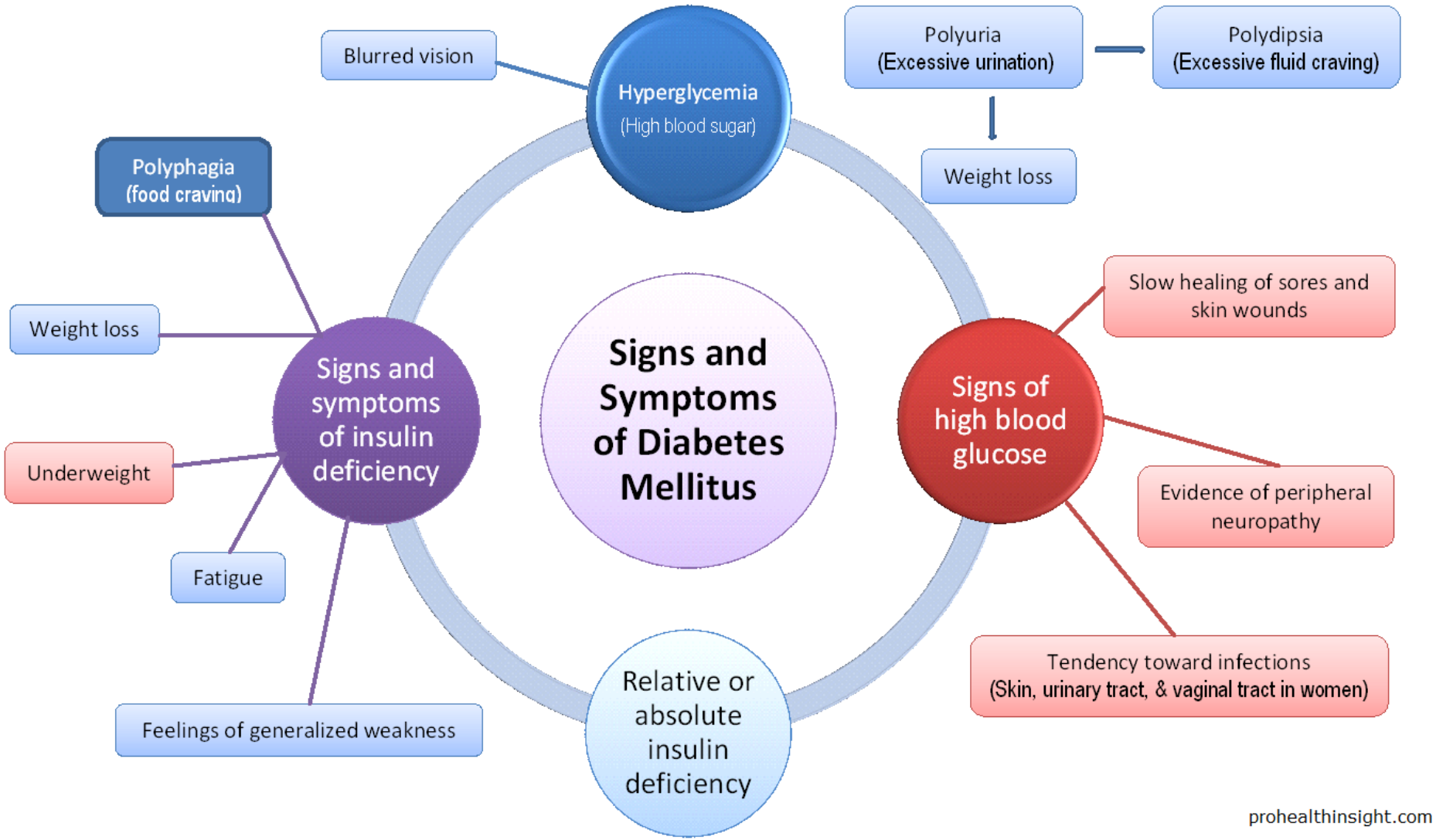
- Also called gestational diabetes
- Usually happen during pregnancy
- Usually there is family history
- There is insufficient insulin secretion or increased peripheral resistance to insulin action due to hormonal factors
- May develop to type 2 DM years after delivery
- Treated with some oral anti-diabetic medication, but mostly insulin injections

Other Causes of Hyperglycemia

- In some cases high blood glucose values are caused by conditions other than diabetes.

- Hyperglycemia can be secondary to:
  - traumatic brain injury
  - febrile disease
  - certain liver diseases
  - over activity of adrenal, pituitary or thyroid Gland
  - certain drugs like doxazocin (anti-hypertensive).

Signs and Symptoms of Diabetes Mellitus



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Long Term Complications of DM

- **Cardiovascular Disturbance**
- **Diabetic macro-angiopathy:** like myocardial infarction, stroke, and peripheral vascular disease
- **Diabetic micro-angiopathy:** like peripheral vascular disease (Diabetic foot), diabetic retinopathy, diabetic nephropathy and peripheral neuropathy
- **Infection**
- **Renal failure**
- **Blindness**

Hypoglycemia

- Hypoglycemia is a blood glucose concentration below the fasting value with a transient decline in blood sugar 2 hours after a meal.

- . It could be caused by one of the followings:
  - Glycogen storage disease
  - Insulinoma

Oral Glucose Tolerance Test (OGTT)

- **Principle of The Experiment:**

Evaluate the insulin response to a large oral glucose dose.

It peaks in 30 to 60 minutes and returns to normal levels within 3 hours.

Then sufficient insulin is present to metabolize the glucose ingested at the beginning of the test.

Indications for OGTT

- Patient has symptoms suggestive of diabetes mellitus.
- Fasting blood sugar value is inconclusive (between 110 – 126mg/dl).
- During pregnancy, excessive weight gaining is noticed with a past history of big baby (more than 4 kg) or past history of miscarriage.
- To rule out benign renal glycosuria.
- Patients with neuropathies, retinopathies, nephropathies and hypertriglyceridemia of unknown origin.

Requirements

- 75gm glucose solution
- 70% alcohol
- Sterile blood lancet
- Test tubes
- Self glucose meter, or spectrophotometer


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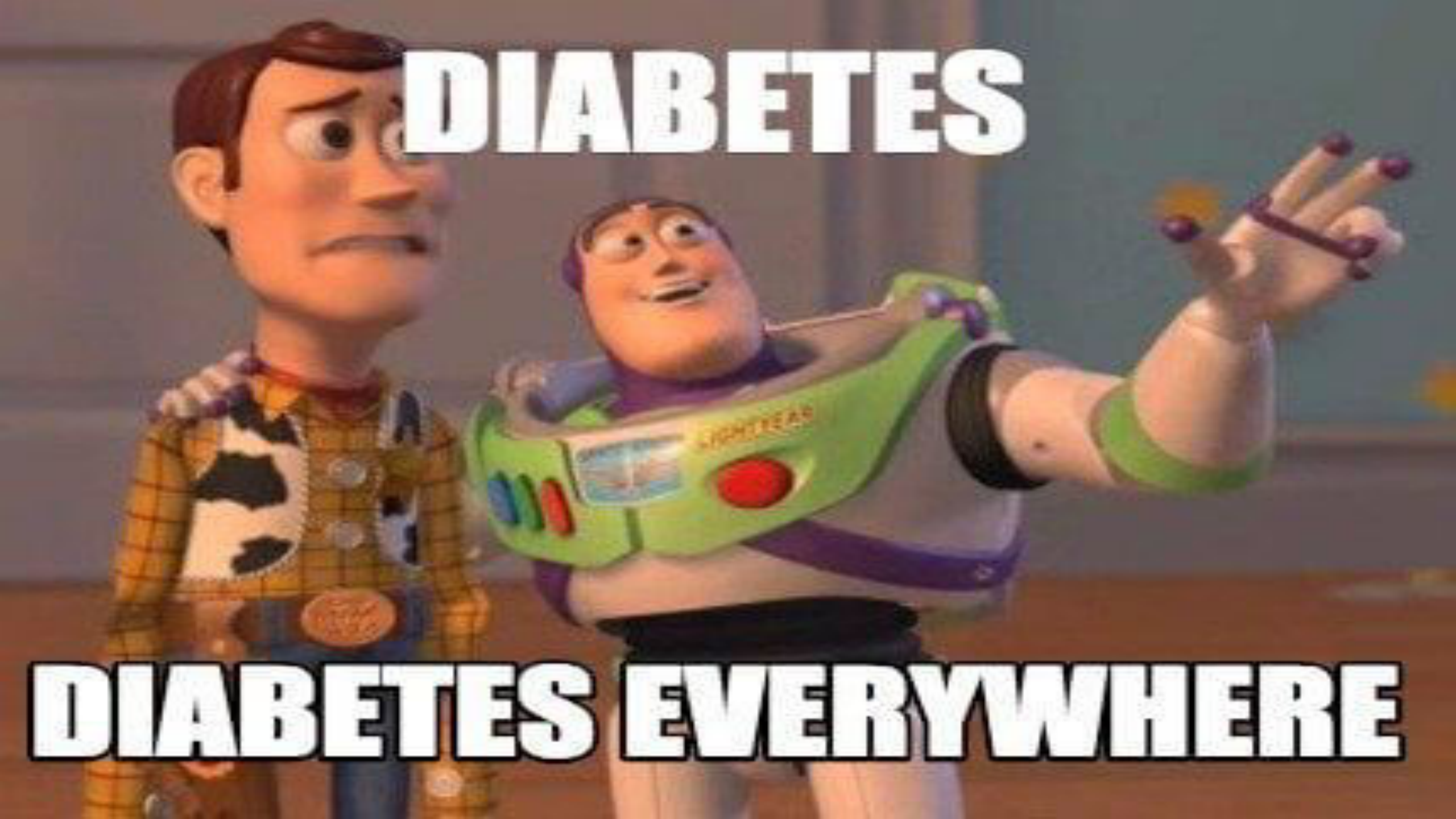
DIABETES
DIABETES EVERYWHERE