



# Glucose Tolerance Test



Physiology lab-7  
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# Background

- ▶ Blood glucose is regulated in large measure by two pancreatic hormones, **insulin** and **glucagon**. Both are peptides secreted by the pancreas (as an “**endocrine function**”)
- ▶ **Insulin** stimulates blood glucose uptake by body tissues, which functionally will reduce blood glucose levels. When the muscles and liver take up blood glucose, and extra blood glucose not needed for cell metabolism can be converted to a storage form of glucose called **glycogen**

# Diabetes mellitus

**Diabetes mellitus** is a disorder of fuel metabolism. The two major syndromes are classified as

1. **Type I diabetes** (formerly **insulin-dependent diabetes mellitus**) **IDDM**
2. **Type II diabetes** (formerly **non-insulin-dependent diabetes mellitus** **NIDDM** and more recently referred to as “**insulin resistance**”
  - Both are characterized by **hyperglycemia** (high blood glucose) and inability to properly metabolize glucose.
  - In someone suffering from diabetes - the blood is overloaded with glucose, but tissues starve as they are unable to use it.



# Objective

- ▶ To assess **insulin performance**, clinicians use the **oral glucose tolerance test (OGTT)**



# WHAT IS A GLUCOSE TOLERANCE TEST?

- ▶ It is a laboratory method to check **how** the body **breaks down** (metabolizes) blood sugar, and **how quickly** it is cleared from the blood.
- ▶ The test usually used to test for diabetes, insulin resistance, impaired beta cell function and reactive hypoglycemia.



## Preparation

- The patient is instructed not to restrict carbohydrate intake in the days or weeks before the test.
- The test should not be done during an illness, as results may not reflect the patient's glucose metabolism when healthy.
- Usually the OGTT is performed in the morning as glucose tolerance can exhibit a diurnal rhythm with a significant decrease in the afternoon.
- The patient is instructed to fast (water is allowed) for 8–12 hours prior to the tests

# Procedure

- ▶ A zero time (baseline) blood sample is drawn.
- ▶ The patient is then given a 75g of glucose in a 300 ml solution and drink within a 5-minute time frame.
- ▶ Blood is drawn every 30 min for 2 hr to measure of glucose (blood sugar). For simple diabetes screening, the most important sample is the 2 hour sample and the 0 and 2 hour samples may be the only ones collected.



# Results

- A- Fasting plasma glucose** should be below **(110 mg/dL)** in **normal** person.
- ▶ Fasting levels between **(110 and 125 mg/dL)** indicate pre-diabetes (Impaired glucose tolerance).
  - ▶ Fasting levels repeatedly at or above **(126 mg/dL)** are diagnostic of **diabetes**.
- B- 1 hour GTT (Glucose Tolerance Test)** glucose level below **(180 mg/dL)** is considered **normal**.
- C- 2 hour GTT** glucose level below **(140 mg/dL)** is **normal**.
- ▶ Blood plasma glucose between **(140 mg/dL)** and **(200 mg/dL)** indicate "pre-diabetes."
  - ▶ Blood plasma levels above **(200 mg/dL)** at 2 hours confirm a diagnosis of **diabetes**.

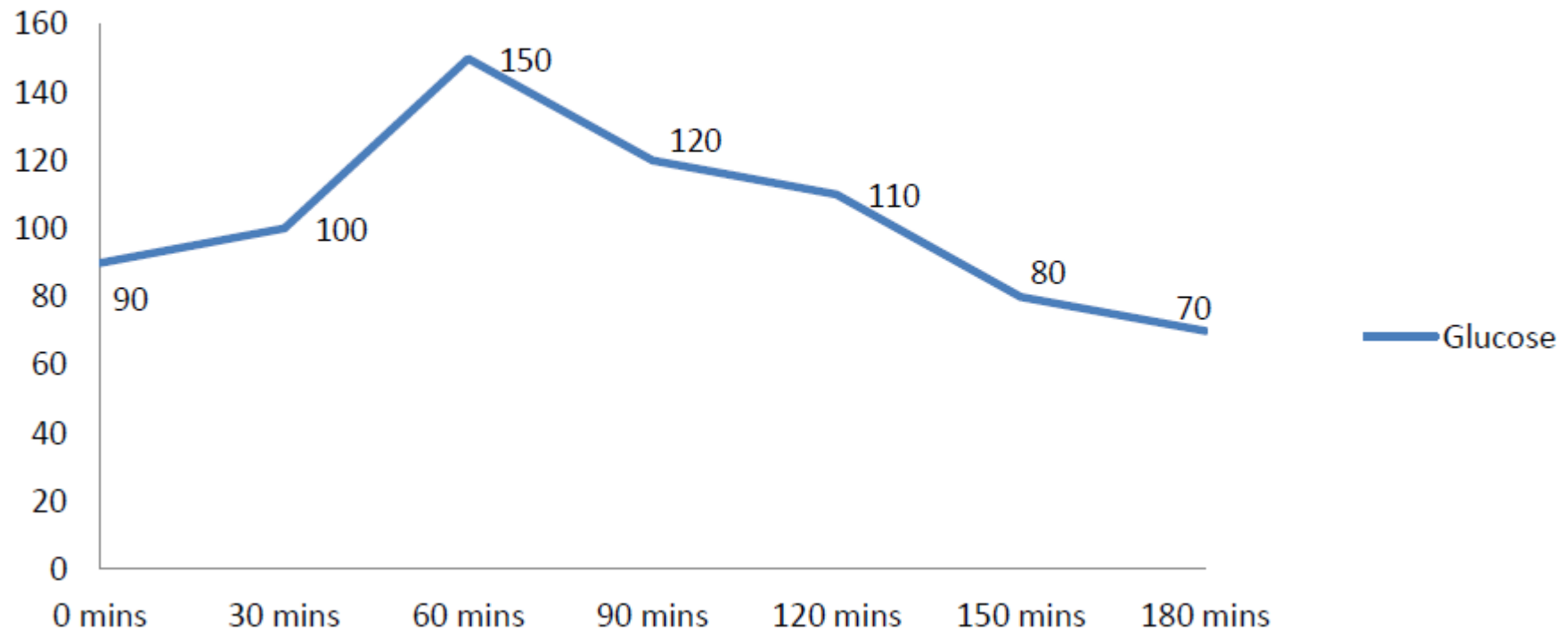


# Glucose tolerance curve

- A curve is plotted with the **blood glucose levels** on the vertical axis against the **time** of collection on the horizontal axis.
- The curve so obtained is called glucose tolerance curve.

# Normal Glucose tolerance curve

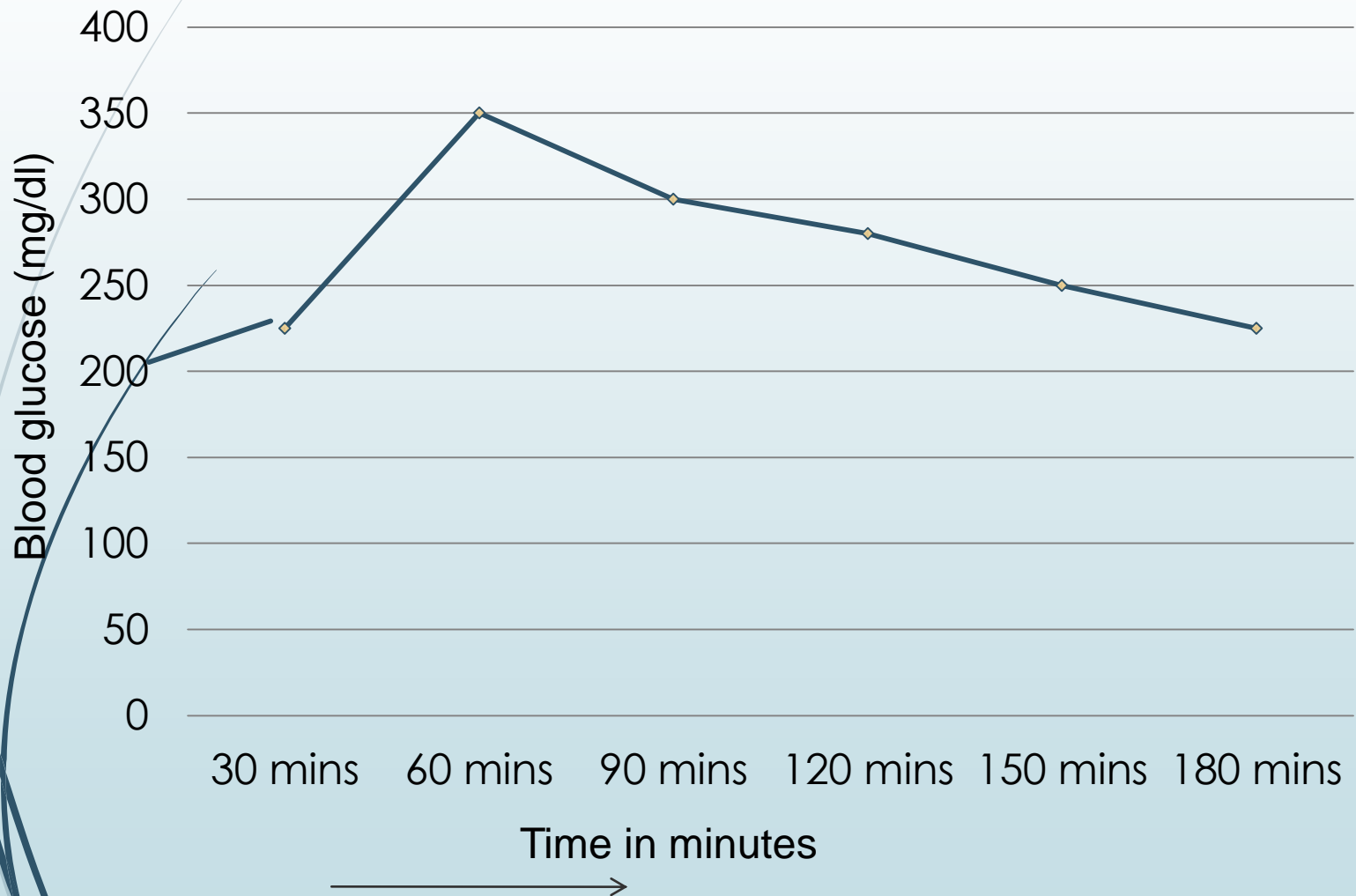
## Glucose Tolerance Curve



# Laboratory profile of a normal person after glucose load

Sample	Fasting (Zero sample)	30 minutes	60 minutes	90 minutes	120 minutes	150 minutes	180 minutes
Blood Glucose (mg/dl)	90	100	150	120	110	80	70
Urinary Glucose	Nil	nil	nil	nil	nil	nil	nil

# Diabetic curve



# Laboratory profile of a diabetic patient after glucose load

Sample	Fasting (Zero sample)	30 minute s	60 minute s	90 minute s	120 minute s	150 minute s	180 minute s
Blood Glucose (mg/dl)	200	225	350	300	275	250	225
Urinary Glucose	+	+	+	+	+	+	+

# Materials

Each group requires a pen-prick with lancets, glucose strips, a digital glucose-meter.



# Methods of Measurement

1. Obtain a droplet of blood from a finger by lancing. [It helps if you squeeze your fingertip to trap blood first before using the lancet.] A partner can prepare the glucose-meter by placing a strip in the meter.
2. When the droplet appears on the LCD, apply the blood drop to the end of the glucose strip (not on top of the strip)
3. An infrared light scans the strip and in a matter of 5-6 seconds, blood glucose is indicated on the screen in mg/dL.
4. After this first (Time 0) reading, drink a roughly 350 mL serving of one of the beverages provided, then record blood glucose at 30, 60 and 90 minutes afterwards.
5. Record data for yourself and your labmate in the table below.



# Data Analysis

Time (min)	Blood Glucose (mg/dl)	
	Full Sugar Drink	Water
0		
30		
60		
90		





**Thank you**