7) The Seventh Experiment:

GLUCOSE TOLERANCE TEST (GTT)

In a healthy individual, the insulin response to a large oral glucose dose is almost immediate. It peaks in 30 to 60 minutes and returns to normal levels within 3 hours when sufficient insulin is present to metabolize the glucose ingested at the beginning of the test. The test should be performed according to WHO guidelines using glucose load containing the equivalent of 75 to 100 g of anhydrous glucose dissolved in water or other solution.

If fasting and post load glucose test results are borderline, the GTT can support or rule out a diagnosis of diabetes mellitus; it can also be a part of a workup for unexplained hypertriglyceridemia, neuropathy, impotence, renal diseases, or retinopathy. This test may be ordered when there is sugar in the urine or when the fasting blood sugar level is significantly elevated.

- The GTT/OGTT should *not* be used as a screening test in no pregnant adults or children.

Indications for Test:

The GTT/OGTT is done on certain patients, with the following indications (few indications still meet wide acceptance):

1. Family history of diabetes

2. Obesity

3. Unexplained episodes of hypoglycemia

4. History of recurrent infections (boils and abscesses)

5. In women, history of delivery of large infants, stillbirths, neonatal death, premature labor,

and spontaneous abortions

6. Transitory glycosuria or hyperglycemia during pregnancy, surgery, trauma, stress, MI, and ACTH administration.

Reference Values

FPG:

Adults: 110 mg/dL or 6.1 mmol/L

30-minute:

Adults: 110–170 mg/dL or 6.1–9.4 mmol/L

60-minute (1-hour) PG after glucose load:

Adults: <184 mg/dL or <10.2 mmol/L *120-minute (2-hour*

GTT test) 2-hour PG after glucose load:

Adults: <138 mg/dL or <7.7 mmol/L

Children: <140 mg/dL or <7.8 mmol/L

3-hour PG after glucose load:

Adults: 70–120 mg/L or 3.9–6.7 mmol/L

All four blood values must be within normal limits to be considered normal.

Procedure:

This is a timed test for glucose tolerance. A 2-hour plasma glucose test is done after glucose load to detect diabetes in individuals other than pregnant women; the 3-hour test is done for pregnant women; and the 4-hour test evaluates possible hypoglycemia.

1. Have patient eat a diet with >150 g of carbohydrates for 3 days before the test.

2. Ensure that the following drugs are discontinued 3 days before the test because they may influence test results:

a. Hormones, oral contraceptives, steroids

b. Salicylates, anti-inflammatory drugs

c. Diuretic agents

d. Hypoglycemic agents

e. Antihypertensive drugs

f. Anticonvulsants

3. Insulin and oral hypoglycemics should be withheld until the test is completed.

4. Record the patient's weight.

a. Pediatric doses of glucose are based on body weight, calculated as 1.75 g/kg not to exceed a total of 75 g.

b. Pregnant women: 100 g glucose

c. No pregnant adults: 75 g glucose

d. Possible gestational diabetes: 100 g glucose

5. A 5-mL sample of venous blood is drawn. Serum or gray-topped tubes are used. The patient should fast 12 to 16 hours before testing. After the blood is drawn, the patient drinks all of a specially formulated glucose solution within a 5-minute time frame.

6. Blood samples are obtained 30 minutes, 1 hour, 2 hours, and 3 hours after glucose ingestion.

7. Specimens taken 4 hours after ingestion are significant for detecting hypoglycemia and may be ordered (5-hour specimens have been discredited).

8. Tolerance tests can also be performed for pentose, lactose, galactose, and D-xylose.

9. The GTT is not indicated in these situations:

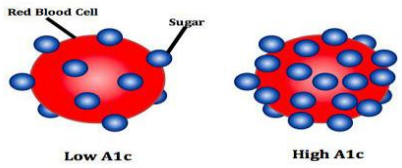
a. Persistent fasting hyperglycemia >140 mg/dL or >7.8 mmol/L

b. Persistent fasting normal plasma glucose c. Patients with

overt diabetes mellitus

d. Persistent 2-hour plasma glucose >200 mg/dL or >11.1 mmol/L

Hemoglobin A1c (HbA1c)



The hemoglobin A1c test (Hba1c test, also known as glycated hemoglobin test) can be used to identify the average level of blood glucose concentration over the past 2 to 3 months.

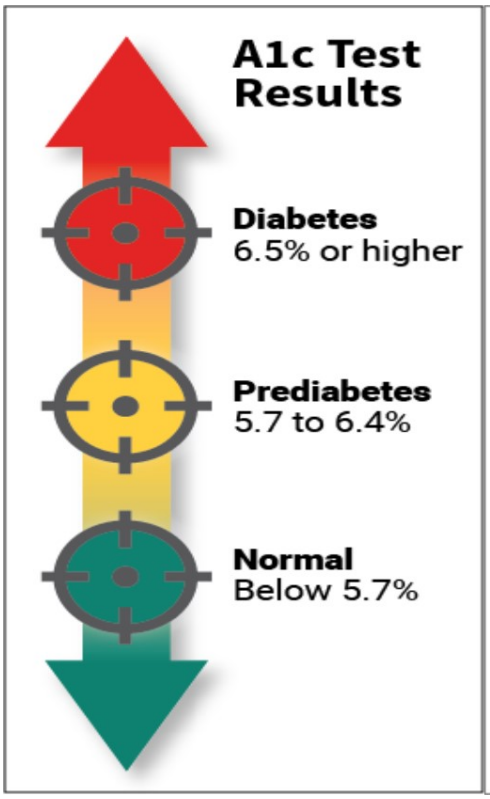
Hemoglobin is a protein within red blood cells which lifespan is about 120 days , when glucose builds up in your blood , it binds to hemoglobin to become HbA1c . Any conditions that affect red blood cell turnovers , such as certain forms of anemia , hemodialysis , hemoglobinopathies, pregnancy , acute or chronic blood loss , will lead HbA1c test to a falsely low result . HbA1c test is not appropriate where there has been a change in diet or treatment within 6 weeks.

The use of HbA1c include:

1) Diagnose diabetes and prediabetes.
2) Monitor long term glycemic control.
3) Adjust diabetes therapy.
4) Assess the quality of diabetes care.
5) predict the risk for the development of complications.

HbA1c test has been widely used for both diagnosing and monitoring diabetes . However, it can't replace blood glucose test. Blood glucose test measures the concentration of blood glucose at a single point of time.

- It shows you the link between blood sugar and food , activity , medication , enables you to take immediate action to keep your blood glucose level within target range .
- HbA1c shows long term average blood glucose level , it can't reflect the glycemic variability like blood glucose test shows .



A1c and Blood Sugar

A1c (%)	Average Blood Sugar (mg/dL)
4	68
5	97
6	126
7	152
8	183
9	212
10	240
11	269
12	298
13	326
14	355