

# Glucose Tolerance Testing

## SCOPE:

This policy applies to all laboratory specimens collected at Central DuPage Hospital (CDH), the offsite laboratories and at client locations.

## PRINCIPAL:

Glucose specimens are collected at appropriate times after the administration of oral glucose. All glucose specimens are tested on approved instrumentation using whole blood collected by venipuncture. The American Diabetes Association's (ADA) guidelines define diabetes as a random or casual plasma glucose > 200 mg/dl, a two-hour post-glucola glucose value > 200 mg/dl or a fasting (minimum eight hours) plasma glucose value > 126 mg/dl. Impaired glucose tolerance is defined as a two-hour post-glucola glucose value > 140 mg/dl and < 200 mg/dl. Impaired fasting glucose is defined as a fasting glucose value > 100 mg/dl and < 126 mg/dl. Note that the impaired fasting glucose range was recently changed from > 110 to > 100 by the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (Diabetes Care vol. 26 #11, Nov. 2003). Diagnostic glucose tolerance results are to be confirmed on a subsequent day.

The ordering physician should be contacted for clarification if glucose tolerance testing is ordered for a time outside the standard formats. When post-prandial hypoglycemia is the indication for the test, a five-hour order is acceptable (not done/discontinued at CDH). In other instances, the ordering party should be informed that we use tests implementing the 1997 National Diabetes Data Group's (NDDG) criteria for diagnosis of diabetes mellitus and the ADA thresholds for fasting glucose diagnosis. If the ordering party still expresses an interest in a test of nonstandard length, he/she must speak to a pathologist for approval.

## CLINICAL SIGNIFICANCE:

Glucose tolerance testing is used for the diagnosis of diabetes and hypoglycemia in children and adults, as well as gestational diabetes.

## PATIENT PREPARATION:

Glucose tolerance testing is scheduled for the morning after an overnight fast (minimum eight hours) except for the GTT-gestational screen (212 0870), which does not require fasting. Fasting means nothing to eat or drink (except for sips of water) for eight hours before and during the scheduled test time. The individual should

engage in minimal physical activity during the test period and refrain from smoking during the test. The patient should remain in the testing area since it is possible that the patient may faint.

## SPECIMEN TYPE:

Venous whole blood collected in an SST (gold) tube.

## MATERIALS:

A 75-gram bottle of glucose drink (glucola) or 100-gram bottle of glucose drink (glucola) depending on the test ordered.

The 75-gram bottle of glucose drink and 100-gram bottle of glucose drink can be stored at room temperature or refrigerated. Do not freeze. Use before the expiration date on the bottle. Once opened, discard any liquid that isn't used by the patient.

## PROCEDURE:

- 1 Verify that the correct test has been ordered.  
The choices are:
  - GTT - gestational screen, one hour post 50 gms glucola (also called glucose challenge test)  
Test code 212 0870
  - GTT - gestational, two hour (75 gms glucola)  
Test code 212 5172
  - GTT - non-gestational, two hour (75 gms glucola)  
Test code 212 9432
  - GTT - gestational, three hour (100 gms glucola)  
Test code 212 5173
- 2 Select the correct glucose drink for the tolerance test according to the following:
  - For the pregnant patient, select either the 50 gms, 75 gms or 100 gms depending on what test is ordered.
  - For the non-pregnant patient, select the 75 gram glucose drink.
  - For the non-pregnant patient who weighs less than 95 pounds, look at the chart on the last page of this procedure to determine the correct amount of drink (75 gram) to administer.
- 3 For the two- or three-hour GTT, obtain a fasting blood specimen using a butterfly attached to a syringe. Discard the butterfly. Use one drop of blood to perform a whole blood glucose. Transfer the rest of the syringe contents into an SST (gold) tube using a transfer device. Invert the tube several times.

Record the results of the whole blood glucose on the appropriate GTT worksheet.

There is no charge for the whole blood glucose (WBG). The WBG cost is included in the price for the GTT.

#### **Satellites only**

- 4 Perform the fasting whole blood glucose. If the value is greater than 140 mg/dl, explain to the patient that the glucola (glucose drink) cannot be given until the fasting venous specimen has been tested. The patient can take the specimen and paperwork to the outpatient lab at the CDH or the entire test can be canceled and rescheduled.

#### **Outpatient lab only**

If the fasting whole blood glucose value is greater than 140 mg/dl, immediately send the fasting venous specimen to chemistry for testing and wait for the results.

- If the fasting venous specimen result is <126, administer the glucola.
- If the fasting venous specimen result is > 126, do not administer the glucola. Cancel the GTT. Order test code 212 1157 (glucose), result using the fasting venous value, and add the comment \XGTT, which translates to “Glucose tolerance test canceled due to provisional diagnosis of diabetes.”

#### **Draw sites**

Fasting whole blood glucose will not be performed if HealthLab does not have a CLIA license at the site. Glucola can be administered and draws performed per protocol.

- 5 If the glucola is given, the patient should finish the glucose drink within five minutes.
- 6 Advise the patient that you will be observing him/her for any adverse reactions. In the outpatient lab, if the patient becomes faint, call a “Code White.” At a satellite facility, alert the nursing staff. Prepare to perform a whole blood glucose, and alert the nurse/physician of the results. If the patient becomes ill (vomits), discontinue the test. Always alert the ordering physician to any problems with finishing a glucose tolerance test.
- 7 Fill out the proper worksheet showing the drink dosage and time specimens need to be collected. All times are calculated from the time the patient finishes the drink. Give a copy of the worksheet to the patient for his/her information. Advise the patient of the importance of the proper timing of the test.
- 8 At the appropriate times, collect the specimen by venipuncture into SST (gold) tubes and forward each specimen to the chemistry department for testing. Do not centrifuge the specimen.

**The actual collection time should be written on each tube and on the worksheet. The collection time on the computer labels must be edited to the time the specimen was collected.**

In outpatient lab, file the worksheet in the Glucose Tolerance Worksheet file. At a satellite lab, staple the worksheet to the order.

- 9 For any GTT, there is only one venipuncture charge even though several specimens may have been drawn.

NOTE: *The glucose, two-hour post-meal or two-hour post-prandial (6974) is discontinued.*

### **GTT – Gestational Screen, One Hour (ACOG)** **Also called glucose challenge test** **(50 grams glucola)**

Test code: 212 0870 (This code is used when glucola is provided by our laboratory)

Test code: 212 1157 (This code is used when glucola is provided by the patient’s physician, NOT by our laboratory) add the comment that the specimen is one hour post-glucola.

#### **PRINCIPLE :**

This test is used as a screening test for gestational diabetes in patients meeting certain risk criteria: older than 25 years, excess body weight, family history of diabetes, member of ethnic/racial group with high prevalence of diabetes (Hispanic, Native American, Asian, African American) between 24-28 weeks of gestation.

#### **PATIENT PREPARATION :**

The patient does NOT need to fast for this test.

#### **PROCEDURE :**

Patient gets 50 grams of glucola. Measure one half of the bottle of the 100-gram glucose beverage into a paper cup or give one bottle of a 50-gram glucose beverage to patient to drink.

Exactly one hour after the patient finishes the drink, draw a glucose specimen into an SST (gold) tube and submit for glucose testing.

Follow all procedures defined above for patient care during testing.

#### **REFERENCE RANGE :**

70-139 mg/dl

#### **INTERPRETATION :**

A one-hour post-glucola result of greater than or equal to 140 mg/dl is abnormal and should be followed by a gestational (three-hour) glucose tolerance test for confirmation of gestational diabetes.

## GTT – Gestational, Two Hour (IAD PSG) (75 grams glucola)

Test Code: 212 5172 (two-hour post 75-gram glucola)

### PRINCIPLE:

This test procedure is performed to examine the response of the patient's glucose/insulin control system after the intake of a 75-gram bottle of glucola and a minimum eight-hour fast.

### PATIENT PREPARATION:

The patient should be fasting for a minimum of eight hours prior to the test.

### PROCEDURE:

Draw a fasting glucose specimen and perform a whole blood glucose from a butterfly/syringe draw. Discard the butterfly. Use one drop of blood to perform a whole blood glucose. Transfer the rest of the syringe contents into an SST (gold) tube using a transfer device. Invert the tube several times. If fasting whole blood glucose value is greater than 140 mg/dl, refer to step 4 of the procedure on page 2. If fasting whole blood glucose is <140 mg/dl, instruct patient to drink the required amount of glucola.

Instruct the patient to drink the 75-gram bottle of glucola within five minutes.

Draw a glucose specimen into an SST (gold) tube at exactly one-hour and two-hour intervals after the glucola (glucose drink) is finished. At the end of the two-hour period, you should have drawn three specimens total including the fasting. Submit all the specimens (fasting, one-hour and two-hour) for testing.

### INTERPRETATION:

A fasting blood glucose > 100 mg/dl and < 126 mg/dl indicates impaired glucose metabolism. A fasting blood glucose > 126 mg/dl is a provisional diagnosis of diabetes; the physician is notified and test repeated the following day for confirmation. A two-hour post-glucola glucose value > 140 mg/dl and < 200 mg/dl indicates impaired glucose tolerance. A provisional diagnosis of diabetes is made when a two-hour post-glucola value is greater > 200 mg/dl; the physician is to be informed and the test repeated on a subsequent day for confirmation.

### REFERENCE RANGE:

Glucose specimens collected at:	Reference Range and Limits:
Fasting	70-91 mg/dl
One Hour	70-179 mg/dl
Two Hour	70-152 mg/dl

## GTT – Non Gestational, Two Hour (75 grams glucola)

Test Code: 212 9432 (two-hour post 75-gram glucola)

### PRINCIPLE:

This test procedure is performed to examine the response of the patient's glucose/insulin control system after the intake of a 75-gram bottle of glucola and a minimum eight-hour fast.

### PATIENT PREPARATION:

The patient should be fasting for a minimum of eight hours prior to the test.

### PROCEDURE:

Draw a fasting glucose specimen and perform a whole blood glucose from a butterfly/syringe draw. Discard the butterfly. Use one drop of blood to perform a whole blood glucose. Transfer the rest of the syringe contents into an SST (gold) tube using a transfer device. Invert the tube several times. If fasting whole blood glucose value is greater than 140 mg/dl, refer to step 4 of the procedure on page 2. If fasting whole blood glucose is <140 mg/dl instruct patient to drink the required amount of glucola.

Instruct the patient to drink the 75-gram bottle of glucola within five minutes.

Exactly two hours after the glucola is finished, draw a glucose specimen into an SST (gold) tube. Submit both the fasting and the two-hour post-glucola specimens for testing.

### INTERPRETATION:

A fasting blood glucose > 100 mg/dl and < 126 mg/dl indicates impaired glucose metabolism. A fasting blood glucose > 126 mg/dl is a provisional diagnosis of diabetes; the physician is notified and test repeated the following day for confirmation. A two-hour post-glucola glucose value > 140 mg/dl and < 200 mg/dl indicates impaired glucose tolerance. A provisional diagnosis of diabetes is made when a two-hour post-glucola value is greater > 200 mg/dl; the physician is to be informed and the test repeated on a subsequent day for confirmation.

### REFERENCE RANGE:

Glucose specimens collected at:	Reference Limits:
Fasting	70-99 mg/dll
Two Hour	70-139 mg/dl

## GTT – Gestational, Three Hour (ACOG) (100 grams glucola)

Test Code: 212 5173 (three-hour post 100-grams glucola).

### PRINCIPLE:

This test procedure is performed to examine the response of the patient's glucose/insulin control system after the intake of a 100-gram bottle of glucola and a minimum eight-hour fast.

### PATIENT PREPARATION:

The patient should be fasting for a minimum of eight hours prior to the test.

### PROCEDURE:

Draw a fasting glucose specimen and perform a whole blood glucose from a butterfly/syringe draw. Discard the butterfly. Use one drop of blood to perform a whole blood glucose. Transfer the rest of the syringe contents into an SST (gold) tube using a transfer device. Invert the tube several times. If fasting whole blood glucose value is greater than 140 mg/dl, refer to step 4 of the procedure on page 2. If fasting whole blood glucose is <140 mg/dl instruct patient to drink the required amount of glucola.

Instruct the patient to drink the 100-gram bottle of glucola within five minutes.

Draw a glucose specimen into an SST (gold) tube at exactly one-hour, two-hour and three-hour intervals after the glucola is finished. At the end of the three-hour period, you should have drawn four specimens total including the fasting. Submit all the specimens (fasting, one hour, two hour and three hour) for testing.

### REFERENCE RANGE:

Glucose specimens collected at:	Reference Ranges:
Fasting	70-94 mg/dl
One Hour	70-179 mg/dl
Two Hour	70-154 mg/dl
Three Hour	70-139 mg/dl

### INTERPRETATION:

NDDG diagnostic criteria: Any two assay values that exceed the diagnostic reference threshold.

### Coustan and Carpenter reference limits:

Fasting	95 mg/dl
One Hour	180 mg/dl
Two Hour	155 mg/dl
Three Hour	140 mg/dl

**CONVERSION TABLE FOR ORANGE BEVERAGE (75 GMS) POUNDS (LB) TO KILOGRAMS (KG)**

POUNDS	KGRAMS	OZ. DEXTROSE	POUNDS	KGRAMS	OZ. DEXTROSE
1	0.45	0.1	56	25.45	5.9
2	0.91	0.2	57	25.91	6.0
3	1.36	0.3	58	26.36	6.1
4	1.82	0.4	59	26.82	6.2
5	2.27	0.5	60	27.27	6.4
6	2.73	0.6	61	27.73	6.5
7	3.18	0.7	62	28.18	6.6
8	3.64	0.8	63	28.64	6.7
9	4.09	1.0	64	29.09	6.8
10	4.55	1.1	65	29.55	6.9
11	5.00	1.2	66	30.00	7.0
12	5.45	1.3	67	30.45	7.1
13	5.91	1.4	68	30.91	7.2
14	6.36	1.5	69	31.36	7.3
15	6.82	1.6	70	31.82	7.4
16	7.27	1.7	71	32.27	7.5
17	7.73	1.8	72	32.73	7.6
18	8.18	1.9	73	33.18	7.7
19	8.64	2.0	74	33.64	7.8
20	9.09	2.1	75	34.09	7.9
21	9.55	2.2	76	34.55	8.0
22	10.00	2.3	77	35.00	8.2
23	10.45	2.4	78	35.45	8.3
24	10.91	2.5	79	35.91	8.4
25	11.36	2.6	80	36.36	8.5
26	11.82	2.8	81	36.82	8.6
27	12.27	2.9	82	37.27	8.7
28	12.73	3.0	83	37.73	8.8
29	13.18	3.1	84	38.18	8.9
30	13.64	3.2	85	38.64	9.0
31	14.09	3.3	86	39.09	9.1
32	14.55	3.4	87	39.55	9.2
33	15.00	3.5	88	40.00	9.3
34	15.45	3.6	89	40.45	9.4
35	15.91	3.7	90	40.91	9.5
36	16.36	3.8	91	41.36	9.6
37	16.82	3.9	92	41.82	9.7
38	17.27	4.0	93	42.27	9.8
39	17.73	4.1	94	42.73	10.0
40	18.18	4.2	95	43.18	10.0
41	18.64	4.3	96	43.64	10.0
42	19.09	4.4	97	44.09	10.0
43	19.55	4.6	98	44.55	10.0
44	20.00	4.7	99	45.00	10.0
45	20.45	4.8	100	45.45	10.0
46	20.91	4.9	101	45.91	10.0
47	21.36	5.0	102	46.36	10.0
48	21.82	5.1	103	46.82	10.0
49	22.27	5.2	104	47.27	10.0
50	22.73	5.3	105	47.73	10.0
51	23.18	5.4	106	48.18	10.0
52	23.64	5.5	107	48.64	10.0
53	24.09	5.6	108	49.09	10.0
54	24.55	5.7	109	49.55	10.0
55	25.00	5.8	110	50.00	10.0