BLOOD GLUCOSE TESTING

Blood glucose testing measures the concentration of glucose in a blood sample, used to diagnose and monitor conditions such as diabetes and hypoglycemia.

Principle

The test determines glucose levels in the blood using enzymatic methods such as glucose oxidase or hexokinase. Glucose reacts with reagents to produce a color change, which is measured photometrically or using a blood glucose meter in point-of-care testing.

Condition	Purpose of Test
Type 1 Diabetes	To diagnose and monitor blood glucose control.
Type 2 Diabetes	To diagnose and manage chronic hyperglycemia.
Gestational Diabetes	To screen for glucose intolerance during pregnancy.
Hypoglycemia	To detect low blood glucose levels that can be life-threatening.

Specimen Requirements:

Test Type	Specimen Source	Volume Required	Container
Fasting Blood Glucose	Venous Blood (Serum)	2-5 mL	Serum separator tube (SST)
Random Blood Glucose	Venous or Capillary Blood	2-5 mL venous / 1 drop capillary	SST or capillary tube
Oral Glucose Tolerance Test	Venous Blood (Multiple Timed)	2-5 mL for each sample	SST
Post-prandial Glucose Test	Venous Blood (after meal)	2-5 mL	SST

Criteria for Specimen Collection, Labeling, Rejection, Storage, and Transport:

1. **Specimen Collection**
   a. **Venous Sample**:
      - Collect 2-5 mL of venous blood using a sterile venipuncture technique.
      - Use a serum separator tube (SST).

   b. **Capillary Sample (Finger Prick)**:

      - Clean the puncture site with alcohol.
      - Use a lancet to collect 1 drop of blood.

2. **Labeling**
    - Each specimen must be labeled with:
        - Patient's full name
        - Unique ID number
        - Date and time of collection
        - Type of test (e.g., fasting, random, post-prandial)
3. **Specimen Rejection**
    - Reject specimens if:
        - Improperly labeled
        - Hemolyzed samples
        - Insufficient volume
4. **Storage**
    - Store venous blood in SST at 2-8°C if not tested immediately (for up to 48 hours).
    - Capillary samples should be tested immediately.
5. **Transport**
    - Transport specimens in a cooler (2-8°C) for central lab submission within 24 hours.
    - Avoid exposure to extreme temperatures.

Procedures for Submission to Central Labs:

- **Venous Samples**:
    - Package samples in biohazard bags with proper documentation.
    - Ship samples in temperature-controlled containers (2-8°C).
- **Capillary Samples**:
    - Not typically submitted to central labs unless a portable glucose meter is unavailable.

Reagents, Supplies, and Equipment:

Reagent/Equipment	**Purpose**
Glucose Oxidase/Hexokinase Reagent	Used for glucose quantification.
Serum Separator Tubes (SST)	To collect venous blood samples.
Lancet Device	For capillary blood collection.
Glucose Meter	For point-of-care glucose measurement.

Preparation of Reagents, Stains, or Other Materials Used in Testing:

- **Glucose Oxidase/Hexokinase**:
    - Follow manufacturer's instructions for reagent preparation.
    - Store reagents at 2-8°C.
    - Reconstitute if required before testing.

Storage Requirements:

- **Glucose Reagents**:
  - Store between 2-8°C in a dark, cool place.
  - Do not freeze.
- **Serum Samples**:
  - If not immediately analyzed, store at 2-8°C for up to 48 hours.
  - For longer storage, freeze at -20°C.

Calibration:

- Calibrate glucose meters daily using manufacturer-provided calibration solutions.
- For laboratory analyzers, perform monthly calibrations using standardized control materials.

Frequency and Procedures:

Fasting Blood Glucose Test

1. **Frequency**:
   - Performed in the morning after an 8-hour fast.
2. **Procedure**:
   - Ensure patient has fasted for 8 hours.
   - Collect 2-5 mL of venous blood in an SST.
   - Centrifuge the sample within 30 minutes of collection.
   - Analyze the serum glucose using the chosen method (glucose oxidase/hexokinase).

Random Blood Glucose Test:

1. **Frequency**:
   - Can be performed at any time of day without fasting.
2. **Procedure**:
   - Collect venous or capillary blood.
   - Analyze immediately using a glucose meter (for capillary) or send to lab (for venous).

Quality Control (QC):

1. **Control Materials**:
   - Use high and low glucose control solutions.
2. **Preparation**:
   - Prepare and store control solutions as per manufacturer's instructions.
3. **Frequency of Testing**:
   - Perform QC testing with each batch of patient samples or once per shift.
4. **Expected Results**:
   - Controls should fall within the established range (provided by the manufacturer).
5. **Corrective Actions**:

    - If QC results are out of range, recalibrate the instrument or prepare fresh control materials.
6. **Recording and Storage of QC Data**:
    - Record all QC results in the lab's QC log. Store for 3 years.

Testing Instructions:

Quantitative Testing (Venous Sample):

1. Collect venous blood (2-5 mL) in an SST.
2. Centrifuge and separate the serum.
3. Load serum sample into the glucose analyzer.
4. Perform the test according to the analyzer's operational manual.
5. Record results.

Qualitative Testing (Capillary Sample):

1. Prick the patient's finger using a sterile lancet.
2. Place a drop of blood on a glucose test strip.
3. Insert the strip into a glucose meter.
4. Record results.

Reporting Results:

Test Type	Reference Range	Critical Values
Fasting Test	Normal: 70–99 mg/dL	>126 mg/dL (diabetes)
Post-prandial	<140 mg/dL (after 2 hours of eating)	>180 mg/dL (diabetes management)
Random Test	No established range; abnormal >200 mg/dL	N/A

Procedure for Reporting Abnormal Results:

- Notify the physician immediately if critical values are observed.
- Record results in the patient's chart and log abnormal results for review.

Procedure Notes:

1. **Special Precautions**:
    - Ensure proper collection technique to avoid hemolysis.
    - Maintain fasting protocols strictly for accurate results.
2. **Sources of Error**:
    - Hemolysis can falsely lower glucose levels.
    - Improper calibration of glucose meters.

Limitations of Methods:

- Fasting glucose cannot diagnose all forms of diabetes alone. An Oral Glucose Tolerance Test (OGTT) may be required.
- Capillary glucose testing is less accurate than venous testing.

Troubleshooting:

1. **If equipment fails**:
    - Switch to manual glucose test strips if available.
2. **If control results are out of range**:
    - Recalibrate and retest.

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