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| | The Johns Hopkins Hospital<br>**Pathology Volume I – POCT and Phlebotomy/Specimen Collection**<br>**Point of Care Testing–Waived Tests** | *Policy Number* | POCTW016 |
| | | *Effective Date* | |
| | | *Approval Date* | N/A |
| | *Subject*<br>**Hemoglobin – Hb 201** | *Page* | 1of 9 |
| | | *Supercedes* | N/A |

**Keywords**: Hemoglobin, Hemocue, Point of Care

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## I. PURPOSE

This procedure provides instructions for performing hemoglobin testing using the HemoCue Hb 201 Analyzer.

## II. ORDER

A physician's order, standard protocol, or order by other health professionals authorized to request laboratory tests is required for hemoglobin testing

## III. REAGENTS

All reagents are available from Central Stores

| Reagent Name | Unit of Issue | Central Stores/ MDC Cat # |
|---|---|---|
| HemoCue microcuvettes | Box | 105124 |
| Bio-Rad Meter Trax (low control) | Vial | 20693 |
| Bio-Rad Meter Trax (high control) | Vial | 20691 |

## IV. REAGENT STORAGE

| HemoCue Microcuvettes | Bio-Rad Meter Trax Controls |
|---|---|
| Store at Room Temprature of 15 - 30 $^0$ C (59- 86 F) | Store refrigerated at 2 - 8 $^0$ C (40- 50 F) |
| Vial is stable unopened until the manufacturer's expiration date | Vials are stable unopened and refrigerated until the manufacturer's expiration date |
| Do not refrigerate | Do not freeze vials |
| Microcuvettes are stable for 3 months after opening | Once opened, store at room temperature |
| Store vial tightly capped | Once opened, QC vials expire after 30 days |
| Record opened and expiration date on the vial | Record opened and expiration date on side of vials |

## V. SUPPLIES

Additional supplies for testing

- Vinyl or Nitrite disposable gloves
- Timer
- Kimwipes or other absorptive paper
- Blood collection device ( ex. lancets, vacutainers, ABG syringes)
- JHMI approved sharps container
- JHMI approved biohazard waste container
- Parafilm (available from Cardinal health - Catalog # P1150-6)

- Opened/ expiration date labels (available from Standard Register - Catalog # 0590N)

## VI. SAFETY PRECAUTIONS

Follow Standard Precautions and CDC hand washing guidelines when performing this test

- Wear gloves when collecting and testing blood samples
- Dispose of used lancets, syringes, and needles in an approved JHMI sharps container

## VII. METER CLEANING

The cuvette holder should be cleaned everyday.

1. **Cleaning the cuvette holder**
   a. Check that the analyzer is turned off. The display should be blank
   b. Pull the cuvette holder out to the loading position
   c. Carefully press the small catch positioned in the upper right corner of the cuvette holder
   d. While pressing the catch, carefully rotate the cuvette holder sideways as far as possible to the left
   e. Remove the cuvette holder from the analyzer
   f. Clean the cuvette holder with alcohol or mild detergent
   g. Wait 15 minutes before putting the cuvette holder back into the analyzer. It is important that the cuvette holder is completely dry before reinserting it into the analyzer

2. **Cleaning the analyzer and docking station**
   a. Make sure that the analyzer is turned off. The display should be blank.
   b. For the outside surfaces, use Isopropanol <45 volume % i.e. caviwipes

Note: The display can be cleaned with alcohol, without additives.

## VIII. QUALITY CONTROL

*** SELFTEST**

The HemoCue Hb 201 analyzer has an internal electronic "SELFTEST". Every time the anlayzer is turned on, it will automatically verify the performance of the optronic unit of the analyzer. This test is performed every second hour if the analyzer remains switched on.

1. **Running Quality Control**

Two levels of Bio-Rad Meter Trax control solution must be run every 24 hours of use. The analyzer will lockout if QC is not performed within this time.

a. In the Main menu, press the QC Test button.
b. In the next display, choose the required QC level.
c. Fill a cuvette with the appropriate level of Liquid Control.
d. Wait 90 seconds according to manufacturer's guidelines
e. Place the cuvette in the cuvette holder and gently insert into the measuring position
f. Scan the cuvette batch number
g. Manually enter the QC lot number
h. The result will be displayed when all required informartion has been entered and the measurement has been completed
i. The result will be displayed as Pass or Fail
j. Press the Confirm button to store the information.
k. The Main menu will be displayed

2. **QC Troubleshooting**

a. If a result fails, add the appropriate comment and then repeat the level that failed.
b. To add a comment, press the Comment input button and choose one from the list
c. If QC fails a second time, repeat test using new Quality Control material and / or new cuvettes
d. If QC continues to fail, contact the POCT Office at 5-2645

## IX. SPECIMEN

Capillary, venous or arterial whole blood may be used for testing.

- Capillary samples must be tested immediately after collection
- For best results with arterial and venous blood, Heparin or EDTA are reccommended anticoagulants.
- Clear arterial lines before the blood sample is drawn

## X. SPECIMEN COLLECTION

- The patient should be identified by using two unique identifiers, neither to be the room number, prior to collecting the blood sample
- The following procedures are used for collecting patient blood specimens for testing on the Hb 201 analyzer
  - Capillary (Fingerstick)
  - Central Venous Access Devices (VAD)
  - Arterial
  - Peripheral Venous or Arterial from Vacutainer tubes

A. **Capillary Procedure**

1. Remove a cuvette from the bottle and place it on a lint-free tissue. Recap the bottle of cuvettes

2. Select the sampling site: Palmar surface of the distal phalanx of the middle or ring finger
3. The puncture site should be warm and not swollen. Use your thumb to gently massage the finger from the top nuckle to the tip
4. Clean the site with 70% alcohol and allow site to air dry
5. Perform the puncture just off-center of the finger tip
6. Using a dry gauze, wipe away the first 1 -2 drops of blood
7. Allow a small drop of blood to form on the finger. Avoid "milking" the finger as the blood must be free flowing
8. Holding the cuvette by the winged end, move the tip of the filling edge just into the blood drop. The cuvette will fill by capillary action. Avoid aspirating bubbles
9. Gently wipe any excess blood from the cuvette with a lint free tissue
10. Continue with the Standard Testing Procedure

B. **Central venous Access (VAD) Procedure**

1. Label a lithium heparin blood gas syringe with 2 patient identifiers in the presence of the patient
2. Using a waste syringe, collect and discard the first 6 cc of blood
3. Draw the sample for hemoglobin testing in a lithium heparin blood gas syringe
4. Cap the syringe and mix by gentle inversion 10 times so that the anticoagulant is properly mixed with the blood. Sample should be tested immediately after mixing
5. Remove a cuvette from the bottle and place flat on a lint-free tissue
6. Place a small square of parafilm on a lint-free tissue
7. Uncap the syringe and discard a small amount of the sample before delivering a drop of blood to the parafilm square. Recap the syringe
8. Holding the cuvette by the winged end, move the tip of the filling edge just into the blood drop. The cuvette will fill by capillary action. Avoid aspirating bubbles
9. Gently wipe any excess blood from the cuvette with a lint-free tissue
10. Continue with the steps in the Standard Testing procedure

C. **Arterial Line Procedure**

1. Label a lithium heparin blood gas syringe with 2 patient identifiers in the presence of the patient
2. Ensure arterial line is clear before obtaining sample
3. Using a waste syringe, collect and discard the first 3 cc of blood
4. Draw a sample for hemoglobin testing in a lithium heparin blood gas syringe
5. Cap the syringe and mix by gentle inversion 10 times so that the anticoagulant is properly mixed with the blood. Sample should be tested immediately after mixing
6. Remove a cuvette from the bottle and place flat on a lint-free tissue
7. Place a small square of parafilm on a lint-free tissue
8. Uncap the syringe and discard a small amount of the sample before delivering a drop of blood to the parafilm square. Recap the syringe
9. Holding the cuvette by the winged end, move the tip of the filling edge just into the blood drop. The cuvette will fill by capillary action. Avoid aspirating bubbles

10. Gently wipe any excess blood from the cuvette with a lint-free tissue
11. Continue with the steps in the Standard Testing procedure

D. **Peripheral Venous or Arterial Procedure**

1. Label vacutainer tube with the 2 patient identifiers in the presence of the patient
2. Collect blood sample in a vacutainer tube that contains the appropriate anticoagulant (Heparin or EDTA)
3. Mix the tube by gentle inversion 10 times so that the anticoagulant is properly mixed with the blood. Sample should be tested immediately after mixing
4. Remove a cuvette from the bottle and place flat on a lint-free tissue
5. Place a small square of parafilm on a lint-free tissue
6. Remove the vacutainer tube cap and withdraw a sample from the tube using a transfer pipette
7. Gently squeeze the pipette to form a small drop of blood on the parafilm. Discard the pipette into an appropriate biohazard waste container and then recap thevacutainer tube
8. Holding the cuvette by the winged end, move the tip of the filling edge just into the blood drop. The cuvette will fill by capillary action. Avoid aspirating bubbles
9. Gently wipe any excess blood from the cuvette with a lint-free tissue
10. Continue with the steps in the Standard Testing Procedure

## XI. STANDARD TESTING PROCEDURE

1. In the Main menu, press the Patient Test button
2. Scan the cuvette lot number
3. Enter the Patient MRN (can be scanned if barcoded wristband is available)
4. Fill and insert the microcuvette
5. Result will be displayed when all required information has been entered and the measurement has been completed.
6. To add comments to a result, press the Comment input button. The result will remain on the display even if the Cuvette holder is pulled out, allowing for examination of the cuvette before a comment is made
7. If the test needs to be repeated (double checked), press the Verify button, which will allow a second test to be run for the patient
8. Press the Confirm button to store the result. The Main menu will be displayed

## XII. RESULTS REPORTING

The patient's ID number, result, date and time of test, meter ID and operator initials must be recorded according to each Department's documentation method.

## XIII. EXPECTED RESULTS

Normal Range:

Adult male: 13.9 - 16.3 g/dL

Adult female: 12.0 - 15.0 g/dL

## XIV. CRITICAL ACTION VALUES

The Critical Action values (CAV) for hemoglobin at the Johns Hopkins Medical Institutions are:

- Less than 6 g/dL
- Greater than 22 g/dL

Notify the patient's physician/provider to determine if additional follow-up is needed (i.e. sample to the lab, etc).

A comment must be added in the meter everytime a CAV is resulted. To do so, choose one from the provided list.

Document in the patient's record that:

- The physician/provider has been notified of the CAV
- Read-back of the CAV has ocurred and been verified
- Record the date and time that the physician/provider was notified

## XV. LINEARITY

The HemoCue Hb 201 DM Analyzer will accurately read hemoglobin results between 0 - 25.6 g/dL. Values above 25.6 g/dL must be confirmed using a suitable laboratory method.

## XVI. TEST USE

The HemoCue Hb 201 DM Analyzer for hemoglobin testing is used for the screening and ongoing management of patients at the Johns Hopkins Medical Institutions.

## XVII. LIMITATIONS

The following are limitations of the HemoCue Hb 201 DM Analyzer hemoglobin system:

- Measurement of hemoglobin should be made as soon as possible after blood has been drawn into the cuvette. If readings are made later than 10 minutes after filling the cuvette, false results may be obtained
- If air bubbles are seen in the optical eye of a blood filled cuvette, false results may be obtained
- Do not hold the cuvette by the filling end as this can contaminate the optical eye
- Sulfhemoglobin is not measured with this method
- Carboxyhemoglobin levels up to 10% do no interfere for use

## XVIII. ERROR MESSAGES

The following table lists the most common error messages and the action to be taken for troubleshooting. If initial troubleshooting doesn't solve the problem, contact the POCT Office for help at 5-2645.

| Error Code | Explanation | Action |
|---|---|---|
| E00 | Faulty cuvette or the circuit board is out of order | - Check the expiration date for the cuvettes<br><br>- Take a new cuvette and repeat the test |
| E01-E05 | Fault in the optics or electronics | - Turn off the analyzer and clean the optronic unit |
| E06 | The analyzer might be cold | - Turn off the analyzer and allow it to reach rom temperature |
| E11 | Hardware error | - The analyzer needs service. Contact POCT |
| E17 | Internal error | - the analyzer needs service. Contact POCT |
| E26 | The patient test memory is full | - Contact POCT |
| E27 | The QC memory is full | - Contact POCT |

## XIX. COMMENT CODES

Comment codes are available for when QC fails and also when a Critical Value is obtained on a patient sample:

| QC Comment Codes | CAV Comment Codes |
|---|---|
| QC Fail. Will repeat | CAV, Will repeat |
| Operator error | CAV, will send to lab |

## XX. TRAINING

Initial training on the HemoCue Hb 201 will include:

- POCT, Educator or Unit based training
- QC performance observed by trainer
- Taking and passing a written test
- Completion of the Training Checklist to be signed by trainer
- Documentation filed with developmental resume

## XXI. ONGOING COMPETENCY

Ongoing competency will include:

- QC (Low and High Controls) performed and passed twice a year
- MyLearning update completed once a year

## XXII. SPONSOR AND DEVELOPER

**Sponsor:**

Pathology Performance Improvement

**Developer:**

Point of Care Testing Office

## XXIII. SIGNATURE

Reviewed by Laboratory Director