


Director Approval \_\_\_\_\_ Date \_\_\_\_\_

 <p><b>UCSF</b> Medical Center <b>Clinical Laboratories</b></p>	<p><b>Point of Care Testing</b></p>
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## **HemoCue Hb 201+ Procedure**

### **I. PURPOSE**

The HemoCue Hb 201+ is a portable analyzer used for quantitative determination of hemoglobin in whole blood at the patient's bedside.

### **II. PRINCIPLE**

The HemoCue Hb 201+ system consists of a small portable hemoglobin reader, and single use disposable microcuvettes. The optical eye of the microcuvette contains the dried testing reagents. Ten microliters of blood are drawn into the optical eye by capillary action and spontaneously mixed with the reagents. Hemoglobin is converted to azidmethemoglobin. The HemoCue reader tunes the reaction and displays hemoglobin results in grams per deciliter.

### **III. EQUIPMENT**

1. HemoCue Hb 201+ Photometer
2. HemoCue Hb 201+ microcuvettes
3. R + D liquid quality controls
4. HemoCue AC adapter or 4 AA batteries
5. QC log sheets
6. Sharps container
7. Gloves
8. Finger stick lancet
9. Cotton swabs
10. Kimwipes
11. Warm water
12. Refrigerator for liquid control storage

1. HemoCue Hb 201+ Photometer, HemoCue AB, Sweden
  - a. The analyzer can be operated using an AC power adapter or four type AA batteries.
  - b. If a battery symbol appears on the display, the batteries are running low on power. The analyzer will continue to give accurate results, but the batteries should be replaced as soon as possible.
  - c. To turn the analyzer on:
    - i. Pull the cuvette holder out to the “LOADING” position.
    - ii. Press and hold the left button until the display is activated (all symbols appear on the display).
    - iii. The display shows the version number of the program, after which it will show an hourglass symbol and “Hb”. During this time the analyzer will automatically verify the performance of the optronic unit.
    - iv. After 10 seconds, the display will show three flashing dashes and the HemoCue symbol. This indicates that the HemoCue Hb201+ is ready for use.
  - d. To turn the analyzer off:
    - i. Press and hold the left button until the display reads OFF and then goes blank.
  - e. The HemoCue Hb 201+ is calibrated at the factory. Measurement range is 0-25.6 g/dL.
  - f. The HemoCue Hb 201+ is only to be used with HemoCue Hb 201 microcuvettes.
  
2. HemoCue Microcuvettes
  - a. Microcuvettes are stored at room temperature away from any direct heat source.
  - b. Microcuvettes are moisture sensitive. **Always keep the container properly closed.**
  - c. Remove required number of microcuvettes just prior to testing.
  - d. When removing microcuvettes, slide out one at a time onto a clean flat surface. Do not touch the microcuvette eye.
  - e. Unopened containers of microcuvettes may be used until the listed expiration date.
  - f. Open containers of microcuvettes are stable for three months (90 days) if they are tightly sealed between uses.
  - g. **Always label each opened container with initials, the open date, and the new three-month expiration date.**
  
3. HemoCue Liquid Quality Control: R&D GLU/HGB Control
  - a. Two Levels: **Level 1** (Low control), catalog # GH00LX and **Level 3** (High control) catalog # GH00HX
  - b. Order from HemoCue at 1-800-323-1674.
  - c. Open vial is stable for 30 days when stored at room temperature, 15 - 30° C.
  - d. Open vial is also stable for 30 days when stored in the refrigerator at 2 – 8°C. Control must be allowed to equilibrate at room temperature for a minimum of 15 minutes, preferably for an hour before use.
  - e. **Always initial and write open, and new expiration date on the vial.**
  - f. Unopened controls are stable if refrigerated at 2-8°C until the expiration date on the vial.

- g. Test liquid quality controls each day of patient use for each HemoCue Hb 201+ and each open container of microcuvettes.

#### **IV. DAILY MAINTENANCE**

Each day of patient testing, perform daily maintenance on each HemoCue Hb 201+ used and document on the HemoCue control logsheet.

1. Check that the analyzer is turned off. The display should be blank.
2. Pull the cuvette holder out to its “LOADING” position. Carefully press the small catch positioned in the upper right corner of the cuvette holder.
3. While pressing the catch, carefully rotate the cuvette holder towards the left as far as possible. Carefully pull the cuvette holder away from the analyzer.
4. Clean the cuvette holder with alcohol or mild detergent. It is important that the cuvette holder is completely dry before being replaced.
5. A dirty optronic unit may cause the analyzer to display an error code. To clean the optronic unit, proceed as follows.
  - a. Use a swab slightly moistened with either alcohol (without additive) or water to clean the inside of the HemoCue Hb 201+ . Push the swab into the opening of the cuvette holder. Move from side to side 5 – 10 times. If the swab is stained, repeat with a new swab. No further cleaning is required if the swab remains clean.
  - b. Wait 15 minutes before replacing the cuvette holder and using the analyzer.
6. The cover may be cleaned with alcohol or mild soap solution.

#### **V. INTERNAL ELECTRONIC QUALITY CONTROL**

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

#### **VI. LIQUID QUALITY CONTROLS**

Each HemoCue Hb 201+ must be tested with two levels of liquid controls each day of patient testing. In addition, if more than one container of microcuvettes is open you must test liquid controls on each open vial of microcuvettes. Liquid quality controls assure the proper functioning of the entire test system. Document results on the HemoCue control log.

1. Put on gloves. Observe standard precautions.
2. Warm refrigerated controls at room temperature for a minimum of 15 minutes, preferably for one hour before using.
3. Turn HemoCue Hb 201+ on:
  - a. Pull the black cuvette holder out to the “LOADING” position.
  - b. Press and hold the left button until the display is activated. The analyzer will automatically perform an internal electronic “SELFTEST”.

4. Remove a microcuvette by sliding it out onto a clean surface. Do not touch the optical eye. Reseal container immediately.
5. Mix control thoroughly. Roll control between the palms for 20 seconds and gently invert it from end to end 10 times. Do not shake or cause it to become foamy.
6. Remove the cap and squeeze the vial to expel the hanging drop of control.
7. Hold the microcuvette with the pointed end away from you.
8. Touch the pointed end to the drop of control. Allow the microcuvette to fill by capillary action.

**Note: Contents of the control vial should not be allowed to directly contact the HemoCue Hb 201+ microcuvette due to possible back transfer of reagent.**

9. Control may also be dropped onto a hydrophobic surface and sampled.
10. Gently wipe the outside of the microcuvette with a Kimwipe or gauze using a sideways motion. Do not touch the open slit.
11. Examine the microcuvette for bubbles. Repeat sampling with a new microcuvette if bubbles are present.
12. Place the filled microcuvette in the cuvette holder.
13. Push the cuvette holder to the "MEASURING" position.
14. During the measurement an hourglass symbol will show on the display.
15. After 15 – 60 seconds, the hemoglobin value of the sample is displayed. The result will remain on the display as long as the cuvette holder is in the "MEASURING" position. When operating on battery power, the analyzer will automatically turn off after approximately 5 minutes.
16. If this value falls within the acceptable limits listed on the control insert, record the results.
17. Pull the black cuvette holder out to the "LOADING" position.
18. Dispose of microcuvette in a biohazard waste container.
19. Repeat above procedure for the high (Level 3) control.
20. If control value exceeds the acceptable range, repeat the maintenance and the control.
21. If repeat controls again fail, take corrective action.
  - a. Check the open date and expiration date on the microcuvette container.
  - b. Check the open date and expiration date of the control.
  - c. Follow corrective actions listed in the HemoCue Hb 201+ Troubleshooting Guide.
22. Document all corrective actions.
23. Repeat above procedure for each HemoCue Hb 201+ and each opened container of microcuvettes.

## **VII. SPECIMEN REQUIREMENTS**

1. Verify patient identification using two patient identifiers. Sample must be labeled (per Specimen Collection guidelines) if testing is not performed immediately, in the presence of the patient.
2. Volume required: Ten microliters of whole blood.
3. Blood sample may be collected by fingerstick, heelstick or venipuncture.
4. Venipuncture samples can be collected in a vacuum tube with either an EDTA or heparin anticoagulant. Mix immediately by gentle inversion.
5. Unacceptable samples: blood collected in tubes with citrate as the anticoagulant.

## **VIII. PATIENT TESTING**

1. Put on gloves. Observe Universal Precautions.
2. Turn HemoCue Hb 201+ on:
3. Pull the black cuvette holder out to the "LOADING" position.
4. Press and hold the left button until the display is activated. The analyzer will automatically perform an internal electronic "SELFTEST".
5. Remove a microcuvette by sliding it out onto a clean surface. **Do not touch it. Reseal container immediately.**
6. Obtain patient sample following nursing guidelines.
  - a. Sample obtained by fingerstick:
    - i. Wipe away the first drop of blood.
    - ii. Apply light pressure to the finger until a drop of blood forms. Do not squeeze the finger.
    - iii. Hold the microcuvette with the pointed end away from you.
    - iv. Touch the pointed tip of the microcuvette to the drop of blood.
    - v. Allow the microcuvette to fill by capillary action
  - b. Sample from vacutainer tube:
    - i. Mix tube by gentle inversion 10 times and remove the stopper. Observe universal precautions.
    - ii. Hold the microcuvette with the pointed end away from you.
    - iii. Touch the pointed tip of the microcuvette to the tip of the sample syringe and allow the microcuvette to fill by capillary action.
    - iv. Vacutainer must be labeled with patient identification if immediate testing is not performed.
7. Gently wipe the outside of the microcuvette with a Kimwipe or gauze using a sideways motion. **Do not touch the open slit.**
8. Examine the microcuvette for bubbles. If bubbles are present, use a new microcuvette and repeat sampling.
9. Place the filled microcuvette in the black cuvette holder and push the cuvette holder to the "MEASURING" position.
10. During the measurement an hourglass symbol will show on the display.
11. After 15 – 60 seconds, the hemoglobin value of the sample is displayed. The result will remain on the display as long as the cuvette holder is in the "MEASURING" position. When operating on battery power, the analyzer will automatically turn off after approximately 5 minutes.
12. Read and record results.
13. Pull out the black cuvette holder and dispose of the microcuvette in a biohazard waste container.
14. If the black cuvette holder is bloody, you must clean it and the inside of the HemoCue Hb 201+.
15. If the microcuvette is not inserted into the HemoCue Hb 201+ immediately after sampling, keep it in a horizontal position. Testing must be completed within 10 minutes of sampling. Check for bubbles before placing it on the cuvette holder.

NORMAL VALUES

Sex	Age	Normal Values
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	0-7 days	14.5-22.5 g/dL
	8-14 days	13.5-21.5 g/dL
	2-4 wks	12.5-20.5 g/dL
	1-2 mos	10.0-18.0 g/dL
	2-3 mos	9.0-14.0 g/dL
	3-6 mos	9.5-13.5 g/dL
	6-24 mos	11.0-13.5 g/dL
	2-5 yrs	11.2-13.5 g/dL
	5-8 yrs	11.4-15.5 g/dL
	8-12 yrs	11.6-15.5 g/dL
Male	12-15 yrs	12.3-16.0 g/dL
	15-18 yrs	12.6-17.0 g/dL
	18+ yrs	13.6-17.5 g/dL
Female	12-15 yrs	11.8-15.5 g/dL
	15+ yrs	12.0-15.5 g/dL

References for Normal Values: UCSF Clinical Laboratories Manual

HEMOGLOBIN PANIC VALUES:  $\leq 7$  g/dL. Repeat the test. Draw a sample and send it stat to Clinical Labs for confirmation.

Measurement range: 0-25.6 g/dL.

## IX. PRECAUTIONS AND LIMITATIONS

1. Air bubbles in the microcuvette will result in erroneously low values. The microcuvette should be inspected for bubbles before testing.
2. The microcuvette should be filled in a continuous process. It should never be topped off after the initial filling.
3. Blood inside the HemoCue Hb 201+ will interfere with hemoglobin measurement.
4. Blood collected in vacutainer tubes with liquid anticoagulant may give erroneous readings due to the effects of dilution.
5. If the HemoCue Hb 201+ displays an error code, refer to the Troubleshooting Guide.
6. R&D GLU/HGB Controls contain human red cells. Use Universal Precaution when handling controls.

## X. REFERENCES

1. HemoCue Hb 201+ Operating Manual
2. HemoCue Cuvette Package Insert
3. Huberty S., Clinical Labs, HemoCue Procedure, 8/16/99