


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 Classic Procedure**

### **I. PURPOSE**

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

### **II. PRINCIPLE**

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

1. HEMOCUE HEMOGLOBIN CLASSIC PHOTOMETER, HemoCue AB, Sweden
  - a. The photometer is activated with the switch located in the back. The screen displays "Hb" when the HemoCue is on.
  - b. The black cuvette holder is located on the right side of the HemoCue Classic.
  - c. The HemoCue Classic is calibrated at the factory. Measurement range is 0-25.6 g/dL.
  - d. The HemoCue Classic can be operated using five AA type batteries or with an AC power adapter.
  
2. HEMOCUE MICROCUVETTES
  - a. Microcuvettes are stored at room temperature away from any direct heat source.
  - b. The container must be kept tightly capped. Remove required number of microcuvettes just prior to testing.
  - c. Microcuvettes are moisture sensitive. Do not remove desiccant from the container.
  - 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. Label each opened container with the open date and the new three-month expiration date.
  
3. HEMOCUE CONTROL CUVETTE
  - a. This is the daily control for checking the HemoCue Classic calibration.
  - b. Keep the red control cuvette in its box to protect it from contamination.
  - c. The red control cuvette may be cleaned with an alcohol swab.
  - d. Assigned value is written in the red control cuvette box.
  - e. Follow manufacturer's insert to assign a value to a new red control cuvette.
  
4. 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°F. Control must be allowed to equilibrate at room temperature for a minimum of 15 minutes, preferably for an hour before use.
  - e. Write the 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 2 levels of liquid quality control each day of patient testing on each HemoCue Classic and with each open container of microcuvettes.

#### **IV. DAILY MAINTENANCE AND CONTROL**

Perform daily maintenance and QC check with the red control cuvette on each HemoCue Classic on each day of use. Document results in the HemoCue Log. If the red control cuvette value deviates more than  $\pm 0.3$  gms/dL from its assigned value, you must take corrective action and document it in the corrective action log.

1. Turn on photometer with the switch located in the back. Screen reads "Hb".
2. Pull out black cuvette holder and examine. Clean with alcohol if blood is present. Dry before reinsertion.
3. Use a swab slightly moistened with either alcohol or water to clean the inside of the HemoCue Classic.
4. Reinsert black cuvette holder and push to the first stop. After 3 seconds, the screen displays "READY".
5. Place the red control cuvette in the holder and push in completely. Screen displays "MEASURING".
6. Results appear after 15 seconds. Displayed value must be within  $\pm 0.3$ gms/dL of the assigned value.
7. Repeat above procedure with each HemoCue Classic.
8. Return the red cuvette to its storage box after each use. Do Not Discard.
9. Document all results on the HemoCue QC log.
10. If reading exceeds  $\pm 0.3$ gms/dL of the assigned value, clean the red cuvette and the HemoCue Classic with an alcohol swab and repeat the test.
11. If the second red cuvette reading still exceeds the assigned value, the instrument **cannot be used**. Remove it from the premises and notify the supervisor.

## V. LIQUID QUALITY CONTROLS

Each HemoCue Classic must be tested with two levels of liquid controls each day of patient testing. In addition, if more than one container of cuvettes is open you must test liquid controls on each open vial of cuvettes. 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. Pull black cuvette out to the "READY" position.
  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 cap and squeeze the vial to expel a hanging drop of control.
  7. Hold the microcuvette by the wings 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 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 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. Insert the microcuvette in the black cuvette holder and slide it into the "Measuring" position.
  13. After 45 seconds, the HemoCue Classic displays the result. Results are displayed for five minutes if the black cuvette is left in the "MEASURING" position.

14. If this value falls within the acceptable limits listed on the control insert, record the results.
15. Slide the black cuvette out to the "READY" position.
16. Dispose of the microcuvette in a biohazard sharps waste container.
17. Repeat above procedure for the high (Level 3) control.
18. If control value exceeds the acceptable range, repeat the maintenance and the control.
19. 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 Troubleshooting Guide.
20. Document all corrective actions.
21. Repeat above procedure for each HemoCue Classic and each opened container of microcuvettes.

## VI. 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.

## VII. PATIENT TESTING

1. Put on gloves. Observe Standard Precautions.
2. Turn HemoCue Classic on.
3. Pull black cuvette out to the "Ready" position.
4. Remove a microcuvette by sliding it out onto a clean surface. **Do not touch it. Reseal container immediately.**
5. 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 by the wings 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 by the wings 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.**
6. Gently wipe the outside of the microcuvette with a Kimwipe or gauze using a sideways motion. **Do not touch the open slit.**

7. Examine the microcuvette for bubbles. If bubbles are present, use a new microcuvette and repeat sampling.
8. Insert the microcuvette into the black cuvette holder and slide the holder into the "Measuring" position.
9. After 45 seconds, the HemoCue Classic displays hemoglobin results in g/dL. Results are displayed for five minutes if the black cuvette holder is left in the "MEASURING" position.
10. Read and record results.
11. Pull out the black cuvette and dispose microcuvette in a biohazard waste container.
12. If the black cuvette is bloody, you must clean it and the inside of the HemoCue Classic.
13. If the microcuvette is not inserted into the HemoCue Classic 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
	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	13.6-17.5g/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. Values above 25.6 g/dL will be displayed as Error Code 999.

## 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 Classic 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 Classic displays Error codes 900-905, refer to the Troubleshooting Guide that follows this procedure.
6. R&D GLU/HGB Controls contain human red cells. Use Standard Precaution when handling controls.

## **X. REFERENCES**

1. HemoCue Hemoglobin Operator's Manual
2. HemoCue Cuvette Package Insert
3. Huberty S., Clinical Labs, HemoCue Procedure, 8/16/99