MICROHEMATOCRIT

RC.HM.PR.031.r03

Principle A given volume of whole blood is centrifuged to obtain maximal packing of erythrocytes. The volume of erythrocytes is measured and expressed as a percentage of the total volume.

Specimen Collection and Handling

Type:	Whole blood collected in a 4 mL vacutainer. This is the preferred sample. OR Capillary blood collected in a microtainer.
Anticoagulant:	K_2EDTA
Amount:	Whole blood - Minimum sample size is 2.0 mL - Optimum sample size is 4.0 mL Capillary blood - Minimum sample size is 300 mcL - Optimum sample size is 500 mcL
Special Handling:	Specimen must be well mixed for minimum of two minutes before being analyzed. Ensuring adequate mixing is essential. Mix the sample well before filling the first tube and again before filling the second tube. Samples containing hemolysis may give false results (see Note #3).
Timing:	Specimen is stable for 8 hours at room temperature; 72 hours at 4°C.
Criteria for Unacceptable Specimens:	Specimens containing clots, hemolysis or inappropriate volume are unacceptable and must be redrawn.

Equipment

1. SafeCrit™ plastic microhematocrit tubes
2. Critoseal™
3. HemataStat II microhematocrit centrifuge with microhematocrit reader

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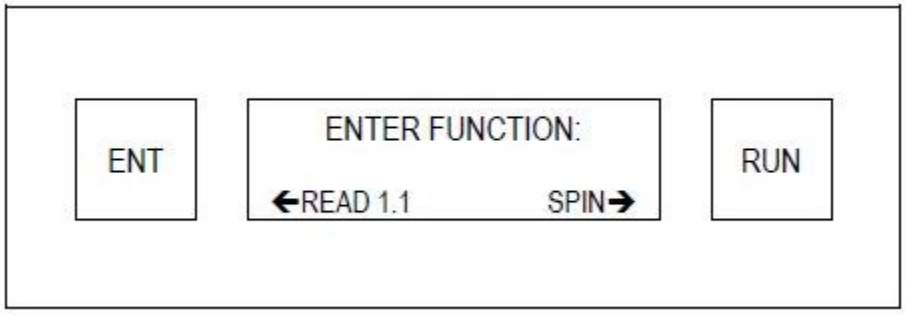
Quality Control

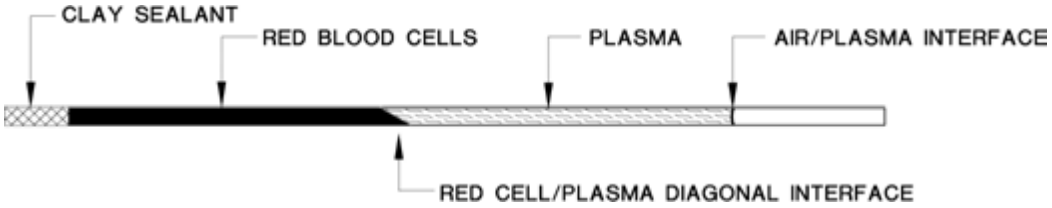
1. Quarterly checks are made of rpm and the timer. See Attachment A for these maintenance procedures.
2. A microhematocrit is performed on a normal blood analyzed on the main hematology analyzer. Results should agree ±2.0 %. Run a normal blood every time you have a patient to run.
3. Samples are run in duplicate and results averaged.

Procedure

1. Using well-mixed specimen, fill 2 plastic microhematocrit tubes between ½ and ¾ full. Ensuring adequate mixing is essential. Mix the sample well before filling the first tube and again before filling the second tube.
2. Seal one end with critoseal. **NOTE:** The interface between critoseal/ blood should be flat. Place tubes into tube holders with sealed ends at the bottom of the tube holder. To balance the rotor, place tubes opposite each other in the centrifuge.
3. With the tube holders and hematocrit tubes in place, lock the lid by firmly pressing down on the lid tab. Start the run cycle by pressing the RUN button. The centrifuge will spin the sample for 60 seconds. Observe the 60 second count down on the LCD. The lid will automatically unlock and open when the rotor stops.
4. Read hematocrit as soon as centrifuge stops. Only one tube at a time should be removed from the rotor for reading. Once a tube has been removed from the rotor, it should be read within 1 minute. Additional tubes may be left in the rotor for up to 5 minutes without any adverse effects. To use the reader:
   a. Look at the LCD to insure that the tube size **1.1 mm** appears in the LCD between the READ and SPIN messages.

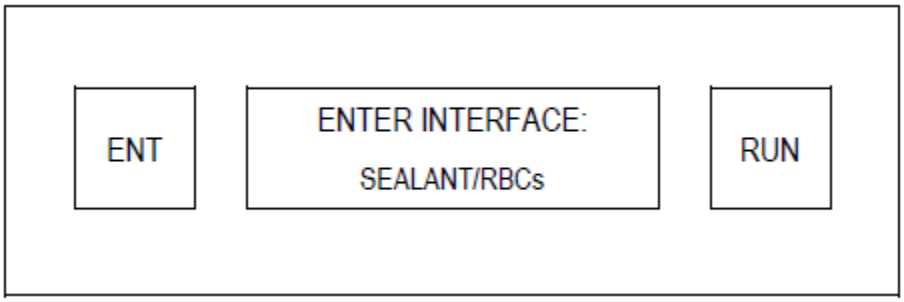


   b. Move the slider to the far left side of the reader tray.
   c. Remove a capillary tube from the rotor and place it in the groove located in front of the LCD. Make sure the sealant end of the tube is to the far left, against the end of the groove. Rotate the tube in the groove so that the full diagonal interface of the Red Blood Cells (RBCs)/PLASMA can easily be seen as shown below:

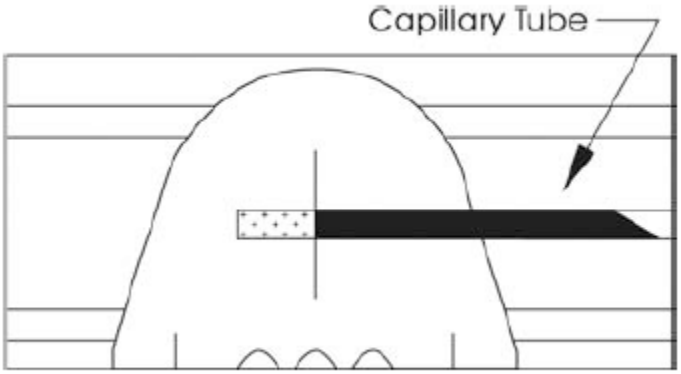


Once it has been properly positioned, make sure you do not move the tube during the reading process.

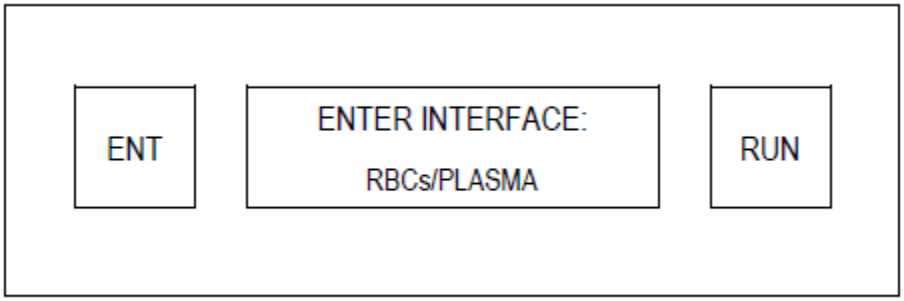
d. Press the ENT button. The LCD will change to:



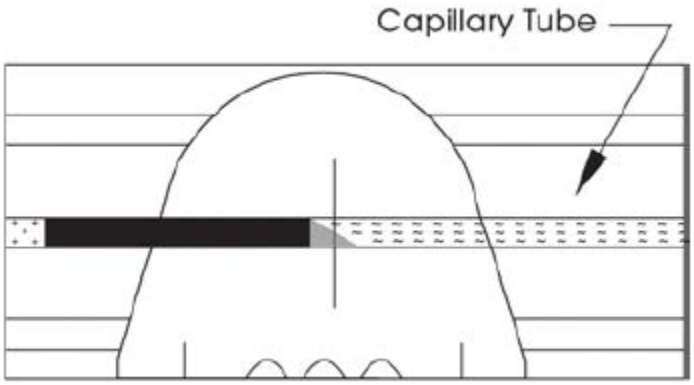
e. Move the slider along the capillary tube to the interface of the tube sealant and red blood cells. Look through the transparent slider and position the vertical black line on the interface as shown in the following diagram.



f. Press the ENT button. The LCD will change to:

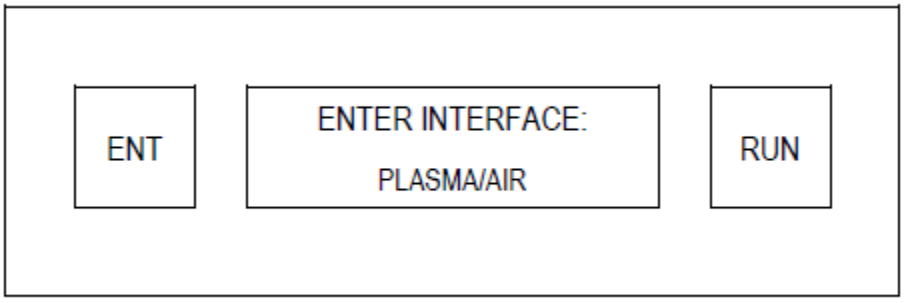


g. Move the slider to the RBCs/PLASMA interface. Look through the transparent slider and position the vertical black line on the middle of the diagonal interface as shown in the following diagram.

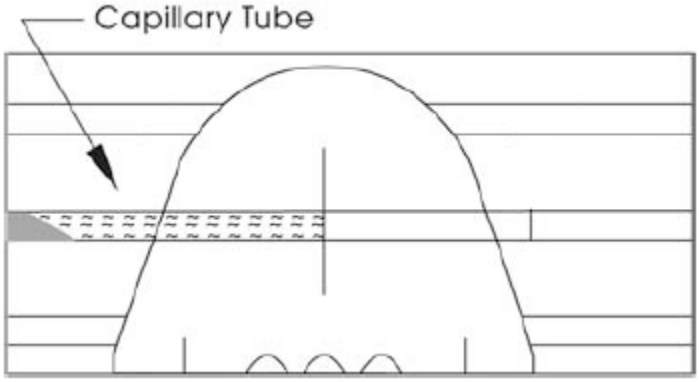


In some instances, a line of red blood cells extending from the RBCs/PLASMA interface through the PLASMA/AIR interface can be observed. These fine lines of red blood cells are residuals from the migration and they have not been found to affect the results.

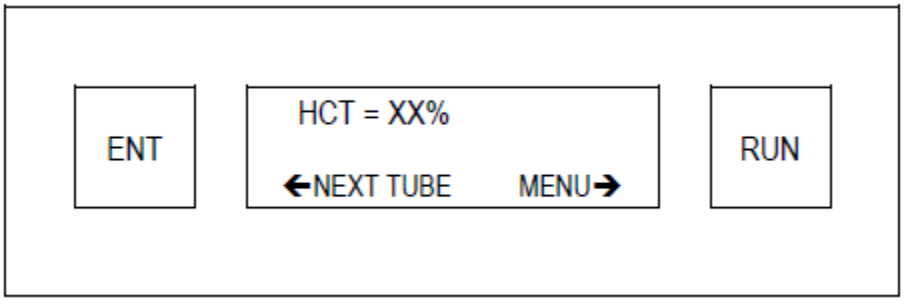
h. Press the ENT button. The LCD will display:



i. Move the slider to the PLASMA/AIR interface. Place the vertical black line of the slider over the interface at the end of the plasma curve as shown in the following diagram.



j. Press the ENT button. The LCD will display the hematocrit result.



k. Press ENT to read another tube. Press RUN to return to the main menu.

Expected Values

Refer to Hematology Normal Values procedure for current normal ranges.

Notes

1. Ensuring the sample is well-mixed is essential. Mix the sample well before filling the first tube and again before filling the second tube.
2. Leakage of blood from bottom of the tube if not sealed properly will cause erroneously low values.
3. Hemolyzed specimens will cause low values.
4. Hematocrit values less than 2.0% are reported as "<2".
5. For smooth operation and extended life of the centrifuge, the rotor must always be balanced before the spin cycle is initiated. There should always be an even number of tube holders (2, 4, or 6) in the rotor and they should be opposite each other to balance the rotor.
6. Tubes spun in HemataStat must be read on the HemataStat. Tubes spun in any other brand of centrifuge cannot be read on the HemataStat.
7. The HemataStat II is designed to operate between 5,670 and 6,930 rpm. If the rpm should drop below the specified range, the motor will shut off, and the message LOW RPM will display on the LCD. To verify the LOW RPM message, press the ENT or RUN button to return to the main menu. Press the RUN button to restart the spin cycle. If the LOW RPM message is displayed again, refer to Attachment B for troubleshooting.
8. Cleaning the tube holders is not recommended. Should a capillary tube break or a sealant blowout occur, simply discard the affected tube and tube holder in accordance with proper laboratory procedures and replace with a new tube holder.

References

1. Wintrobe MM et al. Clinical hematology. Philadelphia: Lea & Febiger, 1974: 109-114.
2. Davidsohn I, Henry JB eds. Clinical diagnosis and management by laboratory methods. Philadelphia: WB Saunders Co, 1984: 585-586.
3. HemataStat II Centrifuge Operator's Manual.

Authorized Reviewers

Medical Director, Hematology

REFERENCES:

1. Miale J. Laboratory medicine. Hematology, 6th ed. St Louis: CV Mosby Co. 1982: 360.

2. HemataStat II Centrifuge Operator's Manual.

Attachments

Attachment A - MICROHEMATOCRIT CENTRIFUGE MAINTENANCE

QUARTERLY

RPM Check:

Place a strip of reflective tape (supplied with the tachometer) on the head of the centrifuge. Turn timer clockwise to start centrifuge. Holding strobe light at an angle to the surface of the centrifuge head, read tachometer scale and record results. RPM must be between 5,670 and 6,930 rpm. The rpm reading on the LCD should be within 2% of a tachometer reading.

Timer Check:

Set timer for 60 seconds as indicated on centrifuge timer scale. Using stop watch, check seconds after setting timer. The motor takes less than 10 seconds to accelerate to proper rpm. Once achieved, the spin time will be displayed on the LCD. Start timing the spin when WAIT 60 SEC is displayed on the LCD. Stop timing the spin when the motor shuts off. Spin time is factory set at 60 +/- 3 seconds.

Quarterly Quality Control Check:

A microhematocrit is performed on a normal blood analyzed on the main hematology analyzer. Results should agree $\pm$2.0 %.

Cleaning and Maintenance:

1. As with all electrical devices, make sure the centrifuge is unplugged before cleaning. NEVER USE BLEACH, ABRASIVES OR CORROSIVE SOLVENTS. DO NOT SPRAY OR ALLOW ANY LIQUID TO GET INSIDE THE CENTRIFUGE. LIQUID WILL HARM THE ELECTRONICS. Use a disinfectant towelette or a cloth slightly dampened with any non-corrosive disinfectant solution to clean the lid and other parts of the centrifuge housing. Dry all surfaces with a soft tissue or cloth after cleaning.
2. Cleaning the tube holders is not recommended. Should a capillary tube break or a sealant blowout occur, simply discard the affected tube and tube holder and replace with a new tube holder. Inspect tube holders regularly and replace them when they become dirty and/or contaminated.
3. Periodically inspect the lid, lid gasket and rotor to ensure there are no cracks or damage.
4. As needed the rotor may be removed and cleaned. Remove the rotor from the motor shaft by first unscrewing the rotor knob. Gently lift the rotor vertically off of the motor shaft. Make sure the rotor is thoroughly dry before reinstalling. Liquid left on the rotor will cause damage to the device. Re-install the rotor making certain that the rotor knob is tight.

Settings:

See the operator's manual in the event settings need to be restored or updated.

Attachment B - TROUBLESHOOTING

SYMPTOM	PROBLEM	SOLUTION
No display	Power supply not firmly plugged into electrical outlet or in back of device.	Check both plugs.
	Power supply not functioning.	Replace power supply.
	ON/OFF switch not ON	Turn ON/OFF switch ON.
	Faulty electrical outlet.	Try a different electrical outlet.
Rotor will not spin	Lid not locked.	Press firmly down on the lid tab.
Unit Noisy	Rotor knob is not tight.	Tighten rotor knob.
	Rotor not balanced.	Balance the rotor.
Lid will not open	Device is in the spin cycle.	Allow spin cycle to end. Turn ON/OFF switch off, wait 5 seconds and turn it back on.
	Lid lock is engaged.	Use the key tool on the underside of the unit. Insert the “L” shaped end of the tool into the ”L” shaped key opening on the left side of the unit. Push gently until the lid opens.
LOW RPM message	Low rpm	Insure that the rotor moves freely. Check rotor balance.
RUN ABORTED message	Power failure	Restore power.
	Power supply disconnected.	Reconnect plug.
ENTRY ERROR message	If the slider is moved out of sequence or is moved in the wrong direction.	Move the slider to the far left and start the reading process over.

LCD flashing	Low battery pack charge (less than 20% capacity). Power supply not firmly plugged into electrical outlet or in back of device.	Recharge or replace battery pack. Check both plugs. Try a different electrical outlet.
Battery pack will not charge.	Power supply not properly connected. Battery pack not properly connected. Faulty battery pack.	Check Power Supply. Optional Rechargeable Battery Pack. Replace battery pack.
Battery pack does not hold adequate charge	Voltage is inadequate to charge HemataStat II.	Plug in fewer power supplies in electrical outlet (same circuit).

MICROHEMATOCRIT

Document Control

Location of Master: Hematology Procedure Manual
Master electronic file stored on the Beaumont Laboratory server:
S:\HEMACOAG\Document Control\Hematology\Procedure\Master Documents\ Microhematocrit.doc.
Number of Controlled Copies posted for educational purposes: 0
Number of circulating Controlled Copies: 0
Location of circulating Controlled Copies: NA

Document History

Signature	Date	Revision #		Related Documents Reviewed/ Updated
Prepared by: Nancy Ramirez, MT(ASCP)SH	12/1987			
Approved by: Joan C. Mattson, MD	12/29/1987			
Reviewed by: (Signature)	**Date**	**Revision #**	**Modification**	**Related Documents Reviewed/ Updated**
Joan C. Mattson, MD	02/20/1989		OK	
Joan C. Mattson, MD	02/19/1990		No change	
Joan C. Mattson, MD	12/24/1991		No change	
Joan C. Mattson, MD	12/05/1992		OK	
Joan C. Mattson, MD	12/27/1993		OK	
Joan C. Mattson, MD	12/12/1994		OK	
Joan C. Mattson, MD	12/22/1995		No change	
Joan C. Mattson, MD	02/07/1997		Updated min vol; pg 1; STKR→STKS; pg. 2; updated manuals, pg. Added pg. 4	
Noelle Procopio, MT(ASCP)SH	01/05/1998		No change	
Noelle Procopio, MT(ASCP)SH	01/04/1999		No change	
Joan C. Mattson, MD	01/24/2000		No change	
Joan C. Mattson, MD	01/28/2000		Converted STKS→Sysmex pg. 1; Equipment updated to PLASTIC microhematocrit table; added comment to run normal blood with every patient specimen, pg. 1	
Noelle Procopio, MT(ASCP)SH	12/04/2001		No change	
Noelle Procopio, MT(ASCP)SH	12/30/2002		No change	
Joan C. Mattson, MD	12/29/2003		Updated to K_2EDTA – pg. 1	
Noelle Procopio, MT(ASCP)SH	12/15/2004		No change	
Joan C. Mattson, MD	02/16/2005	00	Standardized procedure format; updated specimen stability, pg. 1; removed Sysmex SE9500 analyzer referral, QC #2, pg. 2	

Noelle Procopio, MT(ASCP)SH	10/24/2006		No change	
Ann Marie Blenc, MD	04/30/2007		Updated specimen amount; new director	
Ann Marie Blenc, MD	02/26/2008	01	Referred expected values to Normal Range procedure.	
Ann Marie Blenc, MD	02/23/2009		No change	
Ann Marie Blenc, MD	02/15/2010		No change	
Ann Marie Blenc, MD	05/03/2011	02	Updated uL to mcL.	NA
Ann Marie Blenc, MD	05/17/2013		No change	OK
Ann Marie Blenc, MD	04/10/2015		No change	OK
Ann Marie Blenc, MD	03/14/2017		Logo update only.	OK
Elizabeeth Sykes, MD	02/02/2018			
Peter Millward, MD	01/30/2019		New Medical Director	
Ann Marie Blenc, MD	11/14/2019		No change	OK
Ann Marie Blenc, MD	06/15/2020	03	Change of equipment. Equipment previously used was Adams microhematocrit centrifuge (MHCTII) with Damon/IEC microhematocrit reader (IEC #2201). Equipment updated to HemataStat II microhematocrit centrifuge with microhematocrit reader. Updated procedure and notes in accordance with HemataStat II Operator's Manual.	OK