



# KAISER PERMANENTE®

<b>DOCUMENT NUMBER:</b>
<b>DOCUMENT TITLE:</b>
<b>DOCUMENT NOTES:</b>

<b>LOCATION:</b>	<b>VERSION:</b>
<b>DOC TYPE:</b>	<b>STATUS:</b>

<b>EFFECTIVE DATE:</b>	<b>NEXT REVIEW DATE:</b>
<b>RELEASE DATE:</b>	<b>EXPIRATION DATE:</b>

<b>AUTHOR:</b>	<b>PREVIOUS NUMBER:</b>
<b>OWNER:</b>	<b>CHANGE NUMBER:</b>

## BAL Cell Count and Differential

<b>Purpose</b>	This procedure provides instructions for performing and resulting of the cell count with differential order on bronchoalveolar lavage (BAL), test mnemonic CC BAL GL.
<b>Scope</b>	This microscopy procedure is intended for trained Clinical Laboratory Scientists (CLS) in the hematology department.
<b>Principle</b>	<ul style="list-style-type: none"><li>• BAL is a lavage created by the physician during bronchoscopy. It retrieves secretions that coat the apical surfaces of the bronchial and alveolar epithelium diluted by the saline used to perform the BAL.</li><li>• Because it does not exist naturally in the body, it should not be grouped under body fluids in terms of cell differential reference ranges.</li><li>• In patients with interstitial lung disease (ILD), accurate interpretation of BAL cellular analysis, including reference range, requires the BAL to be performed correctly and the BAL fluid to be handled and processed properly.</li></ul>
<b>Specimen source and collection</b>	<ul style="list-style-type: none"><li>• For specimen source, the selected bronchopulmonary segment is generally indicated on the specimen container and/or electronic test order.</li><li>• A minimum volume of 5 mL pooled BAL sample is needed for BAL cellular analysis. The optimal volume is 10-20 mL.</li><li>• The BAL fluid should be collected in sterile containers that do not promote cell adherence to container surfaces (e.g., silicone-coated glass, polypropylene, or other plastics designed for suspension tissue culture).</li></ul>
<b>Specimen transport</b>	<ul style="list-style-type: none"><li>• BAL can be transported fresh at room temperature within one hour of collection.</li><li>• Specimens must be transported on ice if the delivery time exceeds one hour.</li></ul>
<b>Specimen rejection</b>	<ul style="list-style-type: none"><li>• Specimens collected for more than 24 hours are not suitable for analyses.</li><li>• Follow lab policy on improperly submitted and/or identified specimens.</li></ul>
<b>Specimen processing</b>	<ul style="list-style-type: none"><li>• Prompt processing of the BAL fluid or cell suspension, once it reaches the laboratory, provides optimal results.</li><li>• Specimens with gross mucus can be strained through loose gauze.</li><li>• The specimen should then be centrifuged at an appropriate speed, resuspended, and set up for a cytospin slide to use for the cell differential.</li></ul>

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## BAL Cell Count and Differential, Continued

Equipment/s	Centrifuge Cytospin centrifuge	Slide stainer Microscope				
Reagents and/or Media	22% Bovine Albumin solution Wright-Giemsa stain					
Materials and supplies	Cytology funnel and caps Cytology clips	Slides				
Safety Precautions	Refer to the safety manual for general safety requirements.					
Quality Control	Verify that appropriate cell count controls are performed and acceptable. Verify that slide staining by the stainer has been reviewed and deemed acceptable for the day.					
Cytospin slide preparation	<ul style="list-style-type: none"><li>• Follow local protocol in properly labeling a slide with unique patient specimen identifiers.</li><li>• Add a drop of the bovine albumin to each sample chamber before adding the specimen cell suspension.</li><li>• Add no more than eight drops of the specimen cell suspension to the sample chamber.</li><li>• Follow instructions on the operation of the cytocentrifuge.</li><li>• Air dry or heat fix the slide before staining.</li></ul>					
Procedure	Follow the steps below to perform and result the BAL cell count and differential. <table><tr><th>Step</th><th>Action</th></tr><tr><td>1</td><td>Perform a cell count for red blood cells (RBC) and nucleated cells (TNC), using manual method. Enter results in Cerner ARE, and click Perform.</td></tr></table>		Step	Action	1	Perform a cell count for red blood cells (RBC) and nucleated cells (TNC), using manual method. Enter results in Cerner ARE, and click Perform.
Step	Action					
1	Perform a cell count for red blood cells (RBC) and nucleated cells (TNC), using manual method. Enter results in Cerner ARE, and click Perform.					

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## BAL Cell Count and Differential, Continued

PathNet General Lab: Accession Result Entry

MDIASSAY, TEST4  
ZZ000018429  
53 years  
Race:

Accession: 224-018-000052

Procedure	Result	Flags	Status	Reference Range
BAL RBC Manual	620	H	Pending	<= 500
BAL TNC Manual	450	H	Pending	<= 449
BAL Neut pct			Pending	<= 2
BAL Lymphs pct			Pending	10 - 15
BAL Macro pct			Pending	>= 86
BAL Eos pct			Pending	<= 0
BAL Epith pct			Pending	<= 4
BAL OthCell pct			Pending	
BAL Comment				

Order: CC BAL GL; Status: Ordered; Procedure: BAL Neut pct; Location: BPK Body Fluid; Collected: 1/18/2024 11:33 AM

CERTCS K240216 1/18/2024 2:24 PM

2 Perform a 10x smear examination. Examine the smear on 10x magnification to assess cell distribution and stain quality. If unacceptable, make a second smear using appropriate albumin, saline, and sample ratio to obtain a good Cytospin prep smear.

3 Using 50x or 100x magnification, count 100 nucleated cells, differentiating between neutrophils, lymphocytes, macrophages, eosinophils, and other nucleated cells (including non-mesothelial, lining cells, etc.)

To access the Cerner BAL Diff Count Counter:

a) Click on **Mode** on the ARE menu bar.  
b) Select Differential.

PathNet General Lab: Accession Result Entry

MDIASSAY, TEST4  
ZZ000018429  
53 years  
Race:

Accession: 224-018-000052

Mode: Accession, Differential..., Instrument Queue, Worklist, Correction

Procedure	Result	Flags	Status	Reference Range
BAL RBC Manual	620	H	Performed	<= 500
BAL TNC Manual	450	H	Performed	<= 449
BAL Neut pct			Pending	<= 2
BAL Lymphs pct			Pending	10 - 15
BAL Macro pct			Pending	>= 86
BAL Eos pct			Pending	<= 0
BAL Epith pct			Pending	<= 4
BAL OthCell pct			Pending	
BAL Comment				

c) To choose the Cerner BAL Diff Count counter:

- Review and ensure that it is showing CC BAL GL for Procedure, and that it is BAL Diff Count for Option.
- Click OK.

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## BAL Cell Count and Differential, Continued

d) Confirm cursor is in Count box at the bottom of the window.

e) Start classifying the nucleated cells by using the numeric keypad to enter the differential count as follows:

**CERNER DIFF COUNTER LEGEND FOR BAL DIFF COUNT ORDER**

RESULT	DIFF COUNT KEY
BAL Neut pct	+
BAL Lymphs pct	6
BAL Macro pct	5
BAL Eos pct	7
BAL Epith pct	9
BAL OthCell pct	0


f) When differential count for 100 cells is completed, click OK, followed by Perform.

Note:  
If less than 100 nucleated cells are present for the differential count, calculate the count to the percent of the total number of cells differentiated. Note the **total number of cells differentiated** in the comment field (e.g. 58-cell Diff) in step 5. The Comment field has a 15-character limit.

4 After performing the differential, switch to Accession mode by clicking Accession under Mode.

Continued on next page

## BAL Cell Count and Differential, Continued



5 Add result comment if indicated. Proceed to verify results in Cerner ARE.

Procedure	Result	Flags
BAL RBC Manual	501	H
BAL TNC Manual	450	H
BAL Neut pct	3	H
BAL Lymphs pct	28	H
BAL Macro pct	52	L
BAL Eos pct	0	
BAL Epith pct	17	H
BAL OthCell pct	0	
BAL Comment	58-cell Diff	

Click on Comment field.  
Add result comment if indicated.

### Reference Range

The following are the reference ranges for the BAL cell count and differential:

Values outside of the reference range will be flagged Abnormal.

Result Component	Range	Displays in Cerner as
BAL RBC Manual	Less than 500 cells/mm <sup>3</sup>	<=500 cells/mm <sup>3</sup>
BAL TNC Manual	Less than 450 cells/mm <sup>3</sup>	<=449 cells/mm <sup>3</sup>
BAL Neutrophils	Less than 3 %	<=2
BAL Lymphocytes	10-15 %	10-15
BAL Macrophages	Greater than 85%	>=86
BAL Eosinophils	Less than 1 %	<=0
BAL Epithelial Cells	Less than 5%	<=4

For BAL Other Cells, the following Interpretive Comment is in place of Reference Range: The reference interval(s) and other method performance specifications have not been established for this body fluid. The test result must be integrated into the clinical context for interpretation.

A reference link to the published literature source of reference interval range for BAL is available under the BAL Epithelial Cells.

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## BAL Cell Count and Differential, Continued

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**Non-Controlled Documents**    The following non-controlled documents support this policy.

Meyer, Keith, et al. American Thoracic Society Documents, An Official American Thoracic Society Clinical Practice Guideline: The Clinical Utility of Bronchoalveolar Lavage Cellular Analysis in Interstitial Lung Disease <https://www.thoracic.org/statements/resources/interstitial-lung-disease/clinical-utility-blcaild.pdf> , last accessed 4/8/2024

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**Author(s)**    • SCPMG Hematology Working Group

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Signature Manifest

Document Number: LAMC-PPP-1433  
Title: BAL Cell Count and Differential  
Effective Date: 24 Apr 2024

Revision: 02

All dates and times are in Pacific Standard Time.

Hematology Regional Docs

Operations Approval

Name/Signature	Title	Date	Meaning/Reason
Jocelyn Javier (T684676)	Director	16 Apr 2024, 03:56:37 PM	Approved

Final Approval

Name/Signature	Title	Date	Meaning/Reason
Hedyeh Shafi (I086749)	Pathologist	19 Apr 2024, 01:26:51 PM	Approved