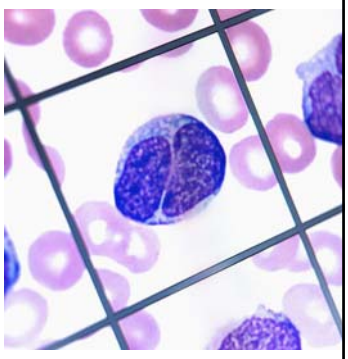
CellaVision Users Group

CELLAVISION

Agenda

- Cell Location
- Body Fluids
- Moving Cells Efficiently
- Archiving, Autodelete & Backup
- Pre-classification Accuracy
- Methods for collecting images
- Tools and Settings
- Maintenance/Troubleshooting
- CRRS



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Cell Location is used to test the analyzer's ability to LOCATE cells.

You are really performing QC on your slide-making and staining as well.

Cell Location slides should:

- Have a WBC Count of at least 7.0 X 10^6/uL
- Be a freshly made and freshly stained slide
- Be a properly made and properly stained slide

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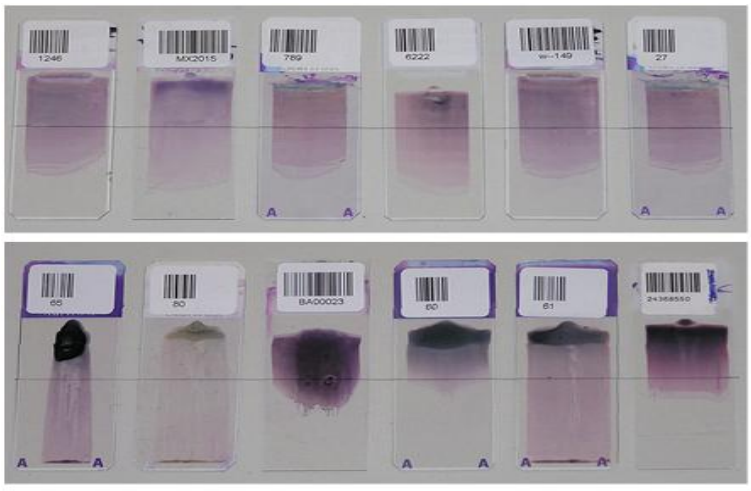

Good slides

Slides that should not be run on CellaVision systems

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- Tips and Tricks:
  - Always keep a QC slide which has had a passing value of 100% available
    - If this slide passes again, the trouble is with your slide/stain
    - If this slide fails, you may have a mechanical problem
  - If you have two stainers, you should be running two Cell Location slides.
  - Cell Location should be run at least once a day or anytime you change your stain.
  - The boxes DO NOT need to be around the cells.

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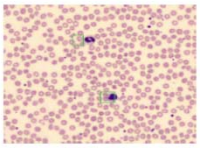
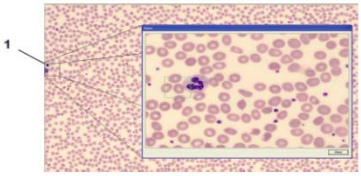


The object has been located by the system if there is a box associated with it. The boxes are not always centered on the cells and can be completely separated from the cells. As long as there is a box associated with a cell this indicates that the system has found the cell.



1 Cell at the edge of the image

If a cell is at the edge of the image the cell box can sometimes be 'outside' the image. To confirm that the cell has been located, double click on the cell to view the magnified image and confirm that the cell has a box associated with it.

Note! On screen, cell images are not always presented in the same order as the system is working. Cells marked with black boxes may occur in the middle of the test, not only towards the end.

(Cont'd)

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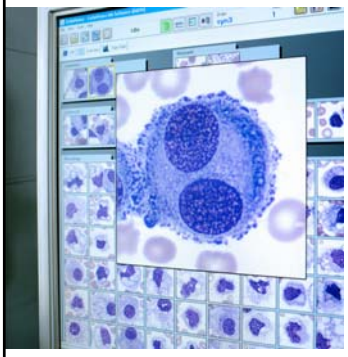
Body Fluids on CellaVision



- Just as with Peripheral Blood, the specimen you run is important!
- Properly made/properly stained
- Could require different stain settings
- Will always do diff from the center of the button

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Preparation Guidelines

The BF program will always do the diff starting with the center of the button. Therefore, it is important that the button not be too thick.

Buffered saline or standard tissue culture media both with a drop or two of bovine serum albumin (BSA), which promotes cell adhesion to the microscope slide, may be used as a diluent.

The recommendation is to have 5000-12000 cells in total on the slide

Note! Cells are concentrated approximately 20-fold by cytocentrifugation, however the quantitative yield varies from 30-75%. The speed and time of centrifugation, the amount of sample in the chamber and the filter paper absorbance are factors that can influence both the cell yield and morphology. (ref. Body Fluid Analysis for Cellular Composition, CLSI, H56 A Vol 26, No 26)

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How do you classify?

- WBC count or Nucleated Cell Count?
  - Make sure that your test name reflects what you are reporting
- WBC Diff or Nucleated Cell Diff?
  - Where should mesothelial cells, lining cells, etc. go?
  - What happens if you are not including them in the diff and you get a lot of them?

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BF Overview Tab

How much of the button do you need to look at?

At what power?

What are you looking for?

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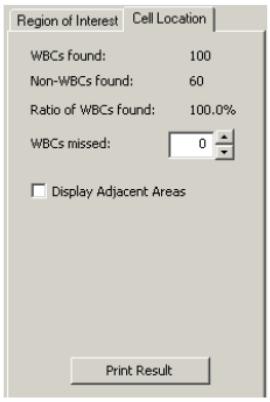
Body Fluid Cell Location



Cell Location tab is found on the Overview tab.

The light-shaded area shows where the diff has been done.

What was the percentage of missed cells?

Make sure that you view all of the light-shaded area.

Just like PB, should be done at least once a day or whenever stain has been changed.

What if my only/first BF slide is a mess?

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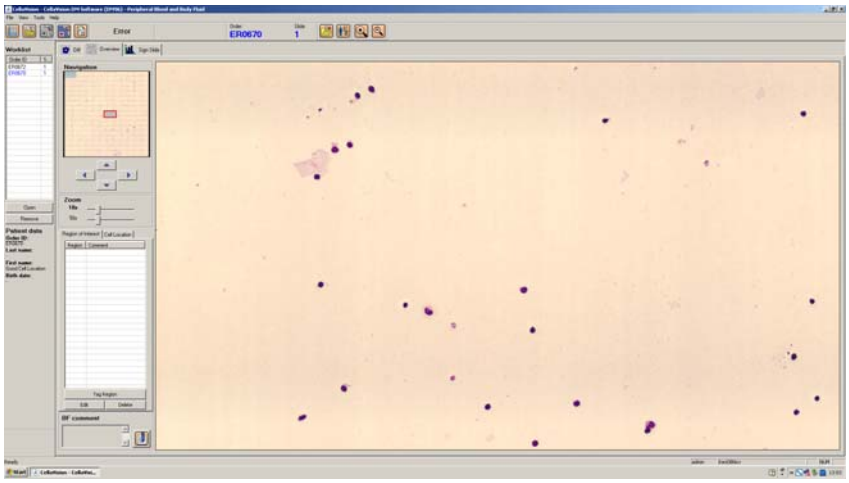
Excellent Preparation



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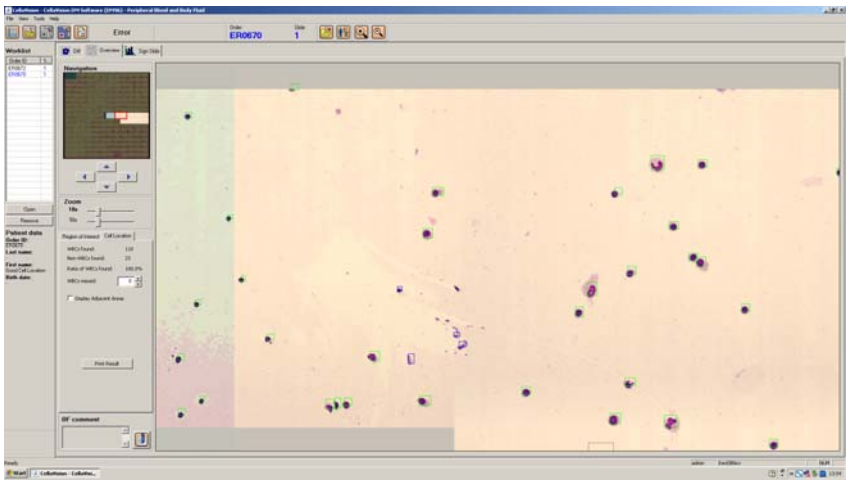
Excellent Cell Location



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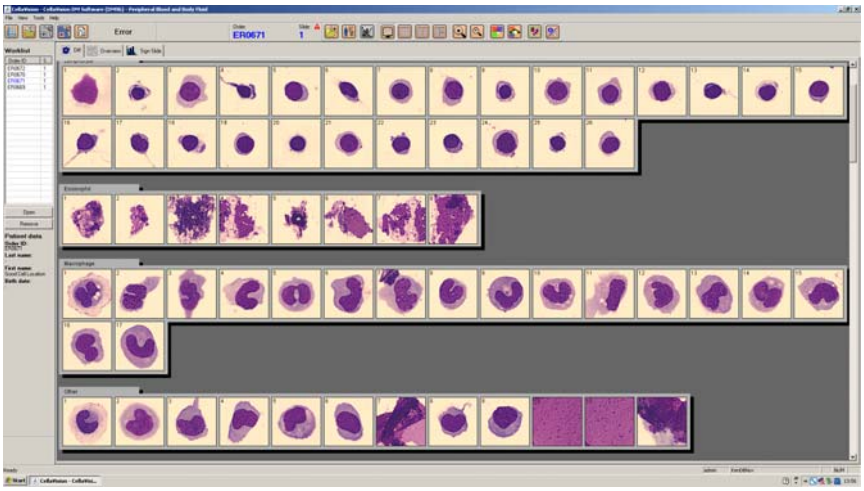
Example:

Low Count CSF



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Low Count CSF Overview

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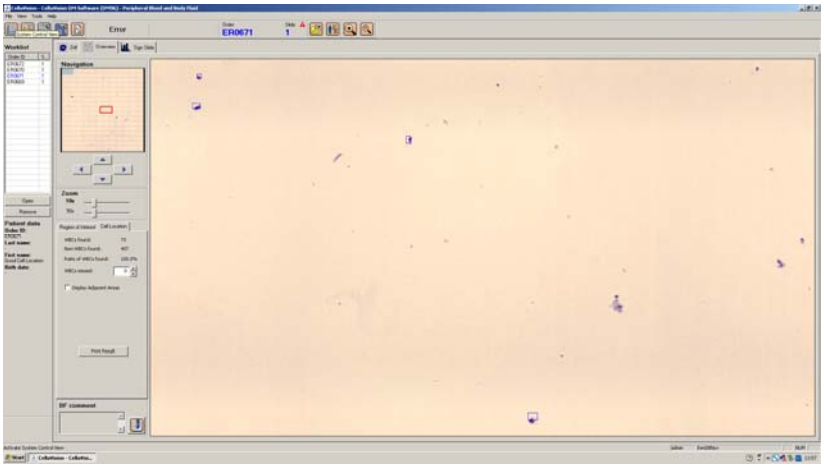
Low Count CSF Cell Location



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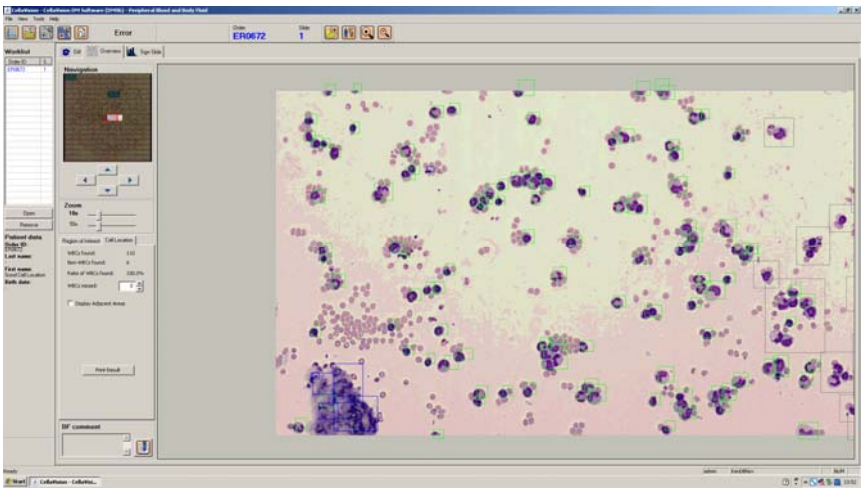
Not ideal, but passes



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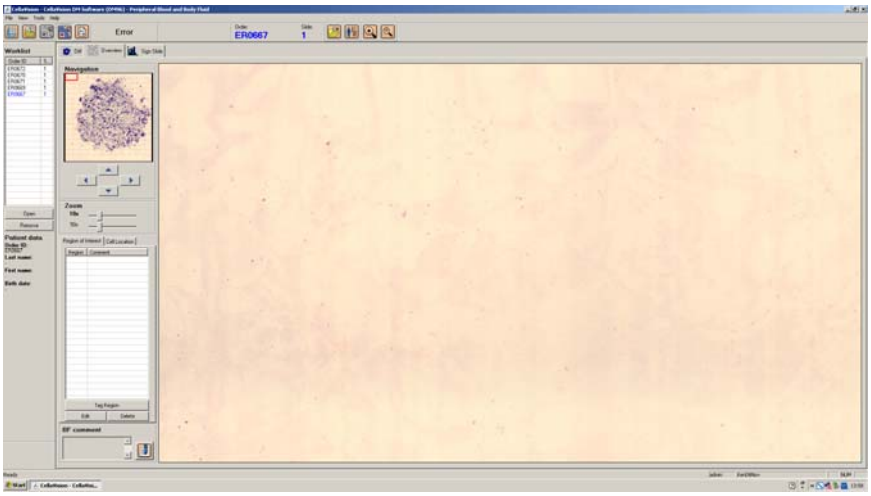
Too Thick



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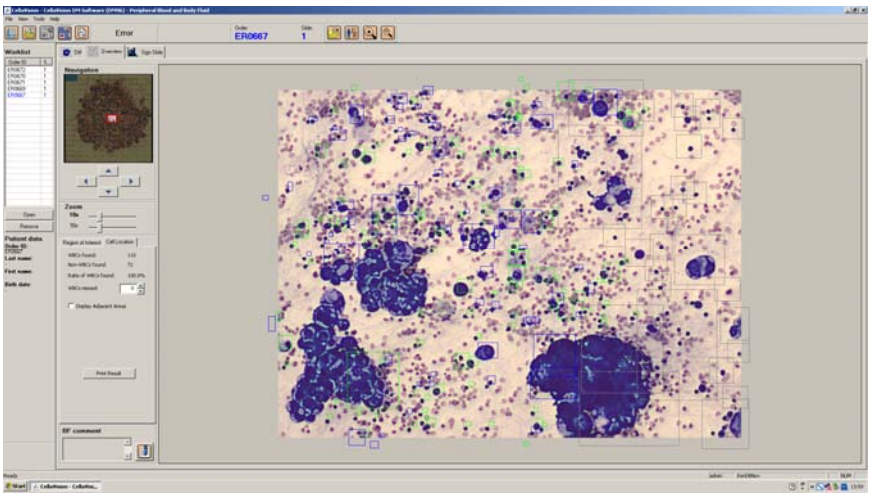
Too Thick- Cell Location Fails



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CellaVision Proficiency Software

- Competency & Educational tool for:
  - Peripheral Blood differentials
  - Body Fluid differentials
- Compatible with CellaVision DM Software version 3.1 and higher
- Can be used without a CellaVision analyzer

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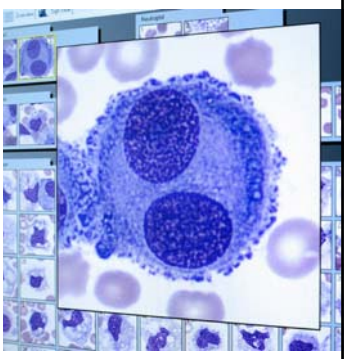
Key Features

- Web-based program that can be accessed from any computer- (no installation of software)
- Support for Peripheral Blood and Body Fluids
- Supports any size laboratory
- Cell images can be uploaded from your CellaVision instrument
- Allows you to assess classification down to the individual cell level
- Automated result analysis and report generation are available for instant viewing and exporting



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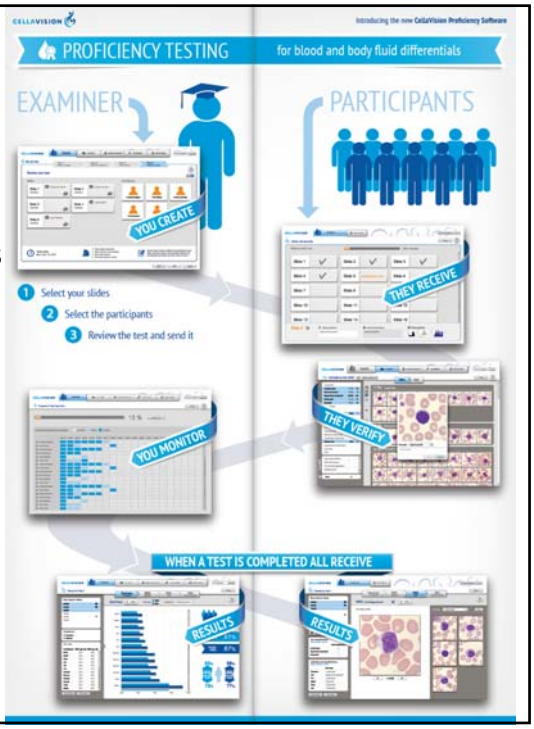
Work Flow

- Two user levels
  - *Examiner* -creates tests
  - *Participant* -takes test



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Create a Test Case

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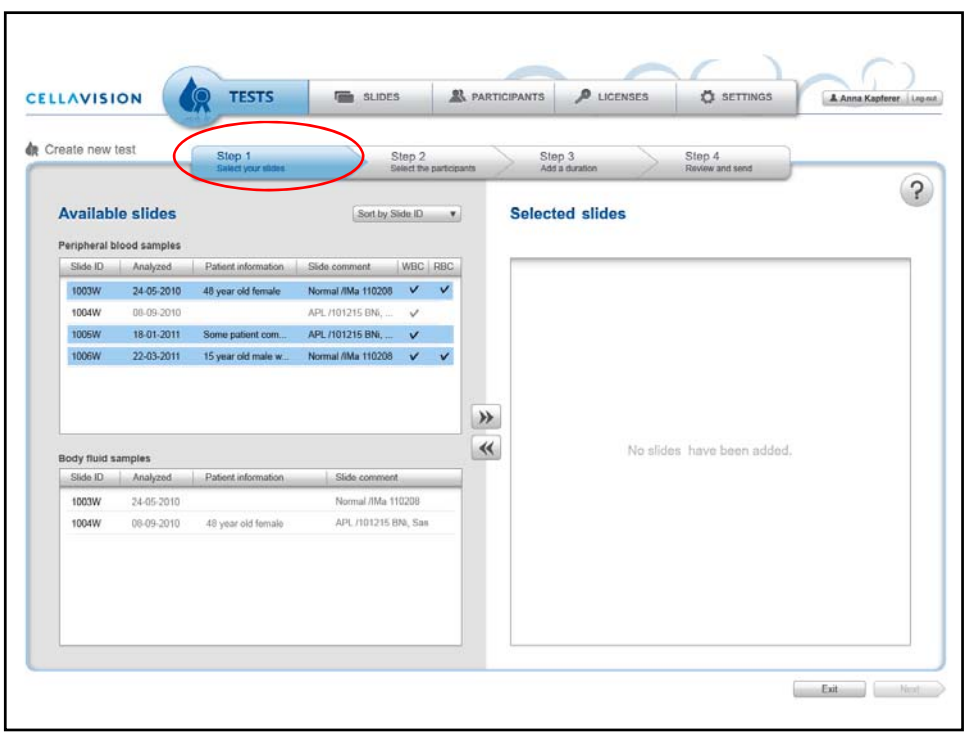
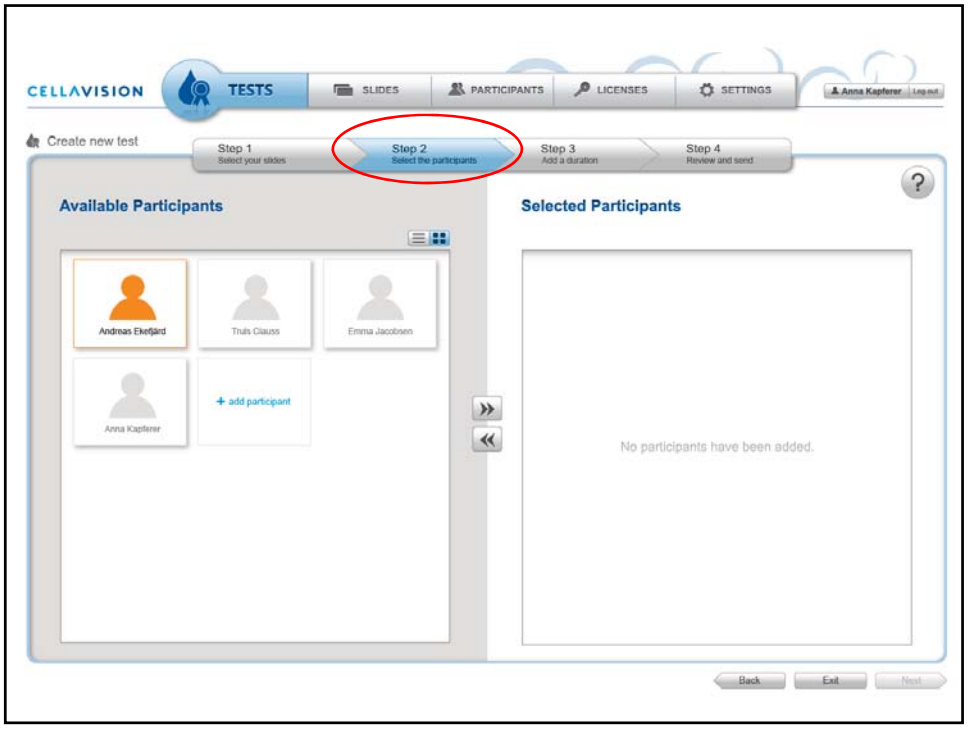
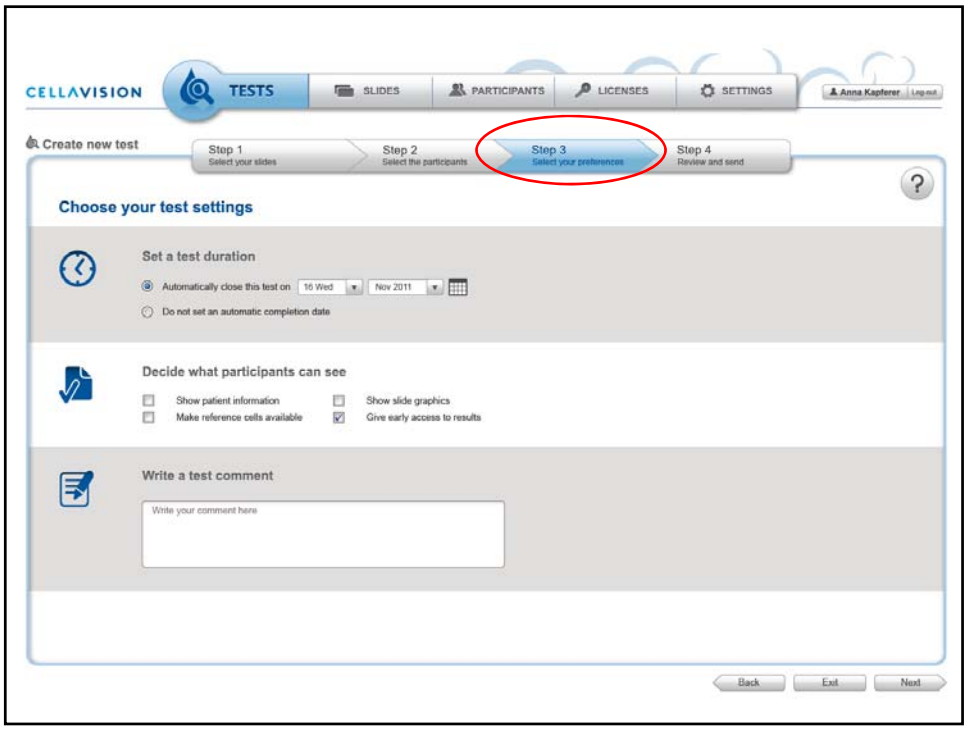
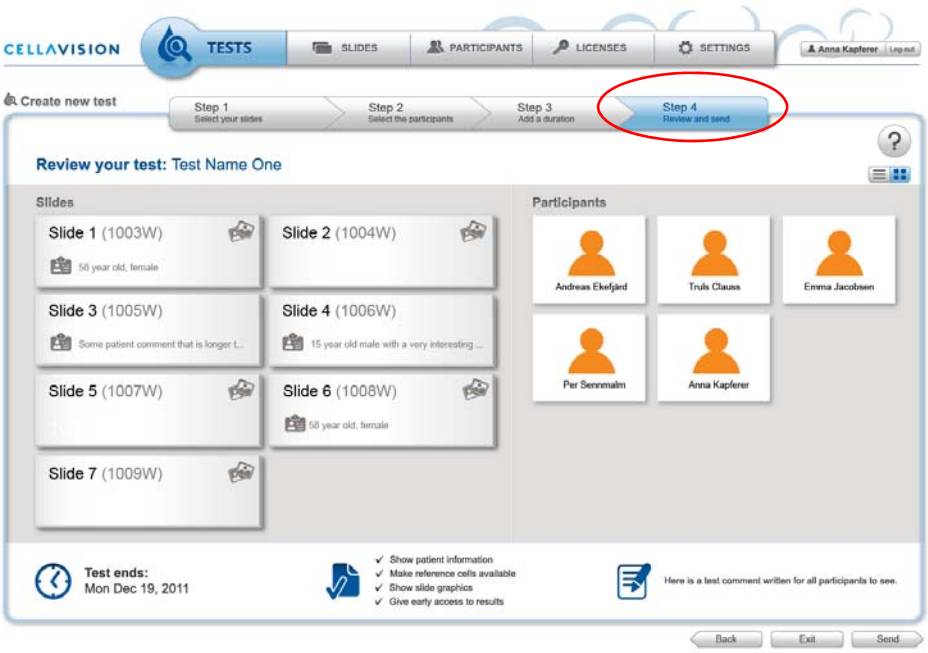



CELLAVISION
TESTS
SLIDES
PARTICIPANTS
LICENSES
SETTINGS
Anna Kapferer
Create new test
Step 1
Select your slides
Step 2
Select the participants
Step 3
Add a duration
Step 4
Review and send
Available Participants
Selected Participants
Andreas Ekefjärd
Truls Clauss
Emma Jacobsen
Anna Kapferer
+ add participant
No participants have been added.
Back
Exit
Next


CELLAVISION
TESTS
SLIDES
PARTICIPANTS
LICENSES
SETTINGS
Anna Kapferer
Create new test
Step 1
Select your slides
Step 2
Select the participants
Step 3
Select your preferences
Step 4
Review and send
Choose your test settings
Set a test duration
Automatically close this test on
16 Wed
Nov 2011
Do not set an automatic completion date
Decide what participants can see
Show patient information
Show slide graphics
Make reference cells available
Give early access to results
Write a test comment
Write your comment here
Back
Exit
Next



Taking the Test

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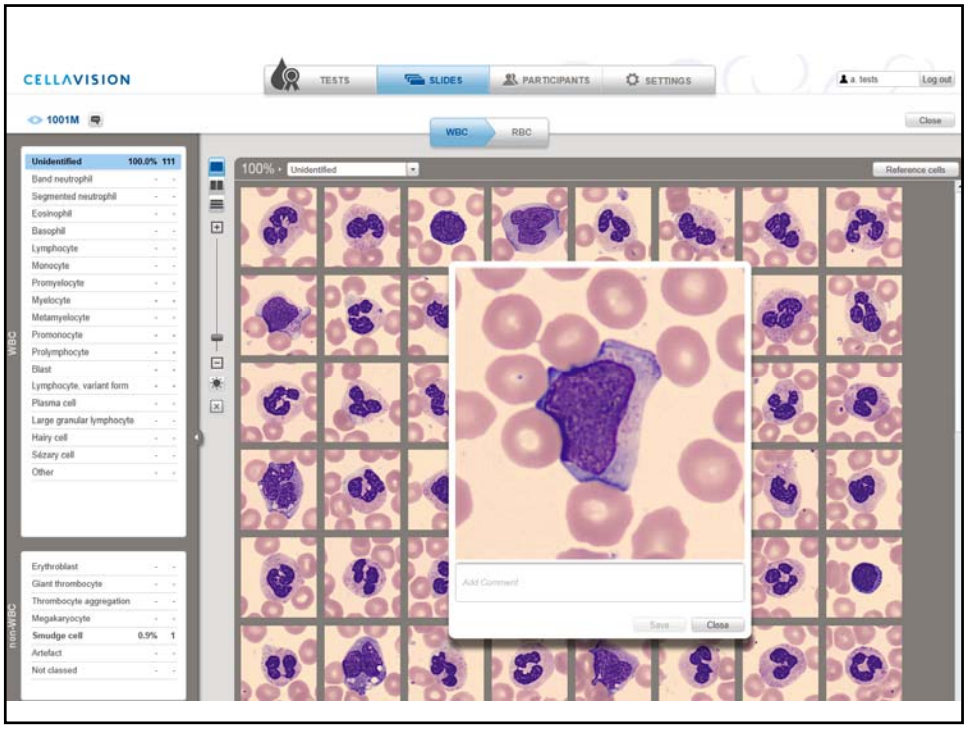
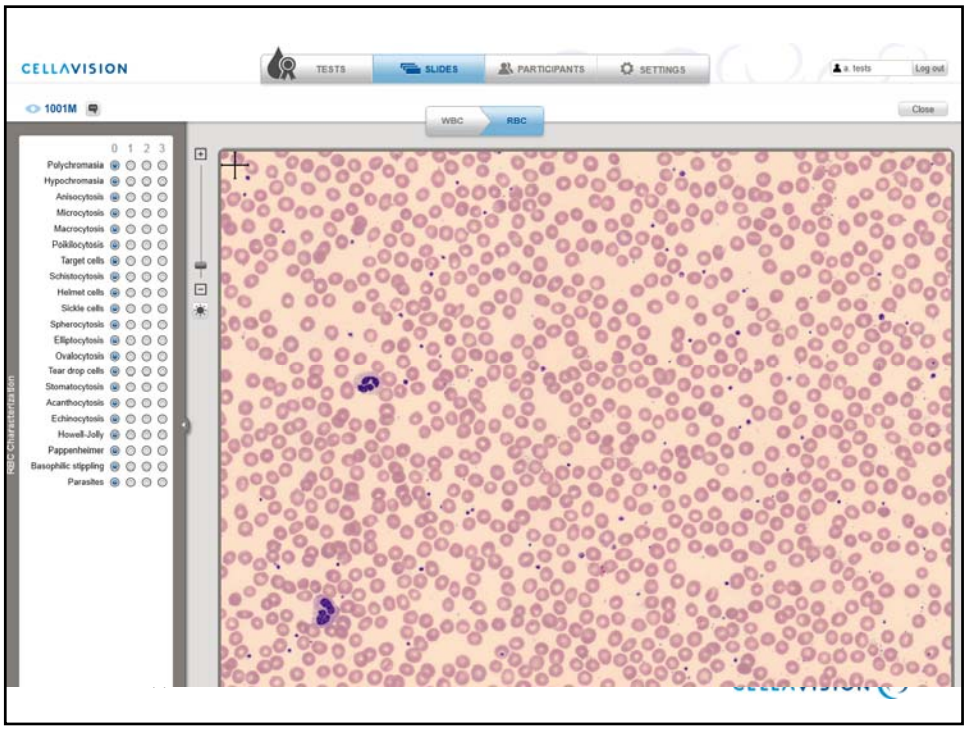
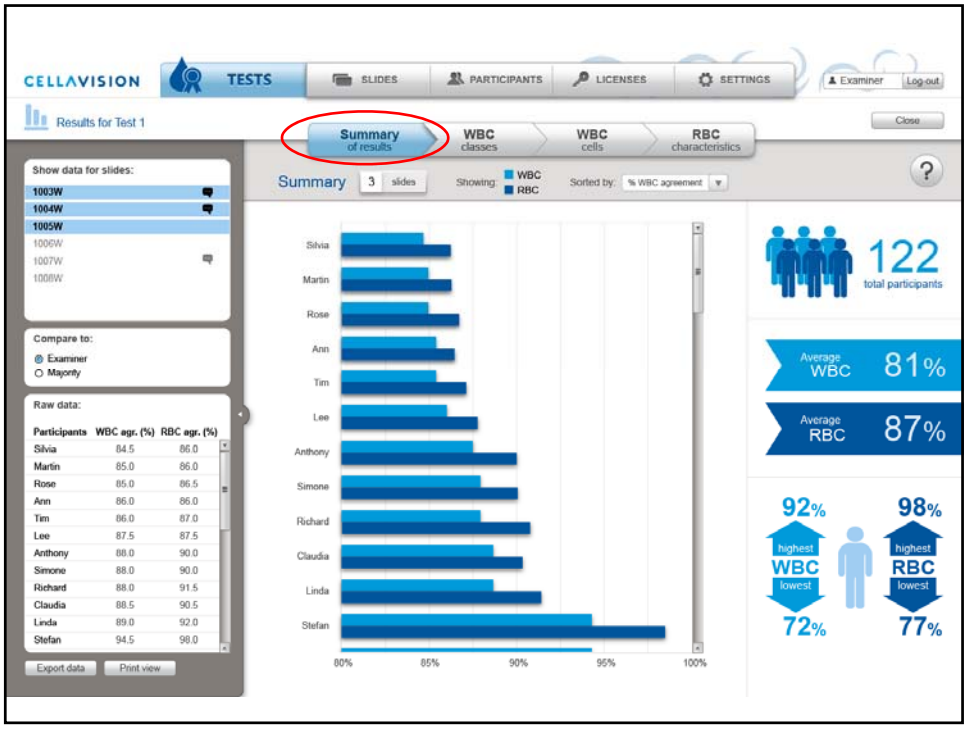
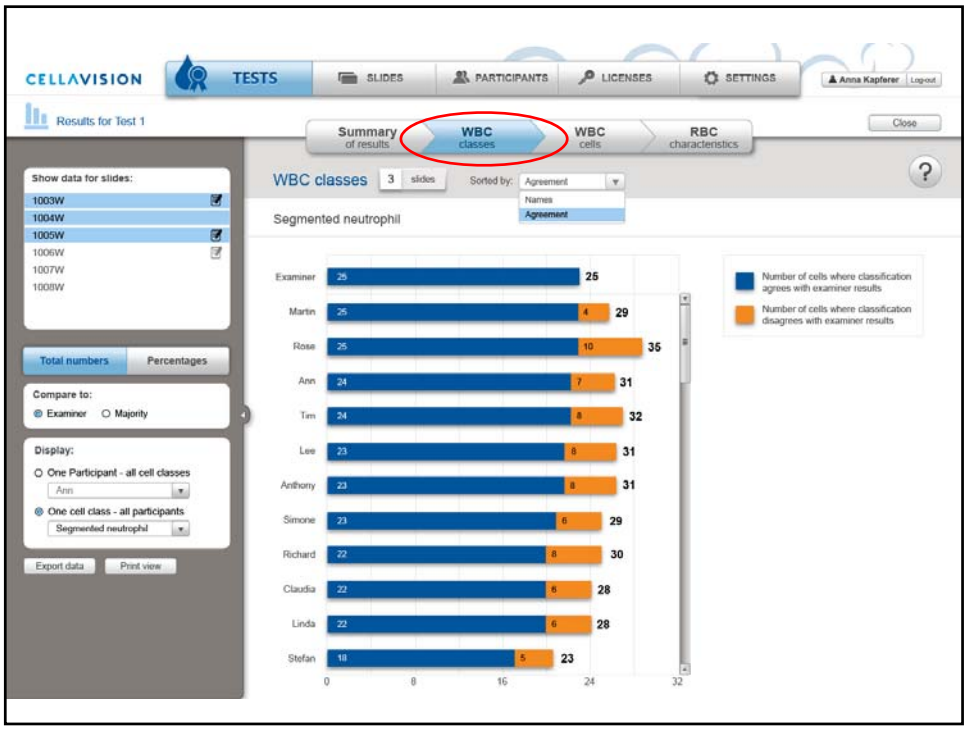
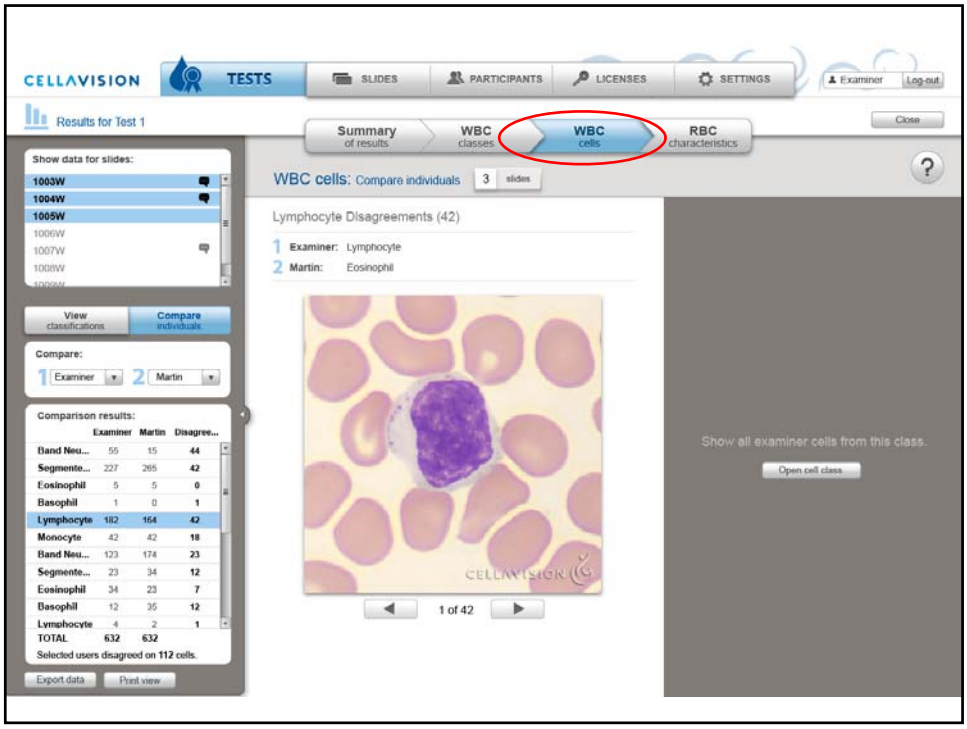
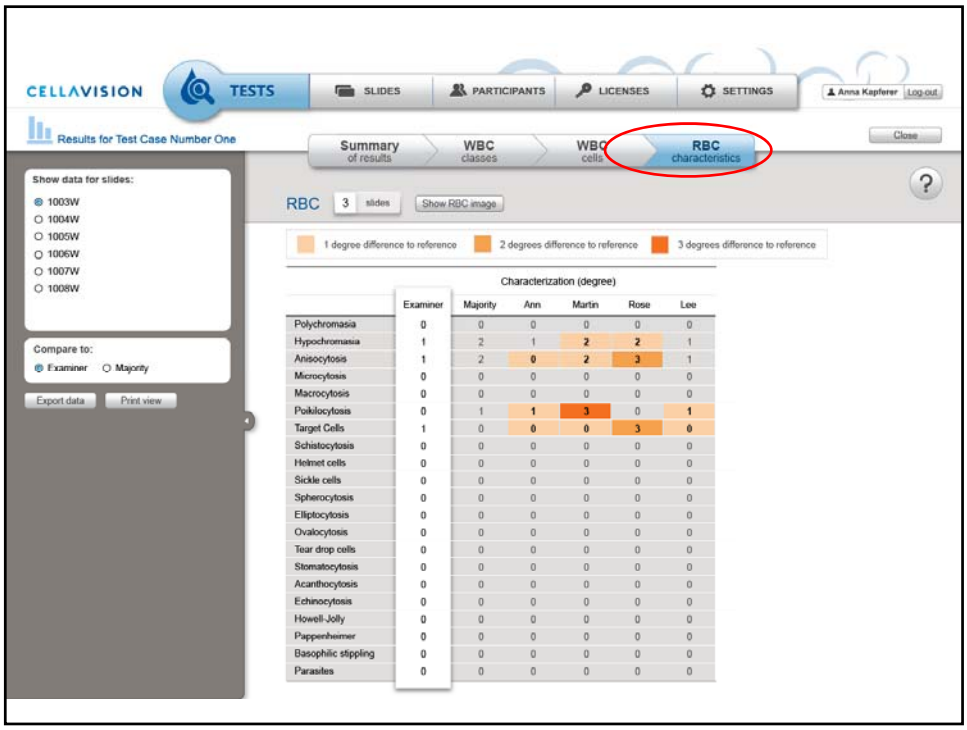

CELLAVISION
TESTS
SLIDES
PARTICIPANTS
SETTINGS
1001M
WBC
RBC
Close
Unidentified 100.0% 111
Band neutrophil
Segmented neutrophil
Eosinophil
Basophil
Lymphocyte
Monocyte
Promyelocyte
Myelocyte
Metamyelocyte
Promonocyte
Prolymphocyte
Blast
Lymphocyte, variant form
Plasma cell
Large granular lymphocyte
Hairy cell
Sézary cell
Other
WBC
Erythroblast
Giant thrombocyte
Thrombocyte aggregation
Megakaryocyte
Smudge cell 0.9% 1
Artefact
Not classed
nonWBC
100%
Unidentified
Reference cells
Add Comment
Save
Close


CELLAVISION
TESTS
SLIDES
PARTICIPANTS
SETTINGS
1001M
WBC
RBC
Close
0 1 2 3
Polychromasia
Hypochromasia
Anisocytosis
Microcytosis
Macrocytosis
Poikilocytosis
Target cells
Schistocytosis
Helmet cells
Sickle cells
Spherocytosis
Elliptocytosis
Ovalocytosis
Tear drop cells
Stomatocytosis
Acanthocytosis
Echinocytosis
Howell-Jolly
Pappenheimer
Basophilic stippling
Parasites
RBC Characterization


CELLAVISION
TESTS
SLIDES
PARTICIPANTS
LICENSES
SETTINGS
Examiner
Log-out
Results for Test 1
Close
Summary of results
WBC classes
WBC cells
RBC characteristics
Show data for slides:
1003W
1004W
1005W
1006W
1007W
1008W
Compare to:
Examiner
Majority
Raw data:
Participants WBC agr. (%) RBC agr. (%)
Silvia 84.5 86.0
Martin 85.0 86.0
Rose 85.0 86.5
Ann 86.0 86.0
Tim 86.0 87.0
Lee 87.5 87.5
Anthony 88.0 90.0
Simone 88.0 90.0
Richard 88.0 91.5
Claudia 88.5 90.5
Linda 89.0 92.0
Stefan 94.5 98.0
Export data
Print view
Summary
3 slides
Showing
WBC
RBC
Sorted by:
% WBC agreement
Silvia
Martin
Rose
Ann
Tim
Lee
Anthony
Simone
Richard
Claudia
Linda
Stefan
80%
85%
90%
95%
100%
122
total participants
Average WBC 81%
Average RBC 87%
92%
highest
WBC
lowest
72%
98%
highest
RBC
lowest
77%


CELLAVISION
TESTS
SLIDES
PARTICIPANTS
LICENSES
SETTINGS
Anna Kapferer
Log-out
Results for Test 1
Close
Summary of results
WBC classes
WBC cells
RBC characteristics
Show data for slides:
1003W
1004W
1005W
1006W
1007W
1008W
Total numbers
Percentages
Compare to:
Examiner
Majority
Display:
One Participant - all cell classes
Ann
One cell class - all participants
Segmented neutrophil
Export data
Print view
WBC classes
3 slides
Sorted by:
Agreement
Names
Agreement
Segmented neutrophil
Examiner 25 25
Martin 25 4 29
Rose 25 10 35
Ann 24 7 31
Tim 24 8 32
Lee 23 8 31
Anthony 23 8 31
Simone 23 6 29
Richard 22 8 30
Claudia 22 6 28
Linda 22 6 28
Stefan 18 5 23
0
8
16
24
32
Number of cells where classification agrees with examiner results
Number of cells where classification disagrees with examiner results


CELLAVISION
TESTS
SLIDES
PARTICIPANTS
LICENSES
SETTINGS
Examiner
Log-out
Results for Test 1
Close
Summary of results
WBC classes
WBC cells
RBC characteristics
Show data for slides:
1003W
1004W
1005W
1006W
1007W
1008W
View classifications
Compare individuals
Compare:
1 Examiner
2 Martin
Comparison results:
Examiner Martin Disagree...
Band Neu... 55 15 44
Segmente... 227 265 42
Eosinophil 5 5 0
Basophil 1 0 1
Lymphocyte 182 164 42
Monocyte 42 42 18
Band Neu... 123 174 23
Segmente... 23 34 12
Eosinophil 34 23 7
Basophil 12 35 12
Lymphocyte 4 2 1
TOTAL 632 632
Selected users disagreed on 112 cells.
Export data
Print view
WBC cells: Compare individuals
3 slides
Lymphocyte Disagreements (42)
1 Examiner: Lymphocyte
2 Martin: Eosinophil
1 of 42
Show all examiner cells from this class.
Open cell class


CELLAVISION
TESTS
SLIDES
PARTICIPANTS
LICENSES
SETTINGS
Anna Kapferer
Log-out
Results for Test Case Number One
Close
Summary of results
WBC classes
WBC cells
RBC characteristics
Show data for slides:
1003W
1004W
1005W
1006W
1007W
1008W
Compare to:
Examiner
Majority
Export data
Print view
RBC
3 slides
Show RBC image
1 degree difference to reference
2 degrees difference to reference
3 degrees difference to reference
Characterization (degree)
Examiner Majority Ann Martin Rose Lee
Polychromasia 0 0 0 0 0 0
Hypochromasia 1 2 1 2 2 1
Anisocytosis 1 2 0 2 3 1
Microcytosis 0 0 0 0 0 0
Macrocytosis 0 0 0 0 0 0
Poikilocytosis 0 1 1 3 0 1
Target Cells 1 0 0 0 3 0
Schistocytosis 0 0 0 0 0 0
Helmet cells 0 0 0 0 0 0
Sickle cells 0 0 0 0 0 0
Spherocytosis 0 0 0 0 0 0
Elliptocytosis 0 0 0 0 0 0
Ovalocytosis 0 0 0 0 0 0
Tear drop cells 0 0 0 0 0 0
Stomatocytosis 0 0 0 0 0 0
Acanthocytosis 0 0 0 0 0 0
Echinocytosis 0 0 0 0 0 0
Howell-Jolly 0 0 0 0 0 0
Pappenheimer 0 0 0 0 0 0
Basophilic stippling 0 0 0 0 0 0
Parasites 0 0 0 0 0 0

Free Trial Version

Expreience how easy Hematology Competency assesment can be.

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Moving Cells Efficiently

Subheading

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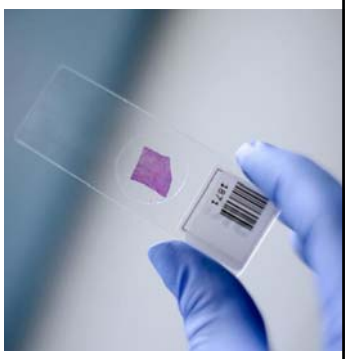
What is the fastest way?

- Use of Shift to move cells that are next to each other
  - Cannot be used across cell classes
- Use of Ctrl to move a number of cells that are not contiguous
  - Can be used across cell classes



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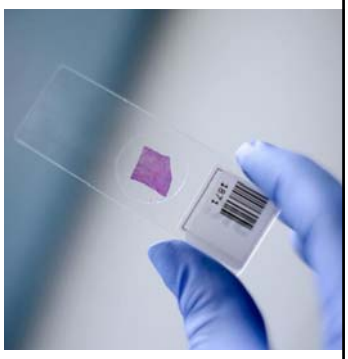
What is the fastest way?

- Split cell
  - Is it faster to move and then split or split and then move?
- Sometimes it is faster to move ALL the cells in a class and then use Ctrl to move the ones you don't want back.
- Do you need to move things from artefact to smudge or PLT clump to artefact?



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Multiple Slide Orders

- Excellent for Low WBC counts
  - Make multiple slides with the same Order ID
  - Run all slides on DM
  - Review and decide
  - Sign the Order
- All slides in the order should be either signed or deleted if not reviewed.

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Database Management

Subheading

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Database Management

- It is crucial that you keep the size of your databases under 20GB.
- Two Strategies
  - Autodelete-permanently deletes orders older than a certain number of days
  - Archiving-Reducing the size of the Database by moving the images elsewhere for long term storage

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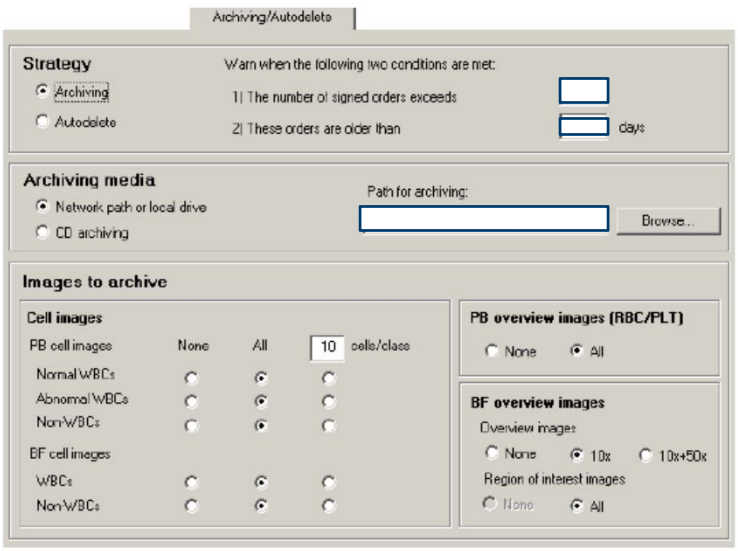

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What is the difference between Archive and Backup?

- **Archive**

  Having access to slides analyzed a long time ago

- **Backup**

  Makes it possible to restore the database (and archives!) if there is a hard disk crash

- **Export**

  Long term storage of interesting slides in another database

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Archiving & Backup

Archiving maintains size of DB by "stripping" the images from other patient data, storing them elsewhere and mapping their location in the DB.

- If DB crashes w/o a backup all Archived files become useless
- Archiving is initiated by lab (someone with Administrator status).

Backup is the copying of all databases and archive files for protection.

- The frequency and process for doing this is dictated by IT.
- Initiated by IT using 3rd party backup software or CV-provided "scripts" (little programs)

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Calculate Archive settings

	Workload Data				
	# Slides per day	# MB per week	# GB per week	# GB per day	days to 20GB
Differentials	100	2800	2.8	0.40	50
Body Fluids	5	5250	5.25	0.75	
# months images stored	12	months			
		8050	8.05	1.15	17

Suggested Settings for Archive or Auto-delete		
# signed orders exceeds	100	slides
and orders older than	17	days

Time required to perform		
Time Required to Archive once/dy	35	minutes
Time Required to auto-delete	N/A	

Data Strorage Requirements		
Storage Space required for Archives & Backup files*	793	GB

**Note: In order to maintain total backup/archive space to above size, IT will need to delete all archive files older than* 12 *months*

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Archiving slides

- Possible to archive onto CD-R, CD-RW, LAN, and external hard drive. While there is a DVD player on the DM, there is no functionality to **write** to a DVD.
- Archiving slides will move images to the archive.
- The numerical result and patient demographics will remain in the CellaVision DM database
- Archived slides are indicated in the database view with an icon 
- Opening an archived slide is done by double-clicking on the Order ID in the Database View. If archived on LAN, the images will automatically be loaded. If archived onto CD, you will be prompted to insert a CD with a certain number (created during the archiving process).

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Archiving slides

- You need access to the original database to be able to open a archived slide (the path to where the slide is archived is stored in the database). A crashed database without a proper backup effectively loses all archived images from that Database
- You can store ~150 slides on one CD
- Only signed orders can be archived
- Archiving takes ~20 min per 1 GB of data (200 slides)

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Minor Database Maintenance

- Delete Unsigned slides > X days old
- Suggestion: Use Export DB instead of Protect for long-term saving

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Pre-Classification Accuracy

Subheading

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What factors affect pre-classification accuracy

- Slide making
- Slide Staining
  - Stain too light, too pink
    - Eos in with segs, or segs with eos
  - Stain too dark, too blue
    - Overcalling of blasts
    - Left shifted cells misclassified/overclassified
  - Too much artefact

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Staining-Wright or Wright Giemsa

Slides Too Pink

- Increase fixation time
- Increase Stain time
- Increase pH of buffer
- Decrease the Rinse Time

Too Much Artefact

- Filter Stain
- Make sure slides are dry
- Increase Rinse
- Make sure slides are clean
- Make sure stain is not expired

Slides Too Blue

- Decrease fixation time
- Decrease Stain time
- Increase Stain/Buffer Time
- Increase Rinse Time
- Lower pH of Buffer

CELLAVISION

Total number of objects (S):	1638				Accuracy (all objects):	73%		
Pre-classified in agreement (P):	1200				Accuracy (SN = BN)	82%		
Sum verified leukocytes	1385				Number of re-classified objects not being part of the cell groups preclassified by the system	1		
Sum non-WBC	253							
Sum re-classified objects	438							
Pre-classification data absolute					Pre-classification data relative			
Cell-class	n1	n2	n3		Cell-class	Pre-classifying agreement	In agreement with final result	
Segmented neutrophil	547	522	689		Segmented neutrophil	95.4%	75.8%	
Eosinophil	41	26	28		Eosinophil	63.4%	92.9%	
Basophil	9	1	5		Basophil	11.1%	20.0%	
Lymphocyte	269	262	325		Lymphocyte	97.4%	80.6%	
Monocyte	143	124	190		Monocyte	86.7%	65.3%	
Band neutrophil	157	0	0		Band neutrophil	0.0%	#DIV/0!	
Var Ly	23	0	0		Var Ly	0.0%	#DIV/0!	
Plasma	0	0	0		Plasma	#DIV/0!	#DIV/0!	
Promyelocyte	42	0	3		Promyelocyte	0.0%	0.0%	
Myelocyte	4	0	6		Myelocyte	0.0%	0.0%	
Metamyelocyte	17	0	1		Metamyelocyte	0.0%	0.0%	
Blast cell	58	50	138		Blast cell	86.2%	36.2%	
Smudge cell	123	117	135		Smudge cell	95.1%	86.7%	
Erythroblast (NRBC)	22	20	21		Erythroblast (NRBC)	90.9%	95.2%	
Artefact	83	63	81		Artefact	75.9%	77.8%	
Giant thrombocyte	24	14	15		Giant thrombocyte	58.3%	93.3%	

CELLAVISION

Total number of objects (S):	1401				Accuracy (all objects):	80%		
Pre-classified in agreement (P):	1119				Accuracy (SN = BN)	91%		
Sum verified leukocytes	1292				Number of re-classified objects not being part of the cell groups preclassified by the system	1		
Sum non-WBC	109							
Sum re-classified objects	282							
Pre-classification data absolute					Pre-classification data relative			
Cell-class	n1	n2	n3		Cell-class	Pre-classifying agreement	In agreement with final result	
Segmented neutrophil	641	633	813		Segmented neutrophil	98.8%	77.9%	
Eosinophil	21	10	12		Eosinophil	47.6%	83.3%	
Basophil	7	1	9		Basophil	14.3%	11.1%	
Lymphocyte	342	341	385		Lymphocyte	99.7%	88.6%	
Monocyte	50	50	69		Monocyte	100.0%	72.5%	
Band neutrophil	159	0	0		Band neutrophil	0.0%	#DIV/0!	
Var Ly	2	0	0		Var Ly	0.0%	#DIV/0!	
Plasma	4	0	0		Plasma	0.0%	#DIV/0!	
Promyelocyte	1	0	2		Promyelocyte	0.0%	0.0%	
Myelocyte	2	0	1		Myelocyte	0.0%	0.0%	
Metamyelocyte	8	1	1		Metamyelocyte	12.5%	100.0%	
Blast cell	3	0	0		Blast cell	0.0%	#DIV/0!	
Smudge cell	48	46	46		Smudge cell	95.8%	100.0%	
Erythroblast (NRBC)	34	1	1		Erythroblast (NRBC)	2.9%	100.0%	
Artefact	39	31	56		Artefact	79.5%	55.4%	
Giant thrombocyte	9	4	5		Giant thrombocyte	44.4%	80.0%	

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Methods of Collection Images for Other Uses

- Saving one or a few images from a particular sample
- Saving ALL of the images (including RBC View) for a particular sample
- Collecting and Exporting a screen shot

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Tools and Settings…

What can and can't you customize?

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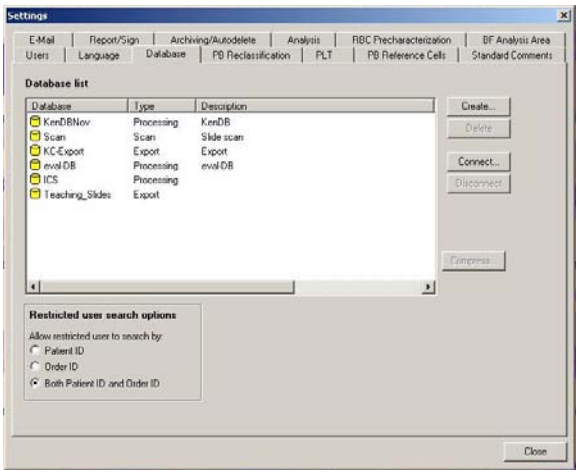
Create a database



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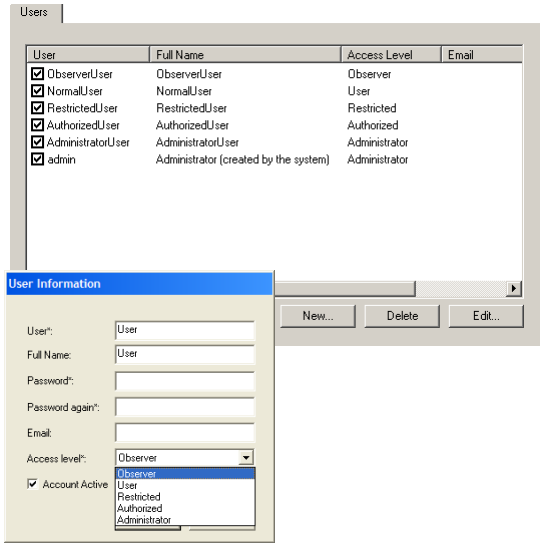
Define users



5 types of users:

Observer

User

Restricted

Authorized

Administrator

Note! Users are defined per database.

See Appendix E in User's Guide

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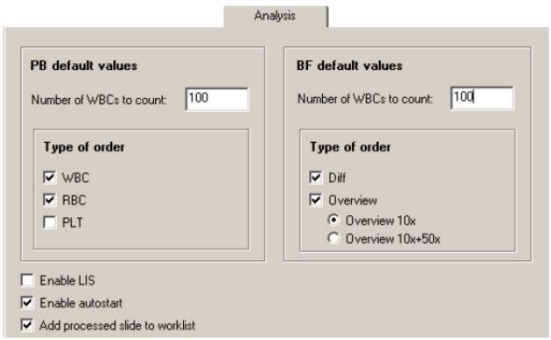
Operating settings—Analysis tab (PB)



Default settings-Peripheral Blood

Default # of WBCs: *105*

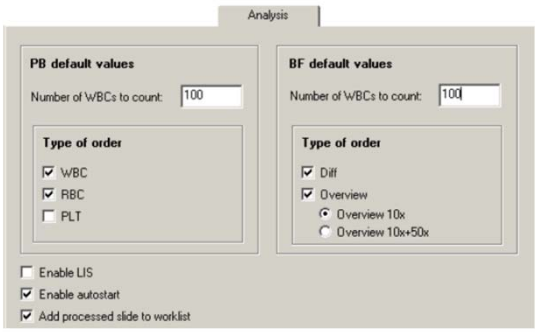
Type of Order: *WBC + RBC + PLT*

Enable LIS: *Disabled (for now)*

Add processed slides to worklist: Enabled

CELLAVISION

Operating settings—Analysis tab (BF)



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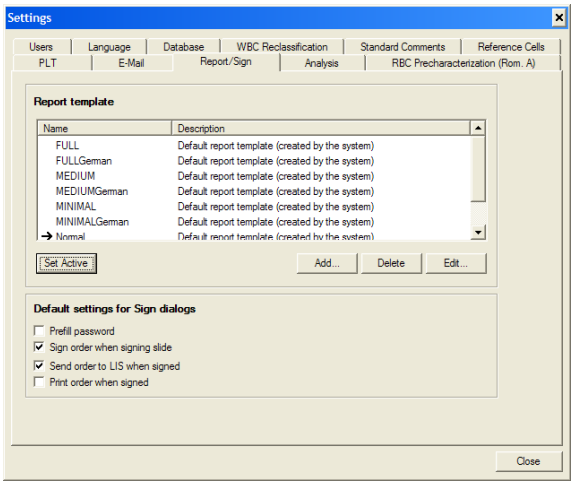
Operating settings—Report/Sign tab



Default settings:

Prefill password: *Disabled*

Sign order when signing slide: *Enabled*

Send order to LIS when signed: *Enabled*

Print order when signed: *Disabled*

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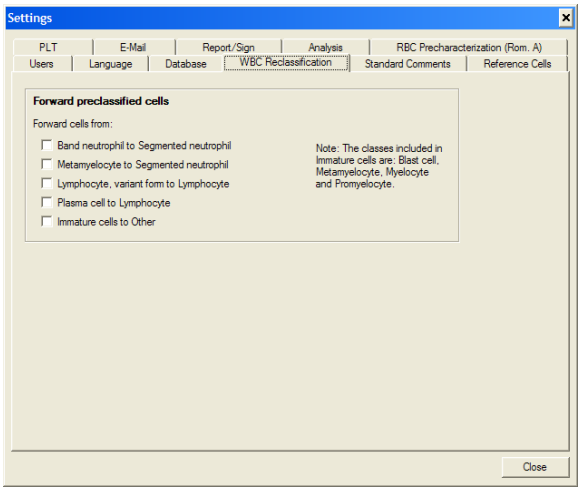
Operating settings —WBC Reclassification tab



Default settings:

All settings: *Disabled*

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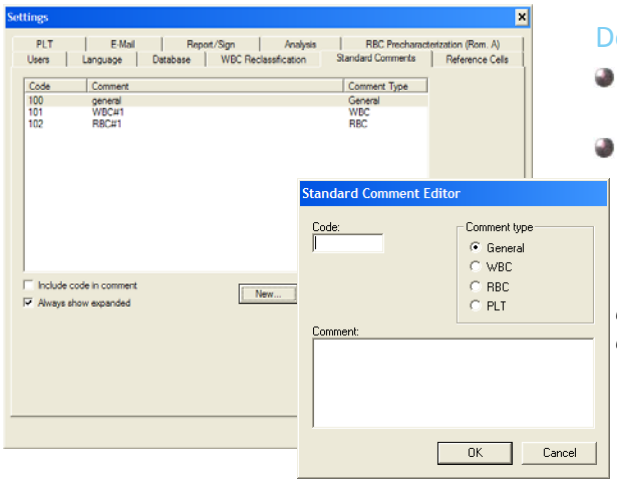
Operating settings —Standard Comments



Default settings:

- **Include code in comment:** *Disabled*
- **Always show expanded:** *Enabled*

Note! WBC, RBC and PLT standard comments are context sensitive.

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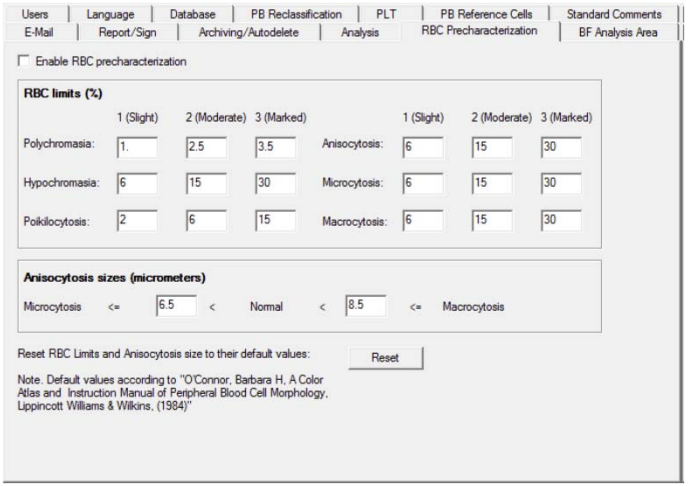
RBC Pre-Classification



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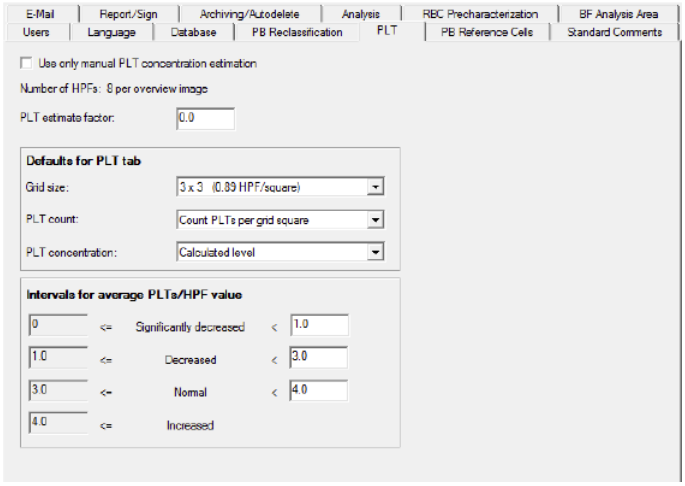
PLT Tab



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Maintenance

- Daily
  - Wipe Stage Area
  - Perform Cell Location
- Weekly
  - Clean Lenses
  - Turn off and restart PC
- Monthly
  - Change Bulb (DM96)
- As Needed
  - Refill Oil
  - Delete Unsigned Slides

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Common problems Peripheral Blood Application

No monolayer found

Incomplete analysis

No slide PID

Poor preclassification

Low performance (throughput)

Long time to logon to the software

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Common problems

No monolayer found

Dirt/oil on the 10x objective

➔Clean the 10x objective (weekly maintenance)

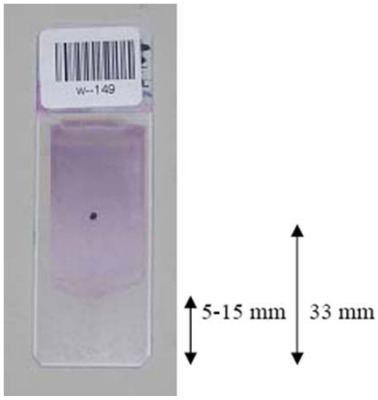
Immersion oil on slide

➔Wipe off immersion oil

Sample not prepared according to recommendations

- Too long smear
- Too short smear
- Too thin smear
- Too thick smear

➔Adjust according to User's manual



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Common problems

Incomplete analysis

Too few WBCs found due to:

- Too much small artifact
  - ➔Adjust/rinse Slide Maker & Stainer (if applicable)
  - ➔Better control of manual staining (fresh stain etc.)
- XY-offset is not correct
  - ➔Call Service
- Too dark or light stain
  - ➔Verify with running QC slides
  - ➔Adjust staining protocol
- Poor smear preparation
  - ➔Prepare smear according to recommendations

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Common problems

Slide jam (use procedure found in Section 13.2.10 in User's Guide to unjam). For magazine jam, use procedure 13.2.11

- Poor barcode quality
  - ➔Verify barcode quality (high contrast, white area between lines, quite zone)
- Debris on the stage
  - ➔Clean the stage (daily maintenance)
- Slide outside specifications
  - ➔Verify length, width, cut corners
- Slide handling misaligned
  - ➔Contact service to calibrate

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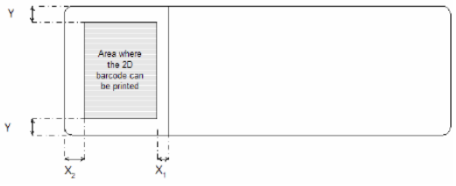
Common problems

No Slide PID

Could not identify barcode label

- Poor barcode quality
  - ➔Verify barcode quality (high contrast, white area between lines, quite zone, print area)
- Slide inserted upside down



Where
X1 > 2 mm; X2 > 6mm; Y > 4mm

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Common problems

Slow/sluggish system

Database is > 20 GB

➔Configure archiving (auto delete or archiving)

Too many databases running

➔ Disable/delete databases not in use

PC has not been restarted for a long period of time

➔ Restart the PC once a week

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Common problems

Long time to logon to software

Database is > 20 GB

➔Configure archiving (auto delete or archiving)

PC has not been restarted for a long period of time

➔ Restart the PC once a week

Database check is done

➔Make sure to turn off the computer as recommended

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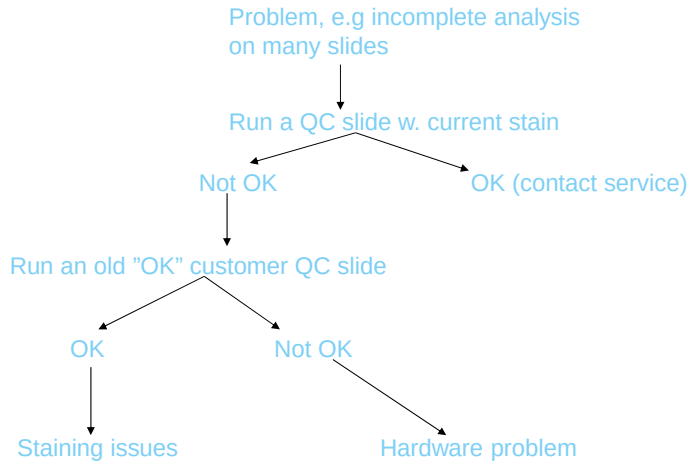
Common problems

Using Cell location test for trouble shooting



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Export the Log Files

- Make sure that the analyzer is ON
- Go to Tools, Export Log Files
- Insert a flash drive into USB port
- Choose Export to LAN and browse for the flash drive
- Click on Export/Burn
- When finished, compress or zip
- Email to your vendor

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Remote Review Software

- Questions about Installation?
- ..\Manuals and Instructions\Installation Instructions\PM-10237 Installation instruction CellaVision Remote Review Software ver 3.x.pdf

- Remote Review for Citrix

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Support

User manuals

LIS Interface manual

CellaVision IT Configuration Guidelines

www.cellavision.com

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CellAtlas free app for iProducts and Android

Your CellaVision vendor representatives

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Case Studies

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Case #1

A 44-year old woman presents to her GP with the following symptoms:

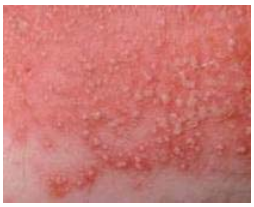
Bloated Feeling

Heartburn

Irregular Bowels

Two months prior the patient had itchy ,flat, red rashes with scalloped edges for which she tried topical anti-bacterial and anti-fungal creams with only limited success.

Lab results were mostly normal with a slightly elevated WBC count.



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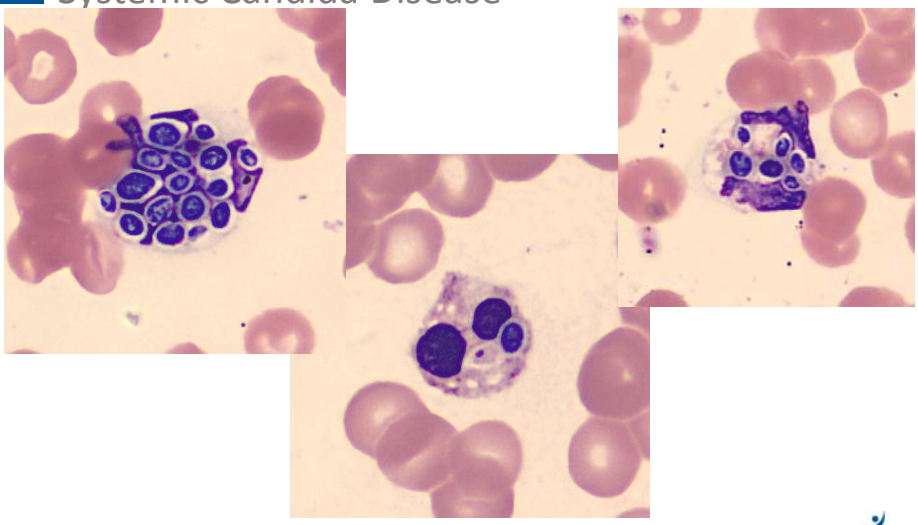
Systemic Candida Disease



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Systemic Candida Disease

The Candida yeast is normally harmless and resides in the mouth and the digestive track. When your immune system is lowered or favorable conditions like warm and humid atmosphere are available, Candida grows uncontrollably and becomes an infection.

Systemic Candida is most often caused by a simple infection that goes untreated or insufficiently treated.

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Case #2

A 35 year old man went to visit relatives for vacation. Two weeks after his return, he presented to the ER and told them he wasn't feeling well. He told them he had just returned from visiting family- nothing out of the ordinary.

He reported high fevers, shaking chills, and flu-like symptoms.

Upon examination he was found to have an enlarged liver and spleen

Lab Results: see below along with a slightly elevated TBili

WBC	12.00
RBC	3.14
HGB	9.1
HCT	27
PLT	107
%Neut	84
%LY	12
%MO	3
%EO	1
%BAS	0

Did anyone ask him where his family lived?- No

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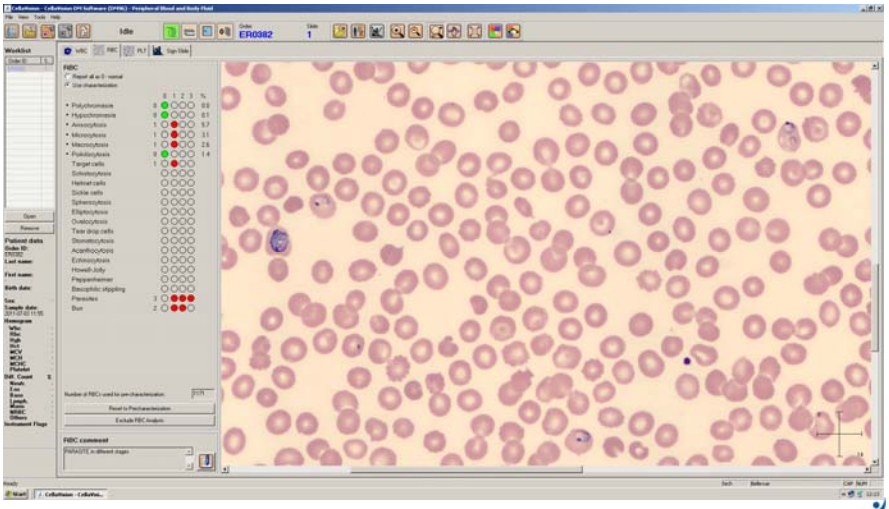

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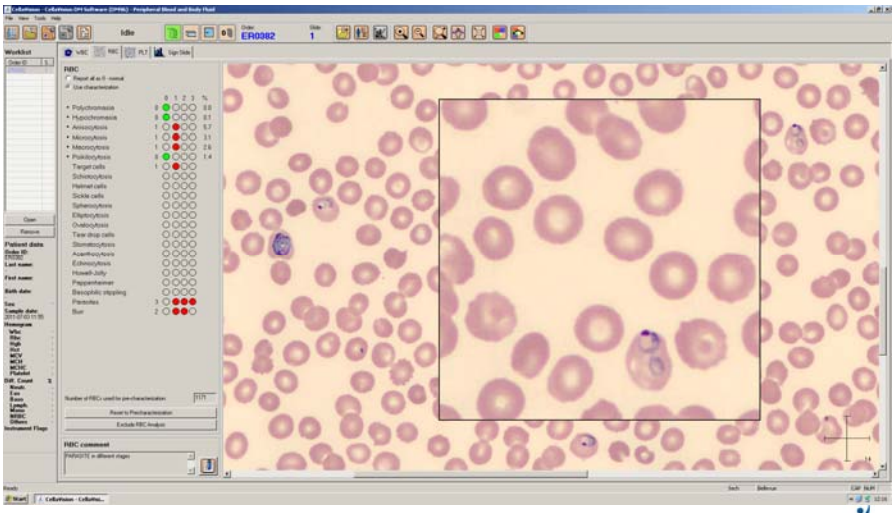
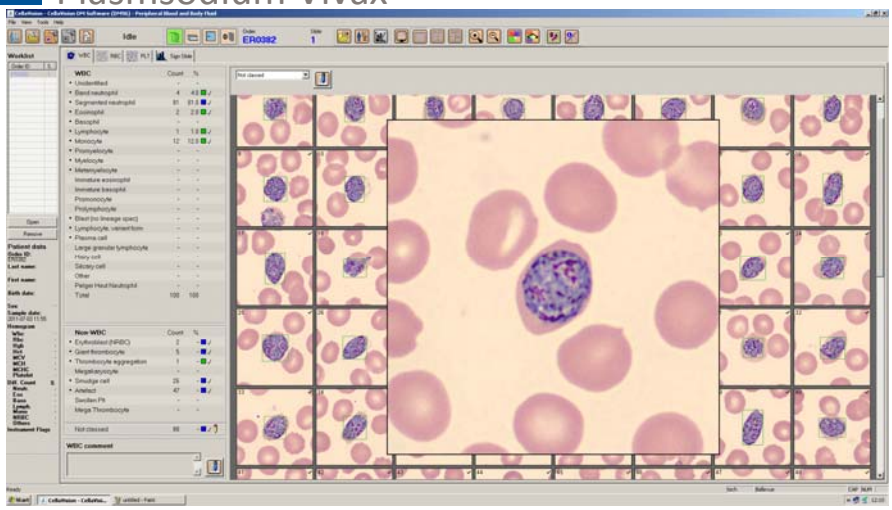


Plasmsodium Vivax



Plasmodium Vivax

Malarial parasites work by digesting red cell proteins and making the RBC membrane less deformable, causing hemolysis, increased splenic clearance, and anemia.

Red cell lysis stimulates release of cytokines and TNF-α. The systemic manifestations of malaria such as headache, fever and rigors, nausea and vomiting, diarrhea, anorexia, tiredness, aching joints and muscles, thrombocytopenia, immunosuppression, coagulopathy, and central nervous system manifestations have been largely attributed to the various cytokines released in response to these parasite and red cell membrane products

P. Vivax makes up 16% of cases reported in US

Not found in West Africa as no Duffy Antigen, which is required for entry in to the RBC.

Characterized by:

- Low to Normal Platelet Count
- Anemia
- White blood cell (WBC) counts during malaria are generally characterized as being low to normal, a phenomenon that is widely thought to reflect localization of leukocytes away from the peripheral circulation and to the spleen and other organs, rather than actual depletion or stasis.
- In P.Vivax it is common to see more than one stage in the life cycle at the same time in the Peripheral Blood.

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Case # 3

7 year old male.

Hemoglobin of 4.5

Came to the ER because he could not stand up.

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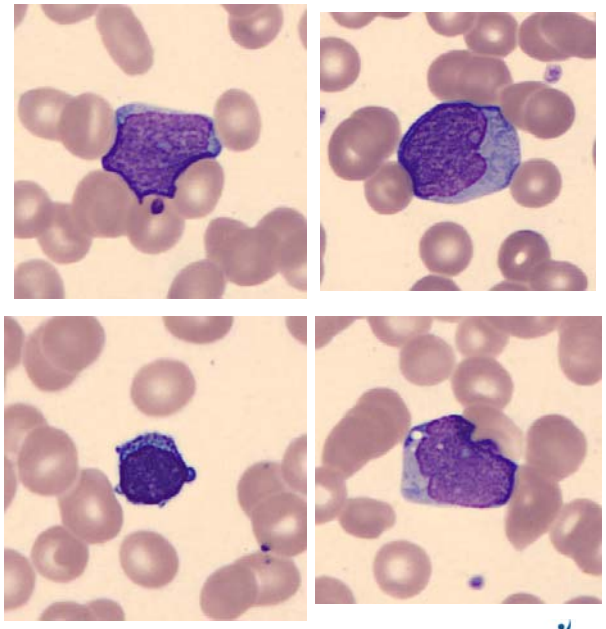
ALL

One blast was found by the technologist using a microscope. We found 3 using Cellavision.

The bone marrow had 90% blasts.



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ALL

- Acute Lymphoblastic Leukemia is the fastest of the leukemic cancers.
- Approximately 6,000 new persons are diagnosed with ALL each year in the US.
- It is the most comment type of leukemia in children under the age of 15.
- Symptoms depend upon whether the cell counts are elevated or decreased.
  - High numbers will cause joint pain, headache, vomiting,
  - Low numbers will cause symptoms consistent with anemia, etc
    - Inability to fight disease
    - Fatigue, anemia
    - Easy bleeding and bruisability
- Initial treatment is chemotherapy
- Secondary treatment is BMT

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Case # 4

6 year-old boy

Repeated illnesses, colds, etc.

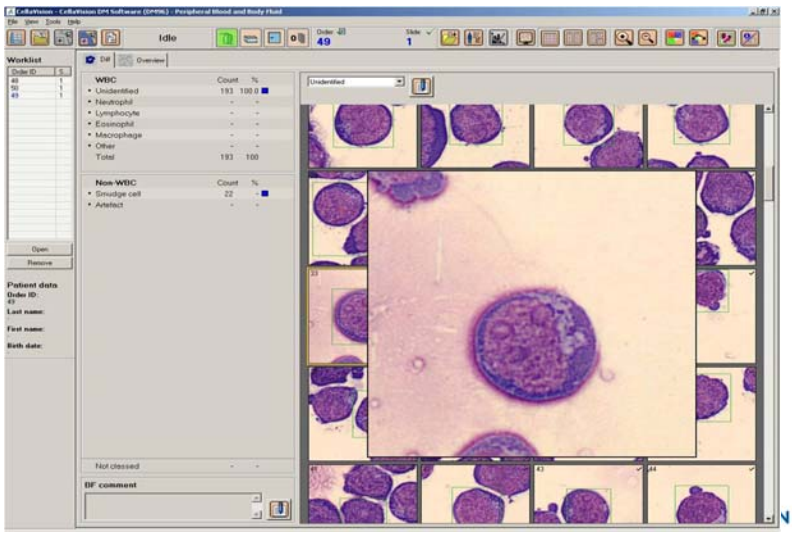
Fatigue

No weight gain

Initial testing: CT scan, Spinal Fluid

- CT Scan showed an Abdominal Mass

Burkitt's Lymphoma (CSF)



Burkitt's Lymphoma

Burkitt's Lymphoma is a non-Hodgkin's Lymphoma that has an especially high incidence in equatorial Africa among children 3 to 16 years of age but is also found in Western countries. The disease is characterized by tumors of the jaw bones and abdomen and is named after Denis Burkett, who mapped its peculiar geographic distribution across Africa in the 1950s.

Mature B-cell neoplasm that arises in lymph node germinal centers

The Epstein-Barr virus, which causes infectious mononucleosis, is present in almost 100% of persons afflicted with Burkitt lymphoma. Burkitt lymphoma occurs more readily in persons who have been weakened by malaria and in persons suffering from AIDS.

Research suggests that it is caused by a genetic mutation in which a piece of chromosome 8 is translocated to chromosome 14.

Can present as lymphoma or leukemia

Similar disease characteristics to diffuse large B cell lymphoma (DLBCL)

Synonym(s): Mature B cell high-grade lymphoma; Mature B cell acute lymphoblastic leukemia, L3 type (FAB classification);

Despite the fast-growing nature of this tumor, Burkitt's lymphoma is also one of the most curable types of lymphoma, depending on the stage of the disease at the time it is diagnosed.

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Case #5

This case was recently captured on DM 96 in The Western United States.

Patient was 1 ½ year old Asian female.

Flu-like symptoms with fever, infections.

Gray Hair. Very pale gray skin.

CBC:

WBC	3.2
RBC	4.51
HGB	13.7
HCT	39.8
MCV	95
PLT	94

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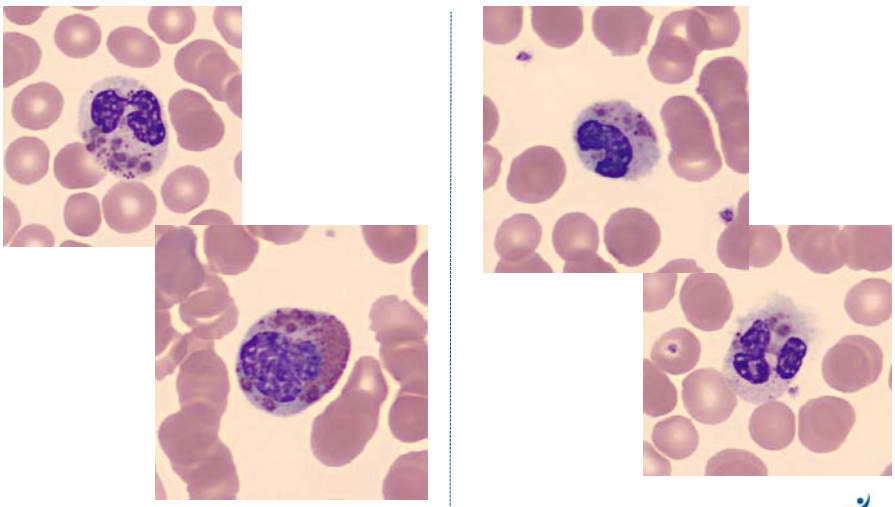
Chediak- Higashi



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Chediak-Higashi Syndrome

Chédiak-Higashi syndrome (CHS) is a rare, childhood autosomal recessive disorder that affects multiple systems of the body. Patients with CHS exhibit hypopigmentation of the skin, eyes, and hair; prolonged bleeding times; easy bruisability; recurrent infections; abnormal natural killer cell function; and peripheral neuropathy. They also frequently complain of solar sensitivity and photophobia. CHS was described by Beguez Cesar in 1943, Steinbrinck in 1948, Chédiak in 1952, and Higashi in 1954-.

Mutations have been found in the CHS1 (also called LYST) gene. The primary defect in this disease is found in certain granules normally present in skin cells and certain white blood cells.

For example, in people with this disease, a skin granule that normally contains melanin is not made properly, resulting in decreased skin color (pigmentation). A defect in granules found in certain types of white blood cells causes immune system problems.

Not only do you see the inclusions in the Neutrophils but the eosinophils have granules that are odd and of different sizes.

This patient has a sister that was a match for Bone Marrow Transplant. While that will help the functionality of the Neutrophils, the patient will be left with peripheral neuropathy.

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Case #6

60 Year Old male. Abdominal pain, pain in neck and armpit and sore throat.

Night sweats and fever.

Unexplained weight loss (over 10%)

Swelling of lymph nodes

CBC results normal w/ suspect flag for variant lymphocytes on automated differential.

Flow cytometry

- CD19+
- CD5+
- CD10+

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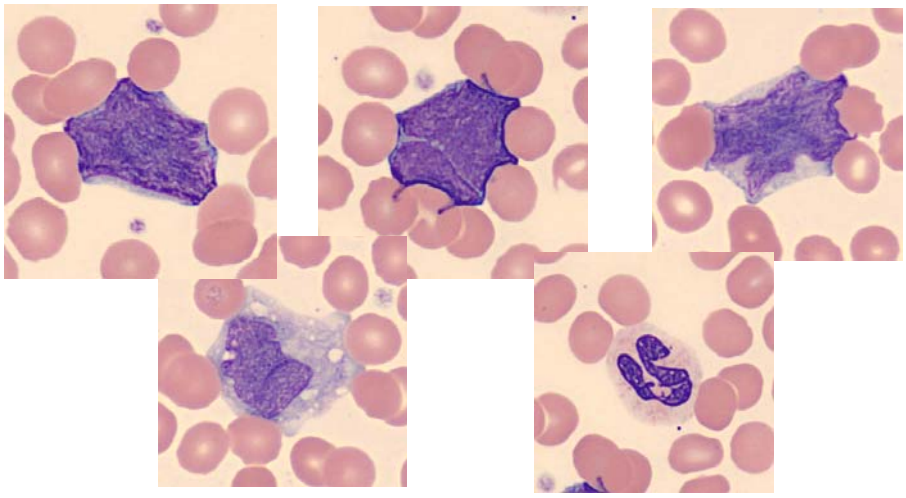
Mantle Cell Lymphoma



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Mantle Cell Lymphoma

Mantle cell lymphoma is a non-Hodgkins lymphoma that occurs in the B cells found on the outer edge of the lymph node follicle, an area known as the mantle zone. The uncontrolled growth of these B cells causes the lymph nodes to swell. Mantle cell lymphoma can also affect the bone marrow, liver and gastrointestinal tract.

Though it looks like a slow growing, low-grade tumor under the microscope, it grows fast and behaves like a high-grade lymphoma. Mantle cell lymphoma accounts for approximately six percent of all non-Hodgkin's lymphoma related diseases, according to The Leukemia and Lymphoma Society.

The overall 5 year survival rate for MCL is generally 50% (advanced stage MCL) to 70% (for limited-stage MCL).

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Case #8

53 year old woman from New Jersey, no recent travel

Fatigue, malaise, loss of appetite

Occasional fever

WBC	6.8	Segs	58
RBC	3.54	Bands	2
HGB	10.9	Lymphs	15
HCT	31.2	Monos	9
MCV	92	Eos	2
PLT	123	Reactive Lymphs	14
		Retic	3.8%

Elevated ESR

Liver function tests: Elevated TBili, LDH, and liver transaminases

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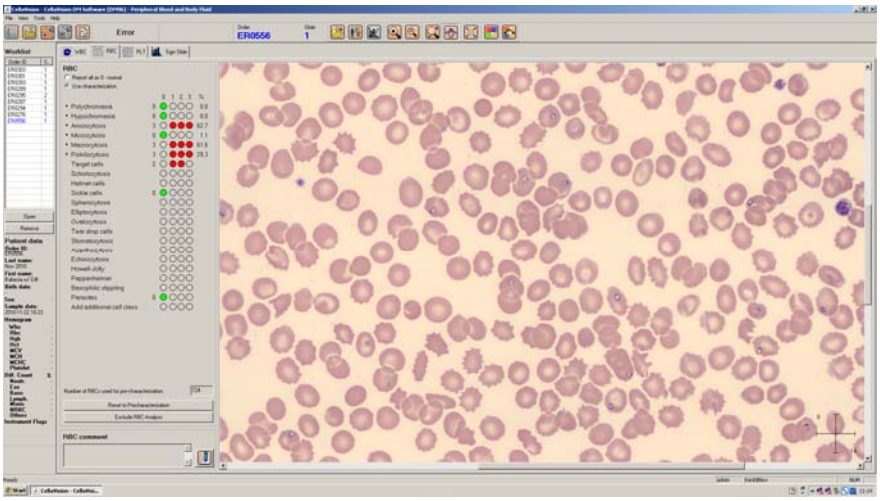

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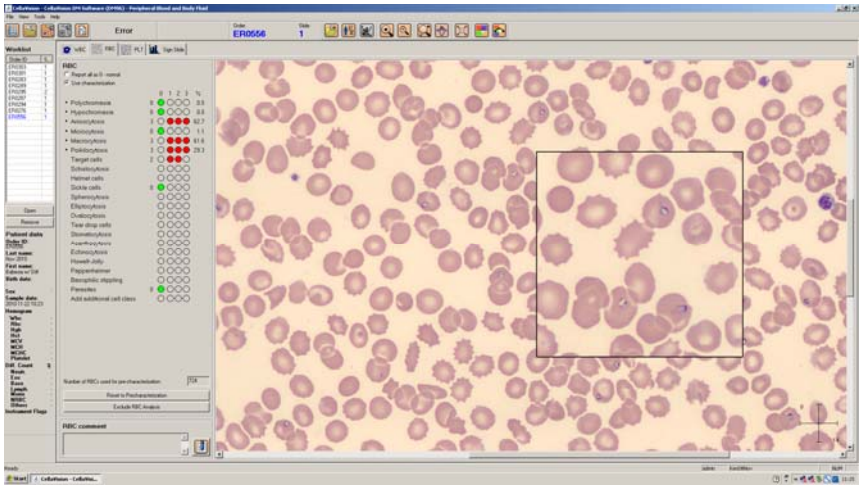
Babesia



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Babesiosis

Because *Babesia* parasites infect and destroy red blood cells, babesiosis can cause hemolytic anemia which can lead to jaundice and dark urine.

Where do most of the cases of babesiosis occur in the United States?

- Tickborne transmission of *B. microti* primarily occurs in the Northeast and upper Midwest, particularly in parts of New England, New York State, New Jersey, Wisconsin, and Minnesota. In the Northeast, babesiosis occurs in both inland and coastal areas, including off-shore islands such as Nantucket and Martha's Vineyard (Massachusetts); Block Island (Rhode Island); and Shelter Island, Fire Island, and eastern Long Island (New York State).

To supplement a blood smear, diagnoses should be made with an indirect fluorescent antibody (IFA) test.

Other possible ways of becoming infected with *Babesia* include:

- receipt of a contaminated blood transfusion (no tests have been licensed yet for donor screening); or
- transmission from an infected mother to her baby during pregnancy or delivery.
  - The Centers for Disease Control and Prevention have issued a warning about babesiosis. According to the CDC the illness is transmitted through blood transfusions and has infected at least 122 people since 2000. This was released on Sept. 7, 2011.

A differential diagnosis needs to include Plasmodium spp.

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Case #9

83 year old man

Fatigue

Lethargy

Had removed a tick three weeks ago.

WBC	4.40	Segs	89
RBC	4.10	Bands	8
HGB	13.6	Lymphs	2
HCT	39.7	Monos	0
MCV	96.7	Reactive Lymph	1
PLT	36		
		Creat	4.1
		ALT	116
		AST	318

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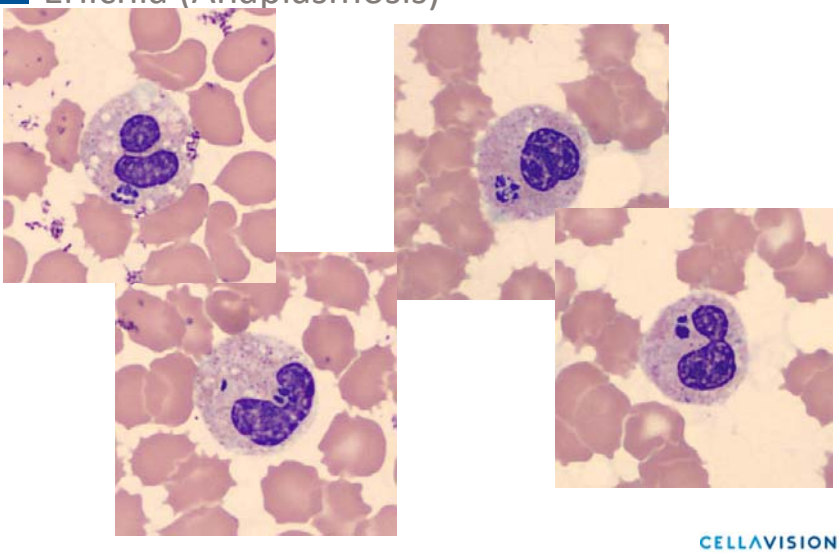
Erlichia (Anaplasmosis)



Anaplasmosis

Anaplasmosis is often characterized by sudden high fever, fatigue, muscle aches, headache. The disease can be mild or life-threatening. Severely ill patients can have low white blood cell count, low platelet count, anemia, elevated liver enzymes, kidney failure and respiratory insufficiency. Older people or people with immune suppression are more likely to require hospitalization. Deaths have occurred due to anaplasmosis.

There are two kinds of *ehrlichiosis*, both of which are caused by tick-borne rickettsial parasites called Ehrlichia that infect different kinds of white blood cells. In HME (human monocytic ehrlichiosis), they infect monocytes. In HGE (human granulocytic ehrlichiosis), they infect granulocytes. HGE was renamed anaplasmosis in 2003. It is likely that the lone star tick transmits HME and that the deer tick transmits HGE.

Ehrlichiosis (HME) was originally thought to be only an animal disease. It was described in humans in 1987 and is now found in 30 states, predominately in the southeast, south-central, and mid-Atlantic states, Europe and Africa.

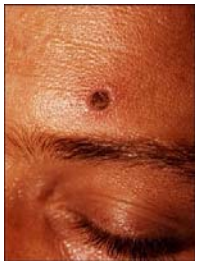
Case #10

A 47 year old woman who is an avid spelunker came to her doctor with complaints of:

- malaise (a general ill feeling)
- fever
- dry or nonproductive cough
- headache
- shortness of breath
- joint and muscle pains
- chills

She also noted this sore on her forehead.

The physician ordered a CSF due to her severe headache.



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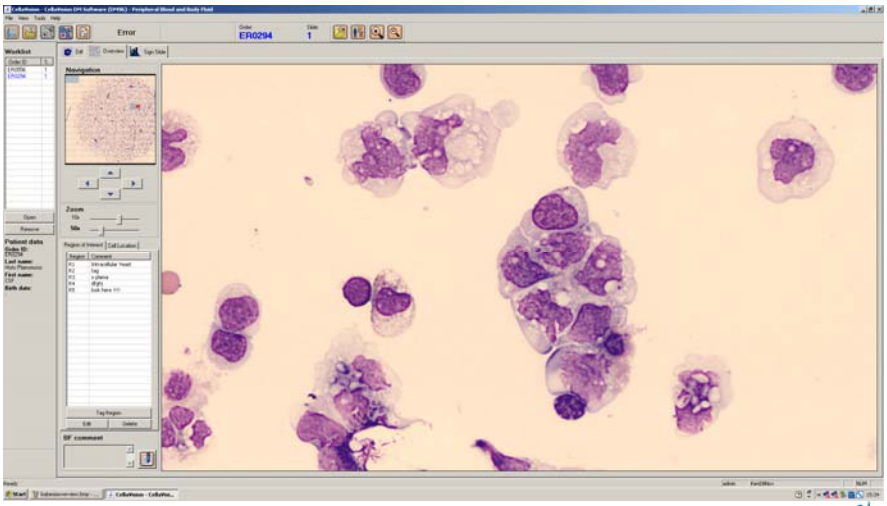
Overview of CSF



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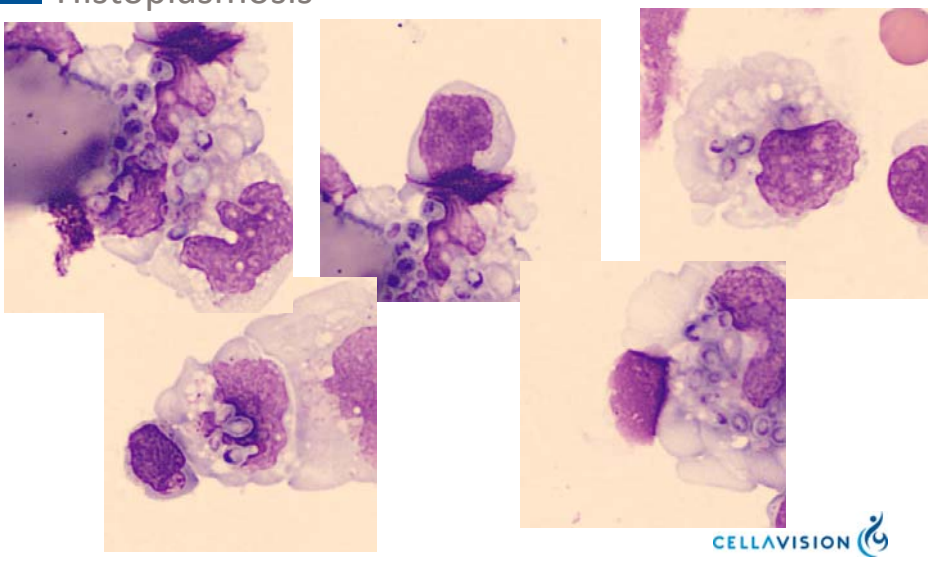
Histoplasmosis



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Histoplasmosis

Histoplasmosis (also known as"Reticuloendotheliosis,"˜Spelunker's Lung" and "Caver's disease") is a disease caused by the fungus Histoplasma capsulatum. Symptoms of this infection vary greatly, but the disease primarily affects the lungs. Occasionally, other organs are affected; this is called disseminated histoplasmosis, and it can be fatal if left untreated. Histoplasmosis is common among AIDS patients because of their suppressed immune system.

H. capsulatum grows in soil and material contaminated with bird or bat droppings (guano).The fungus has been found in poultry house litter, caves, areas harboring bats, and in bird roosts (particularly those of starlings).

Histoplasmosis can be diagnosed by samples containing the fungus taken from sputum, blood, or infected organs. It can also be diagnosed by detection of antigens in blood or urine samples by ELISA or PCR. It can also be diagnosed by a test for antibodies against *Histoplasma* in the blood.

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