

**Rigshospitalet**

REGION

# **Body Fluids at Copenhagen University Hospital**

**MARGIT GROME, Dept. of Clinical Biochemistry, Rigshospitalet**

**Ruth and Annette.**

## Agenda

- Introduction
- BF's analysed on SYSMEX XN
- Cytospin: Preparation and DM96
- Case stories

# Rigshospitalet, Copenhagen



## Accreditation:



RH: Den Danske Kvalitetsmodel (DDKM).

- Dept. of Clinical Biochemistry is accredited according to ISO 15189
- 

- **Number of analyses/year: >5 million**

## Amount and type of BF's in 2013:

• <b>CSF</b>	<b>3220</b>
• Peritoneal Fluid (ASC)	6
• Synovial Fluid	3
• Pleural Fluid	64

**Total:** **3293**

Average per week: 63

**RBC - manual count:153 (in 4 months)**



**BF's can be sent to:**

- **Dept. of Clinical Biochemistry**  
*(24 hours/day)*
- Dept. of Pathology
- Dept. of Microbiology
- Dept. of Clinical Immunology (Flowcytometry)
- Other special laboratories

## A useful guide:

H56-A  
Vol. 26 No. 26  
Replaces H56-P  
Vol. 25 No. 20

### Body Fluid Analysis for Cellular Composition; Approved Guideline

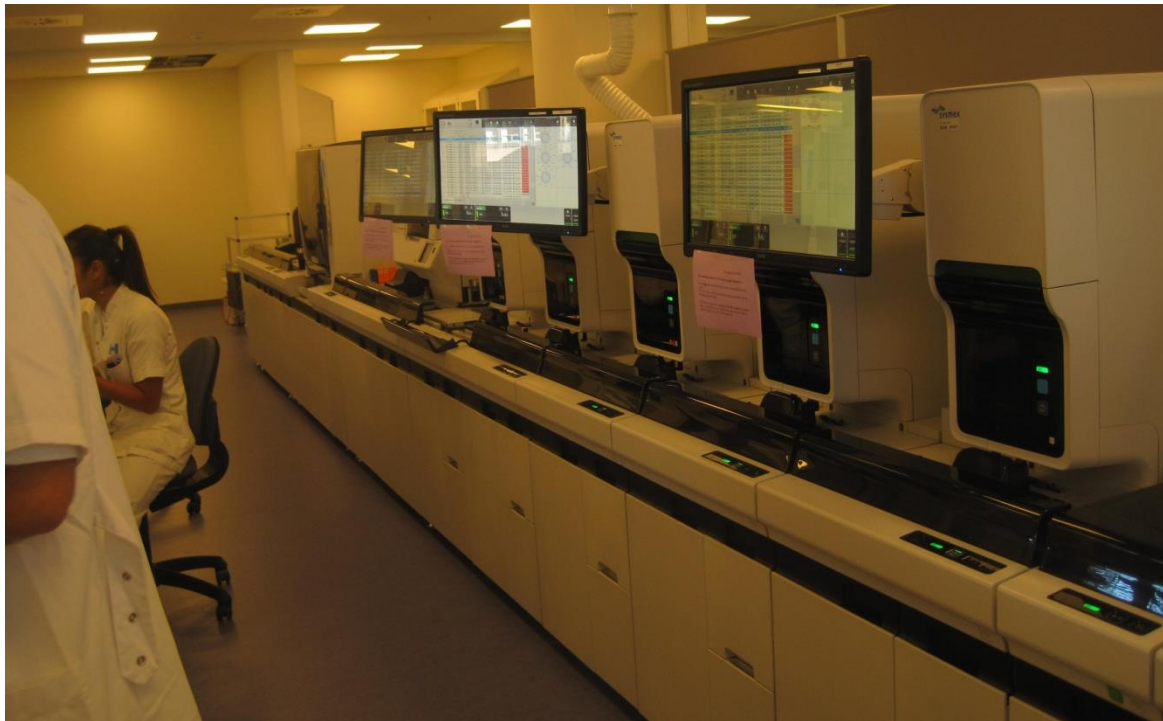
- “...Use properly prepared cyto-centrifuge slides optimally stained with Romanowsky stains (May-Grünwald-Giemsa).”
- “...In the nucleated differential, **all cells** derived from the Hematopoietic system should be included. The term *mononuclear cell* should be avoided, since the term does not adequately distinguish **monocytes from lymphocytes**, a distinction that has diagnostic significance”.

From July 1 2013 we have used **SYSMEX XN**  
APP: **Body Fluid (BF) mode**





**From June 2014 we have used the complete SYSMEX system: 3 Sysmex XN, 1 SP-10 , 1 TS 2000 and (1 Tosoh G8).**

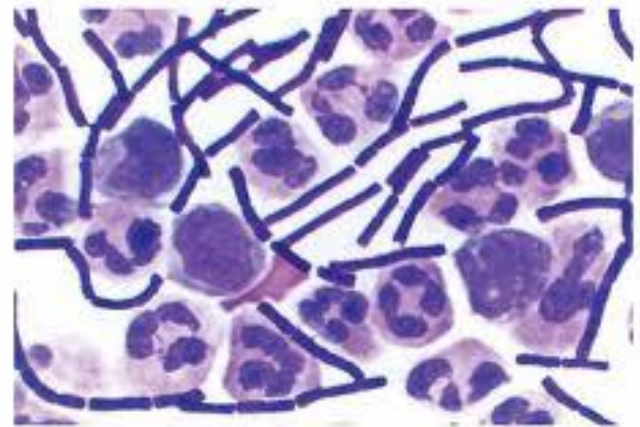


## UNITS

In BF cell-count results,  
we use the unit

- **cells X 10<sup>6</sup>/L**
- **~ million cells/L**

for both nucleated cells (WBC) and  
RBC.



## Reference- intervals:

NPU	Name	Reference-interval KB3011 10 <sup>6</sup> /L
NPU 28838	Cerebrospinal fluid—Nucleated cells and RBC.	< 5 < 5
NPU 28840	Pleural fluid—Nucleated cells	< 1000
NPU 28837	Peritoneal fluid—Nucleated cells	< 100
NPU 28839	Synovial fluid—Nucleated cells	< 200

From: **Body Fluid Analysis for Cellular Composition: Approved Guideline . Vol 26**, and McPherson RA, Pincus MR, ed. **Henry's Clinical diagnosis and management by laboratory methods**. 21st ed. Philadelphia: Saunders, 2007:442-3.

## The Body Fluid application was validated... and a report written according to SOP.

- Method comparison:  
Counting chamber method vs. Sysmex XN.
- **For CSV:** Nucleated cells (WBC) and RBC
- **For other BF's:** Nucleated cells (WBC)

## Lower detection limit - nucleated cells (WBC)

- Lower limit (Sysmex):  $0 \times 10^6/L$
- **Own analysis**
- 4 CSF-samples with low WBC-konc. ( $<5 \times 10^6/L$ )
- Every sample analysed 10 times
- Average value and SD (intra-assay) calculated
- **Detection limit is set to  $0 + 5 \text{ SD}$**
- Conclusion: SD:  $0,49 \times 10^6/L$
- **Our lower WBC- Detection limit:  $3 \times 10^6/L$**

Lower RBC-detection limit (Acc. Sysmex):  $1000 \times 10^6/L$ , which was unacceptably high for us.

Validated Rule Result None 40592 19/01/2012 11:54:28

Main Graph Cumulative Q-Flag Service User Lab. Only

Switch Display Body Fluid

Item	Data	Unit
WBC-BF	266	$10^6/L$

Item	Data	Unit
RBC-BF	0	$10^9/L$

Item	Data	Unit
PHN#	15	$10^6/L$
PHN%	5.6	%
MN#	251	$10^6/L$
MN%	94.4	%

Item	Data	Unit
TC-BF#	267	$10^6/L$
HF-BF#	1	$10^6/L$
HF-BF%	0.0	/100WBC
NE-BF#	15	$10^6/L$
NE-BF%	5.6	%
LY-BF#	135	$10^6/L$
LY-BF%	50.8	%
MO-BF#	116	$10^6/L$
MO-BF%	43.6	%
EO-BF#	0	$10^6/L$
EO-BF%	0.0	%

Item	Data	Unit
HF-BF#	1	$10^6/L$
HF-BF%	0.0	/100WBC
RBC-BF2	0.5	$10^9/L$

RBC

If data from **RBC-BF2** (Research) is used, an additional decimal is added.

$10^9/L \times 1000 = 10^6/L$   
 Example:  $0,5 \times 1000 = 500 \times 10^6/L$

## Lower detection limit RBC:

- Analysis of 5 samples with low count of erythrocytes ( $<500 \times 10^6/l$ )
- **Detection limit is set to  $0 + 5SD$**
- Average SD:  $52,7 \times 10^6/L$
- Lower detection limit:  $264 \times 10^6/L = \underline{\underline{300 \times 10^6/L}}$
- A detection limit of  $300 \times 10^6/L$  is higher than the current limit, but it is clinically acceptable ... or so we thought ...

## Alarm system Sysmex XN:

Alarms:		
@	Next to result	Dilute – or analyze as blood.
WBC Abn Scattergram	IP message	Check number of nucleated cells by manual count
” * ” (STAR) or ... (3 dots)	Next to result – or instead of result	Very, very rare – but check number of nucleated cells by manual count



## Conclusion:

- *The method fulfils all of the established quality demands.*
- And we started using the Sysmex XN for BF's.
- BUT...

## We received an e-mail:

- It turns out that normal atraumatic spinal fluids are now given with erythrocyte numbers  $<300 \times 10^6/L$ . Previously, they were given as  $<3 \times 10^6/L$  with normal spinal fluids.
- This is of considerable importance to our department, as a certain number of **RBC  $>10 \times 10^6/L$  equals a traumatic** puncture in our protocols. For leukaemia, a traumatic lumbar puncture at the time of diagnosis **means an increased risk of spread to CNS**, and this will often trigger extra intrathecal chemotherapy.
- At present, we thus find ourselves unable to distinguish between these situations (traumatic versus atraumatic lumbar puncture).

## Change of handling – CSF RBC < 300 x 10<sup>6</sup>/L

- With samples from **certain wards** (children, oncology and haematology), we count RBC manually if the concentration of RBC in CSF is < 300 x 10<sup>6</sup>/L (counted on SYSMEX XN).
- SYSMEX is working on solving the problem.

## New NPU-codes and parameter names for BF cell count and diff count?

- We do not believe that WBC and other nucleated cells can be separated from each other by automated or manual methods.
- (Tumour cells, erythroblasts, fungi, microorganisms, and more). This can only happen with manual differential count in the microscope/Cellavision DM96.
- Therefore, we decided to change the name in all BF's so  
**Instead of WBC-concentration, from July 1 2013 we have used:**

E.g.: **CSF-Nucleated cells; conc.** (Unit:  $\times 10^6/L$ )

IFCC-IUPAC-code: NPU028838

... and we will use the total count **(TC-BF#)** as result.

Print – SYSMEX XN :

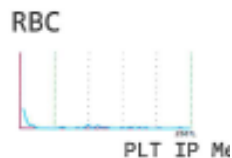
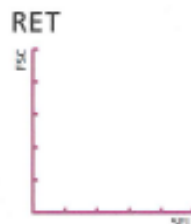
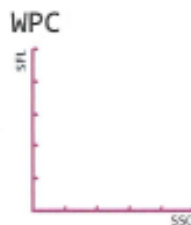
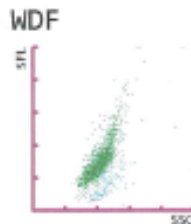
WBC-BF or TC-BF#?

Sample No.: 4059281748  
 Patient ID:  
 Name:  
 Sample Comment:

Ward:  
 Rack:

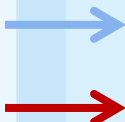
Position: 19  
 Doctor:  
 Birth:  
 Nicknar

WBC	[10 <sup>9</sup> /L]		
RBC	[10 <sup>6</sup> /uL]		
HGB	[mmol/L]		
HCT	[Ratio]		
MCV	[fL]		
MCH	[fmol]		
MCHC	[mmol/L]		
PLT	[10 <sup>9</sup> /L]		
RDW-SD	[fL]		
RDW-CV	[%]		
PDW	[fL]		
MPV	[fL]		
P-LCR	[%]		
PCT	[%]		
NRBC	[10 <sup>9</sup> /L]	[%]	
NEUT	[10 <sup>9</sup> /L]	[%]	
LYMPH	[10 <sup>9</sup> /L]	[%]	
MONO	[10 <sup>9</sup> /L]	[%]	
EO	[10 <sup>9</sup> /L]	[%]	
BASO	[10 <sup>9</sup> /L]	[%]	
IG	[10 <sup>9</sup> /L]	[%]	
RET	[10 <sup>9</sup> /L]	[10 <sup>9</sup> /L]	
IRF	[%]		
LFR	[%]		
MFR	[%]		
HFR	[%]		
RET-He	[fmol]		
IPF	[%]		
WBC-BF	264 [10 <sup>6</sup> /L]		
RBC-BF	0 [10 <sup>9</sup> /L]		
MN	250 [10 <sup>6</sup> /L]	94.7 [%]	
PMN	14 [10 <sup>6</sup> /L]	5.3 [%]	
TC-BF#	265 [10 <sup>6</sup> /L]		



**WBC-BF:** 264 x 10<sup>6</sup>/L  
**TC-BF:** 265 x 10<sup>6</sup>/L

We always use TC-BF#.

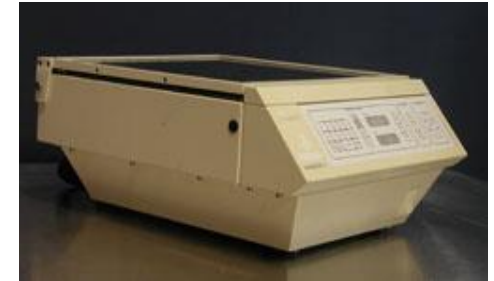


WBC IP Message

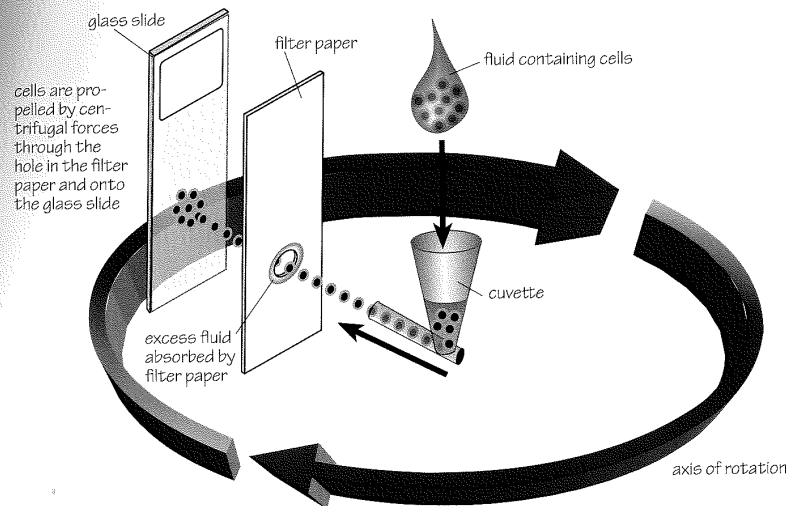
RBC IP Message

PLT IP Message

# Cyto-centrifuge-preparation (we have used this for many years)



## Cyto-centrifuge Principles



A body fluid sample is added to a cuvette. Using centrifugal force, the cyto-centrifuge machine spins the cuvette and propels cells onto a circular area of a glass slide. Residual fluid is absorbed by filter paper overlying the glass slide.

Introduction

13

## Shandon Cytospin:

Optimal amount WBC's per pellet:

Approximately 5000.

Optimal amount of liquid:

300-500  $\mu\text{l}$  (Max. 500  $\mu\text{l}$ ).

We always add:

1 drop of 20 % Albumin.

Speed:

1000 (700) RPM.

**(Optimized in 2008)**

## Manual diff count of BF's

If the concentration of nucleated cells is

$$> 10 \times 10^6/L$$

we will make a differential count.

# The Cytospin slides are stained in Sysmex SP-10

Staining method: May-Grünwald – Giemsa

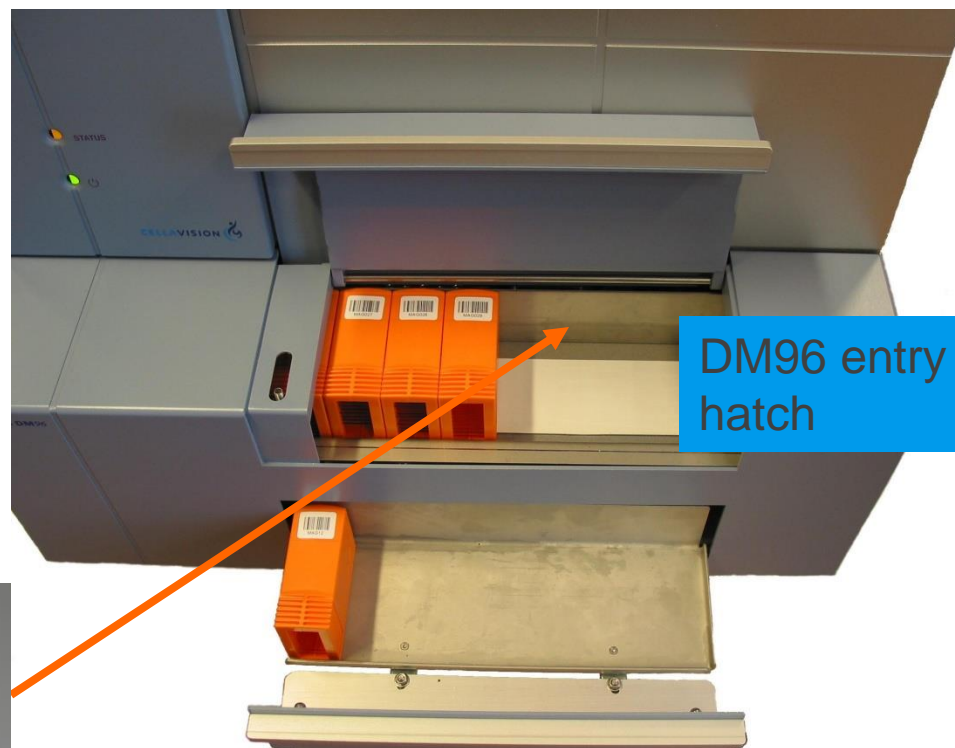


# CellaVision DM96 for BF-diff 's since 2008

CSV-  
Cytospin-prep. stained in SP1000i:



Loading of the preparation:



**NOTE!:**

**BLUE cassette for  
body fluids.**

# Overview of pellet

Zoom

CellaVision - CellaVision DM Software (DM96)

File View Tools Help


Print Setup... Print... Error Order: CB23A Slide: 1

Log off Exit

Dif Overview Sign Slide

OrderID	S...
BF30A	1
BF28B	1
BF25B	1
BF24A	1
CB23A	1

Navigation



Zoom 10x → 50x

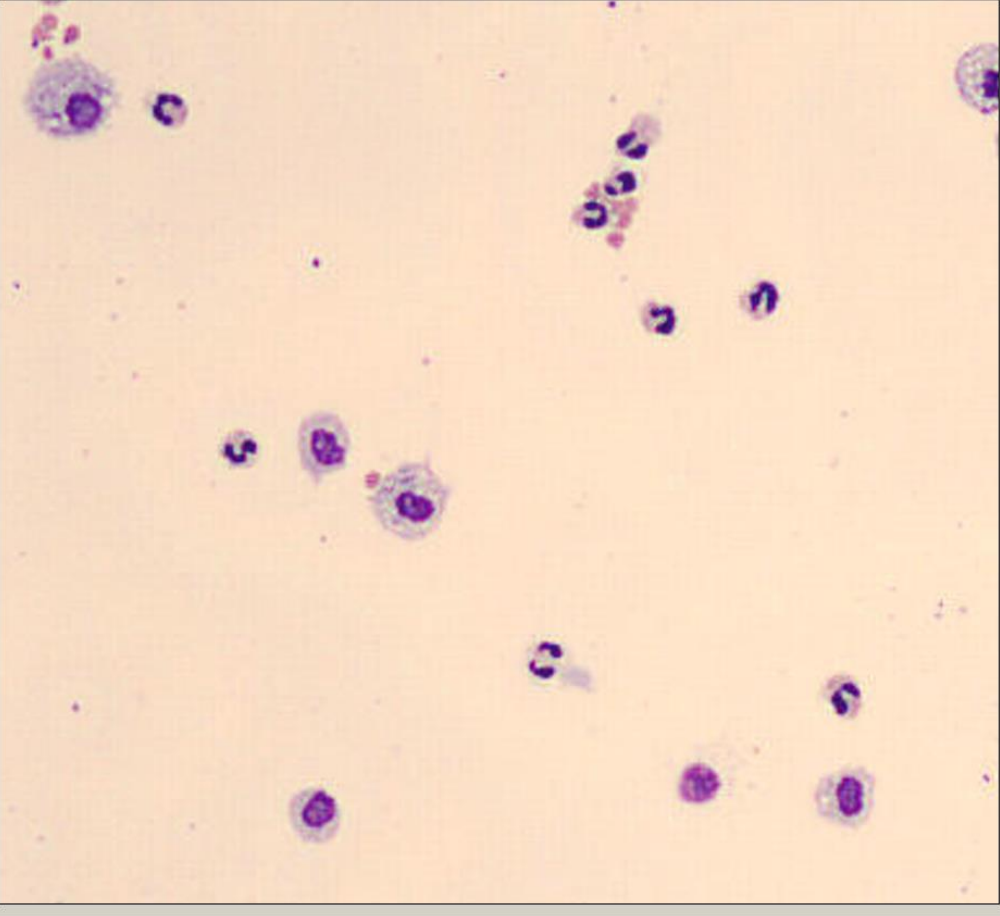
Region of Interest Cell Location

Region	Comment

Tag Region

Edit Delete

BF comment



mg study2\_CPH INUM

Start CellaVision - CellaVis... overview 10x.rtf - Word... 09:23

# BF differential count in CellaVision DM 96 - screenprint where 3 cell classes are shown.

The neural network pre-validates cells, and Lab Technician checks and moves cells if necessary - and signs.

**orklist**

Order ID	S.
F30A	1
F29B	1
F25B	1
F24A	1
B23A	1
B16A	1
B24A	1
F23A	1
F28A	1

**WBC**

	Count	%
• Unidentified	-	-
• Neutrophil	95	48.0
• Lymphocyte	6	3.0
• Eosinophil	-	-
• Macrophage	97	49.0
• Other	-	-
Total	198	100

**Non-WBC**

	Count	%
• Smudge cell	4	-
• Artefact	4	-

**Neutrophil**

**Macrophage**

**Lymphocyte**

**Neutrophils**

**Monocytes/Macrophages**

**Lymphocytes**

Ready | Start | CellaVision - CellaVis... | seg alone.rtf - WordPad | mg | study2\_CPH | NUM | 09:34

# Eos

ImageVision DM Software (DM96)

Order: CB24B Slide: 1

Diff Overview Sign Slide

WBC		
	Count	%
• Unidentified	-	-
• Neutrophil	2	1.0
• Lymphocyte	68	33.7
• Eosinophil	12	5.9
• Macrophage	119	58.9
• Other	1	0.5
Total	202	100

Non-WBC		
	Count	%
• Smudge cell	4	-
• Artefact	16	-

Eosinophil

Lymphocyte

Reference cells

# Plasmacells

Order: BF25B Slide: 1

Sign Slide

Count	%
-	-
103	51.2
45	22.4
-	-
50	24.9
3	1.5
201	100

Other

Count	%
7	-
23	-

Macrophage

Reference cells

Microscopy images showing various cell types, including plasmacells (labeled 1, 2, 3) and macrophages (labeled 22-36).

OBS.

Are placed  
in "Other"

## Differential count of body fluids:

	Previously (Manually)	<i>Since Dec. 2008</i>
Number of cells:	100 (3)	200 (5)
Cell classes:	<b>Neutrocytes</b>	<b>Neutrocytes</b>
	<b>Lymphocytes and monocytes</b>	<b>Lymphocytes</b>
	<b>"Other"</b>	<b>Monocytes and macrofages</b>
		<b>Eosinophiles</b>
		<b>Other</b>
		<b>(Unidentified)</b>

## Smudge cells ?

- Are a problem.
- We "include" them in the result if they are > 20%-
- We place them in "Other" and give a comment.
- "Other" we use to so many other cell-classes:  
Mesothelia-cells, blasts, basofiles, plasmacells ....

## So : New cell type:

- DNK35265 Plv(spec.)—Smudge celler; antalk. = ? x 10<sup>6</sup>/L
- DNK35264 Csv—Smudge celler; antalk. = ? x 10<sup>6</sup>/L
- DNK35266 Asc—Smudge celler; antalk. = ? x 10<sup>6</sup>/L
- DNK35267 Ledv(spec.)—Smudge celler; antalk. = ? x 10<sup>6</sup>/L
- DNK35269 B—Smudge celler; antalk. = ? x 10<sup>9</sup>/L
- ”Celler” = Danish word for cells.



Training ? Blood- Diff.: 22 technologists  
 CSV- Diff: 32 technologists

## CellaVision Competency software/ Proficiency Software ( BF-test)

The screenshot displays the CellaVision software interface for a BF-test. The main window shows a comparison of WBC cells between two examiners: 'Other' and 'Majken'. The interface includes a navigation bar with 'TESTS', 'SLIDES', 'PARTICIPANTS', and 'SETTINGS'. The current slide is '1 slide'.

**Comparison results:**

	Examiner	Majken	Disagree...
Other	165	130	29
Lymphocyte	31	58	27
Artefact	2	2	0
Macrophage	4	4	2
<b>TOTAL</b>	<b>202</b>	<b>202</b>	

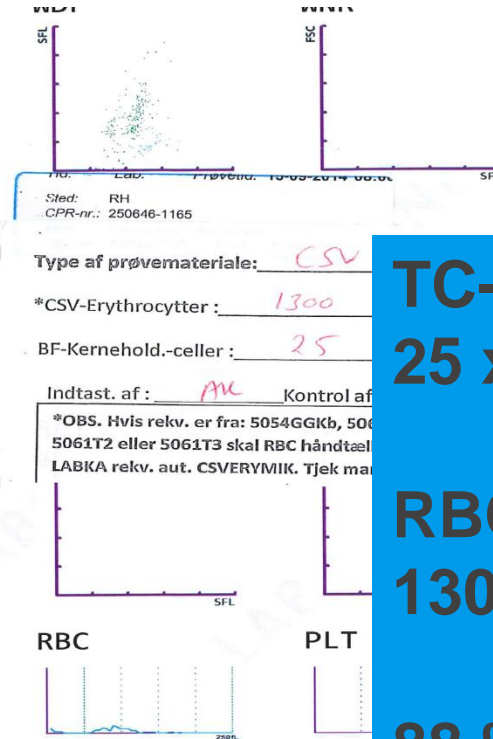
The interface also shows a list of slides for comparison, a 'Compare' section with dropdown menus for 'Examiner' and 'Majken', and a 'Comparison results' table. The main display area shows a large image of a WBC cell with a red circle highlighting a specific feature, and a grid of smaller images showing other WBC cells. The bottom of the screen shows the Windows taskbar with the Start button, taskbar icons for 'Ziworks Progress', 'Inbox - Margt.Grome...', 'CellaVision Proficiency...', and 'CellaVision Proficie...', and the system tray with the time '13:57'.

# Cases:

# CSF Case 1: Dept . of Neurosurgery

WBC		[10 <sup>9</sup> /L]		
RBC		[10 <sup>12</sup> /L]		
HGB		[mmol/L]		
HCT		[Ratio]		
MCV		[fL]		
MCH		[fmol]		
MCHC		[mmol/L]		
PLT		[10 <sup>9</sup> /L]		
RDW-SD		[fL]		
RDW-CV		[%]		
PDW		[fL]		
MPV		[fL]		
P-LCR		[%]		
PCT		[%]		
NRBC		[10 <sup>9</sup> /L]	[%]	
NEUT		[10 <sup>9</sup> /L]	[%]	
LYMPH		[10 <sup>9</sup> /L]	[%]	
MONO		[10 <sup>9</sup> /L]	[%]	
EO		[10 <sup>9</sup> /L]	[%]	
BASO		[10 <sup>9</sup> /L]	[%]	
IG		[10 <sup>9</sup> /L]	[%]	
RET		[10 <sup>9</sup> /L]	[%]	
IRF		[%]		
LFR		[%]		
MFR		[%]		
HFR		[%]		
RET-He		[fmol]		
IPF		[%]		
WBC-BF	25	[10 <sup>6</sup> /L]		
RBC-BF	1	[10 <sup>9</sup> /L]		
MN	22	[10 <sup>6</sup> /L]	88.0	[%]
PMN	3	[10 <sup>6</sup> /L]	12.0	[%]
TC-BF#	25	[10 <sup>6</sup> /L]		
RBC-BF2	1.3	[10 <sup>9</sup> /L]		
NE-BF	3	[10 <sup>6</sup> /L]	12.0	[%]
LY-BF	7	[10 <sup>6</sup> /L]	28.0	[%]
MO-BF	15	[10 <sup>6</sup> /L]	60.0	[%]
EO-BF	0	[10 <sup>6</sup> /L]	0.0	[%]
WBC IP Message				
RBC IP Message				
PLT IP Message				

$\frac{5000}{2475} = 200 \mu\text{l}$



**TC-BF:**  
**25 x 10<sup>6</sup>/L**

**RBC:**  
**1300 x 10<sup>6</sup>/L**

**88 % MN**  
*(LY: 28% and MO: 60 %)*

**12 % PMN**

# CSV Case 1

Diff Overview Sign Slide

WBC	Count	%
• Unidentified	-	-
• Neutrophil	28	14.2
• Lymphocyte	66	33.5
• Eosinophil	-	-
• Macrophage	103	52.3
• Other	-	-
Total	197	100

Non-WBC	Count	%
• Smudge cell	26	-
• Artefact	36	-

**Neut: 14 %**

**Lymf: 33,5 %**

**Mono/Macro: 52,5 %**

Not classed - -

BF comment

Lymphocyte

Macrophage

Reference cells

Neutrophil

Reference cells

mah 18062009 NUM

CellaVision - Remote ... 16:29

Diagnosis:

Glioblastoma in occipital region.

Infection in shunt?

## CSF Case 2

WBC	Count	%
• Unidentified	-	-
• Neutrophil	-	-
• Lymphocyte	28	11.8
• Eosinophil	-	-
• Macrophage	1	0.4
• Other	209	87.8
Total	238	100

Non-WBC	Count	%
• Smudge cell	21	-
• Artefact	27	-

Not classed	Count	%
Not classed	-	-

BF comment

ah 18062009 NUM

CellaVision - Remote ... DA 13:54

12 % Lymf

88 % Other

# CSF Case 2

Diff Overview Sign Slide

WBC	Count	%
• Unidentified	-	-
• Neutrophil	-	-
• Lymphocyte	28	11.8
• Eosinophil	-	-
• Macrophage	1	0.4
• Other	209	87.8
Total	238	100

Non-WBC	Count	%
• Smudge cell	21	-
• Artefact	27	-

Other

51 52 53  
56 57 58  
61 62 63  
66 67 68  
71 72 73  
76 77 78 79 80

Not classed - -

BF comment

ah 18062009 NUM

CellaVision - Remote ... Dokument - WordPad DA 13:58


# CSF Case 2 LIS (LABKA) Print

**LABORATORIEUDSKRIFT**

Fra Søg svar  
 Bestillingsformål= Behandling  
 Udskr. af bruger fra Lab.

Side 1 (Blad 1 af 1)

Dannet 16-09-2014 kl. 15:02:59

Rigshospitalet (RH)		 Rigshospitalet Klinisk Biokemisk afdeling	
<b>Prøvedato og klokkeslæt:</b>	40336 65687 <b>2012</b> <b>mar</b> <b>26</b> <b>14:45</b>		
Rekvirent:	2094N1 (RH)		
Andre modtagere:	2094N1 (RH)		
Kommentar:			
<b>CEREBROSPINALVÆSKE</b>			
Csv - Erythrocytter	35		$\times 10^6/l$ <=1
Csv - Glukose	4,0 ↑		mmol/l 2,2-3,9
- CSV-REFLEKS	Udført		
Csv - Leukoctype gruppe			
Csv - Eosinofilytter	0		$\times 10^6/l$
Csv - Leukocyttter (uspec.)	165		$\times 10^6/l$
Csv - Lymfocyttter	22 ↑		$\times 10^6/l$ <5
Csv - Makrofager+Monocyttter	1		$\times 10^6/l$
Csv - Neutrofilocyttter	0		$\times 10^6/l$ <1
Csv - Leukocyttter	188 ↑		$\times 10^6/l$ <5
Csv - Protein	0,86 ↑		g/l 0,15-0,50 <sup>A</sup>

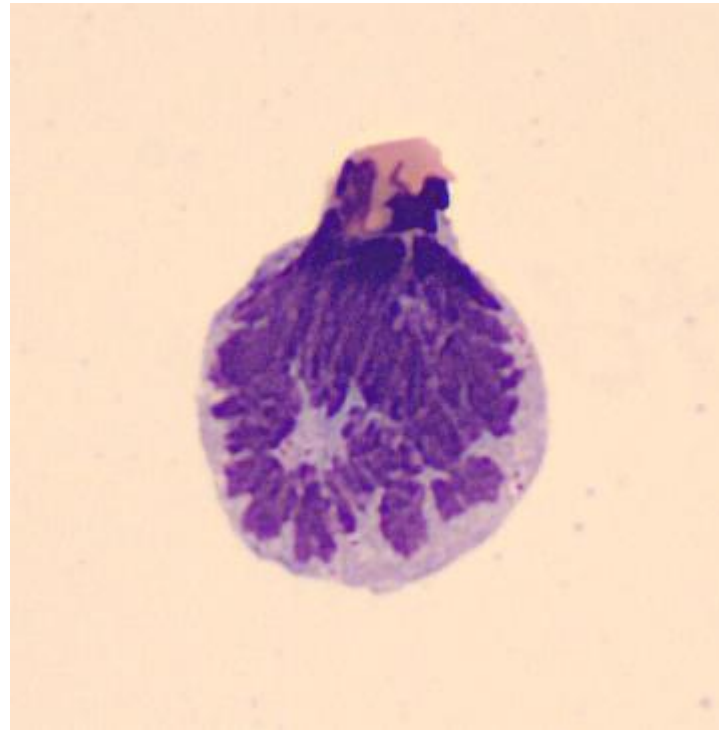
↑: Overn. af uspecif. monocykl. celler, der ses mitoser

CSV- WBC (nucleated cells): 188

CSV-RBC: 35

A note to "Leukocyttter (uspec.) – "OTHER" :  
*"Dominated by immature, mononuclear cells. Mitosis is detected. "*

## Case 2: NK-T-cell lymphoma with CNS-infiltration. (Confirmed by dept. of pathology)





## CSF Case 3:

Male, 19:

- 2007: Pre B-ALL
- April 2010: Finished treatment
- August 2010: Isolated CNS

## Case 3 : CSF-sample with blasts. Sysmex XN-print (2012):

Sample No.: 4059281748  
 Patient ID:  
 Name:  
 Sample Comment:

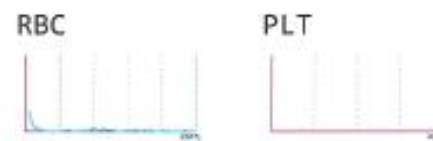
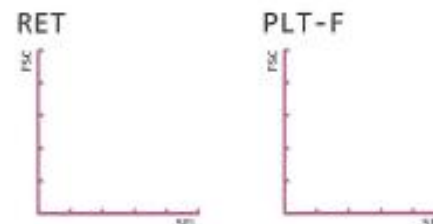
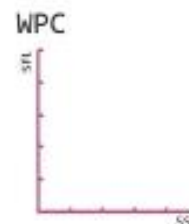
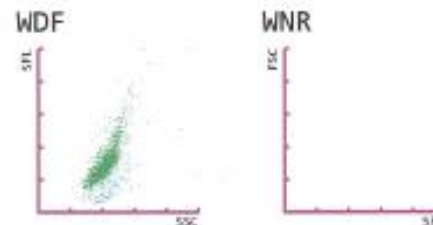
Ward:  
 Rack:

Position: 19/01/2012 11:51:03 BF  
 Doctor:  
 Birth: Sex: 1/8  
 Nickname: XN-2000-1-R

WBC	[10 <sup>9</sup> /L]		
RBC	[10 <sup>6</sup> /uL]		
HGB	[mmol/L]		
HCT	[Ratio]		
MCV	[fL]		
MCH	[fmol]		
MCHC	[mmol/L]		
PLT	[10 <sup>9</sup> /L]		
RDW-SD	[fL]		
RDW-CV	[%]		
PDW	[fL]		
MPV	[fL]		
P-LCR	[%]		
PCT	[%]		
NRBC	[10 <sup>9</sup> /L]	[%]	
NEUT	[10 <sup>9</sup> /L]	[%]	
LYMPH	[10 <sup>9</sup> /L]	[%]	
MONO	[10 <sup>9</sup> /L]	[%]	
EO	[10 <sup>9</sup> /L]	[%]	
BASO	[10 <sup>9</sup> /L]	[%]	
IG	[10 <sup>9</sup> /L]	[%]	
RET	[10 <sup>9</sup> /L]	[10 <sup>9</sup> /L]	
IRF	[%]		
LFR	[%]		
MFR	[%]		
HFR	[%]		
RET-He	[fmol]		
IPF	[%]		
WBC-BF	264 [10 <sup>6</sup> /L]		
RBC-BF	0 [10 <sup>9</sup> /L]		
MN	250 [10 <sup>6</sup> /L]	94.7 [%]	
PMN	14 [10 <sup>6</sup> /L]	5.3 [%]	
TC-BF#	265 [10 <sup>6</sup> /L]		

WBC IP Message

RBC IP Message



PLT IP Message

## Research:

NE-BF: 5,6 %

LY-BF : 50,8 %

MO-BF: 43,6 %

No alarms

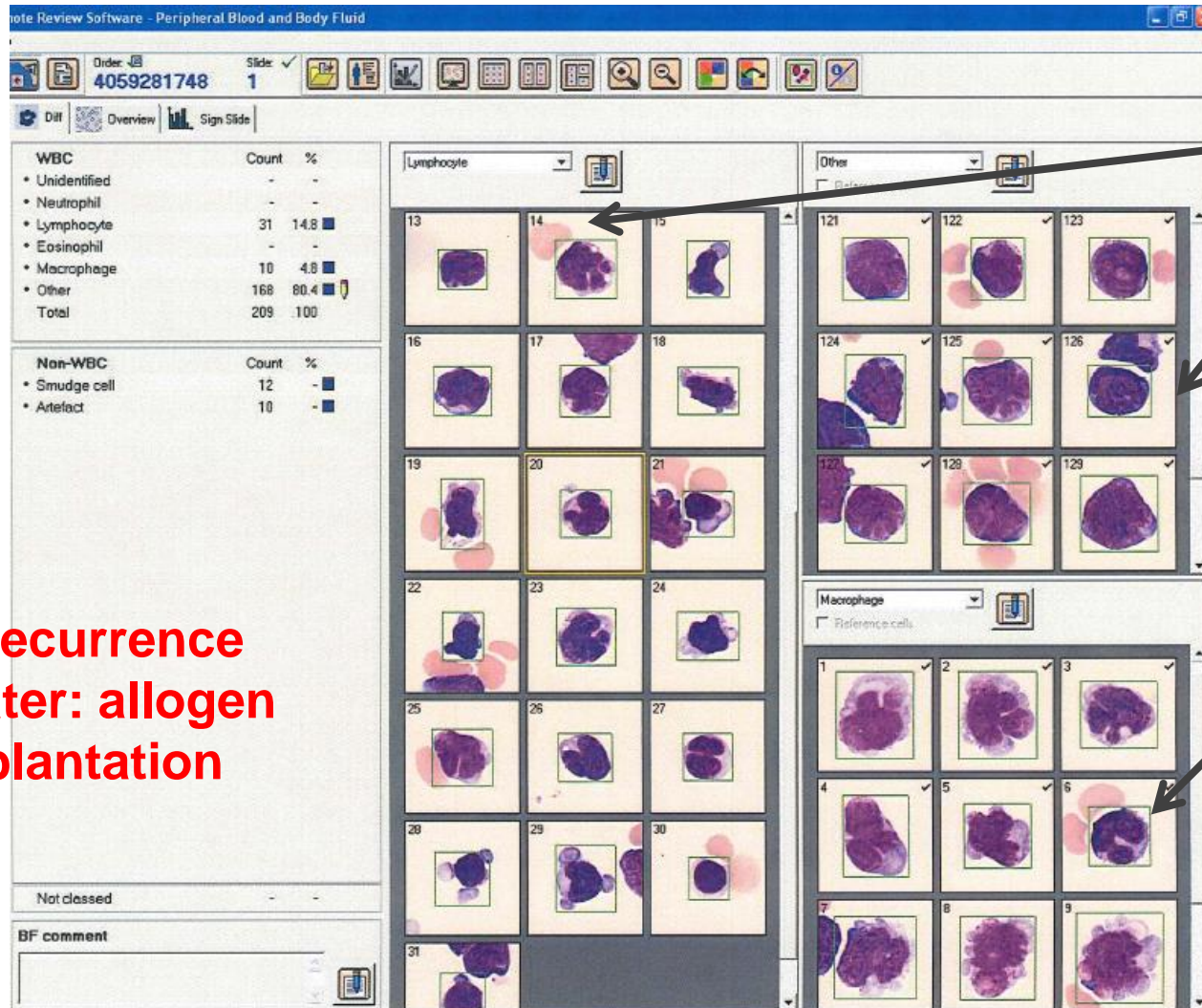
TC-BF#:

265

MN: 95 %

PMN: 5 %

### Case 3: Same sample with blasts (CellaVision DM96-screenshot)



15 % Lymf

80 % Blaster  
(confirmed by  
Dept. of  
Pathology)

5 %  
mono/macro

**CNS-recurrence  
and later: allogeneic  
transplantation**

# Case 4: Blood diff (girl, 7) - AML

WBC Sign Slide

WBC	Count	%
• Unidentified	-	-
• Band neutrophil	-	-
• Segmented neutrophil	42	32.6
• Eosinophil	-	-
• Basophil	-	-
• Lymphocyte	46	35.7
• Monocyte	2	1.6
• Promyelocyte	-	-
• Myelocyte	2	1.6
• Metamyelocyte	9	7.0
• Prolymphocyte	-	-
• Blast (no lineage spec)	9	7.0
• Lymphocyte, variant form	-	-
• Plasma cell	2	1.6
• Large granular lymphocyte	-	-
• Hairy cell	-	-
• Sézary cell	-	-
• Other	-	-
• Nøgne kerner	17	13.2
Total	129	100

Non-WBC	Count	%
• Erythroblast (NRBC)	3	-
• Giant thrombocyte	2	-
• Thrombocyte aggregation	-	-
• Megakaryocyte	-	-
• Smudge cell	-	-
• Artefact	5	-
Not classed	-	-

WBC comment

Blast (no lineage spec) Ref. cells in Gallery 2 Ref. cells in Gallery 3

Myelocyte Reference cells

Metamyelocyte Reference cells

WBC = 2,1 x 10<sup>9</sup>/L

am 18062009 NUM

CellaVision - Remote ... DA 14:08

## Case 4: CSF diff (girl, 7)

CellaVision - Remote Review Software - Peripheral Blood and Body Fluid

File View Tools Help

Order: 4017872411 Slide: 1

Worklist

Order ID	Count	%
4018075353	-	-
4018070696	-	-
4018068608	-	-
4018074322	-	-
4018089788	-	-
4018076422	3	1.5
4018085049	-	-
4018078573	-	-
4018080012	5	2.6
4017818433	-	-
4018078972	186	95.9
4018089699	-	-
4018085120	-	-
4018088188	-	-
4018088153	-	-
4018108359	8	-
4018091332	-	-
4018074322	-	-
4018111430	-	-
4018106160	-	-
4018001376	-	-

WBC

- Unidentified - -
- Neutrophil - -
- Lymphocyte 3 1.5
- Eosinophil - -
- Macrophage 5 2.6
- Other 186 95.9
- Total 194 100

Non-WBC

- Smudge cell 8 -
- Artefact 37 -

Other

Lymphocyte

Reference cells

1 2 3

169 170 171

172 173 174

175 176 177

178 179 180

181 182 183

184 185 186

Not classed - -

BF comment

Order ID: 4017872411  
Last name: .  
First n: WBC: 232 x 10<sup>6</sup>/L  
Cv: RBC: <3 x 10<sup>6</sup>/L  
Birth d:

Ready am 18062009 NUM 14:11

## Case 4: CSF diff (girl, 7) - AML

- **Our comment:**
  - Other: Large, immature cells
- **Saturday evening:** We made 9 Cytospin-slides and sent them to Dept. of Pathology
- **Their result was:**
  - Cell-rich cytopsin with many large cells, primarily blast cells and early myeloid precursors. Few RBC's. CNS-leukaemia

# Case 5: Diagnosis: Brain tumour (Neuroepiteliom)

CSF RBC:  $931 \times 10^6/l$   
CSF WBC:  $50 \times 10^6/l$

Comment to  
"other":  
Immature,  
"blast-like" cells.

The screenshot displays the DM Software (DM96) interface for Peripheral Blood and Body Fluid analysis. The main window is titled "Idle" and shows a differential count table on the left and a grid of microscopic images on the right.

WBC	Count	%
• Unidentified	-	-
• Neutrophil	-	-
• Lymphocyte	24	11.7
• Eosinophil	-	-
• Macrophage	11	5.4
• Other	170	82.9
Total	205	100

Non-WBC	Count	%
• Smudge cell	11	-
• Artefact	43	-

The microscopic images are organized into three panels: "Other", "Macrophage", and "Lymphocyte". The "Other" panel shows 18 images (76-93) of various cells, including several large, immature, "blast-like" cells. The "Macrophage" panel shows 6 images (4-9) of macrophages. The "Lymphocyte" panel shows 8 images (10-17) of lymphocytes. The "Lymphocyte" panel also includes a "Reference cells" checkbox.

At the bottom of the interface, there is a "Not classed" section and a "BF comment" field. The status bar at the bottom indicates the software version (n - CellaVis...), the user's name (My Documents), the date (21012009), and the time (15:46).

# Case 6: CSF

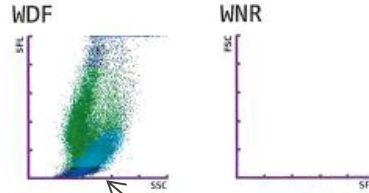
**WBC-BF: 4783- 4916**

**TC-BF: 5079-5264 -**

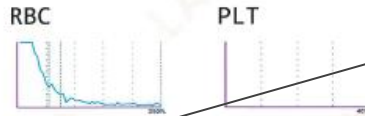
**RBC: 14900**

**Lots of debris – no alarm  
(Abn. Scattergram)**

WBC	[10 <sup>9</sup> /L]	
RBC	[10 <sup>12</sup> /L]	
HGB	[mmol/L]	
HCT	[Ratio]	
MCV	[fL]	
MCH	[fmol]	
MCHC	[mmol/L]	
PLT	[10 <sup>9</sup> /L]	
RDW-SD	[fL]	
RDW-CV	[%]	
PDW	[fL]	
MPV	[fL]	
P-LCR	[%]	
PCT	[%]	
NRBC	[10 <sup>9</sup> /L]	[%]
NEUT	[10 <sup>9</sup> /L]	[%]
LYMPH	[10 <sup>9</sup> /L]	[%]
MONO	[10 <sup>9</sup> /L]	[%]
EO	[10 <sup>9</sup> /L]	[%]
BASO	[10 <sup>9</sup> /L]	[%]
IG	[10 <sup>9</sup> /L]	[%]



WBC-BF	4783	[10 <sup>6</sup> /L]	
RBC-BF	15	[10 <sup>9</sup> /L]	
MN	2594	[10 <sup>6</sup> /L]	54.2 [%]
PMN	2189	[10 <sup>6</sup> /L]	45.8 [%]
TC-BF#	5079	[10 <sup>6</sup> /L]	
RBC-BF2	14.9	[10 <sup>9</sup> /L]	
NE-BF	2188	[10 <sup>6</sup> /L]	45.8 [%]
LY-BF	1804	[10 <sup>6</sup> /L]	37.7 [%]
MO-BF	790	[10 <sup>6</sup> /L]	16.5 [%]
EO-BF	1	[10 <sup>6</sup> /L]	0.0 [%]



WBC IP Message

RBC IP Message

PLT IP Message





## Case 6:

CellVision - Remote Review Software - Peripheral Blood and Body Fluid

File New Tools Help

Slide: 4115886693 1

Worklist

Order ID
4115792001
4115797800
4115818719
4115828412
4115873810
4115878120
4115887398
4115747054
4115845120
4115857379
2728052014
4115888009
4115885725
4115887328
4115888354
4115713772
4115814305
4115888979
4115878620
4115877351
4115888009

Open Remove

Patient data

Order ID: 4115886693  
Last name:  
First name:  
DOB date:

WBC

	Count	%
• Unidentified	9	4.5
• Neutrophil	2	1.0
• Lymphocyte	23	11.5
• Eosinophil	2	1.0
• Macrophage	3	1.5
• Other	161	80.5
Total	268	100

Non-WBC

	Count	%
• Smudge cell	31	-
• Artifact	466	-

Not closed

BP comment

all morphol (B) same like reference, multiple nucleoli "all apparatus" and material, do not get cells as tall / 3x

Micrograph

Artifact

30 31 32

33 34 35

36 37 38

39 40 41

42 43 44

45 46 47

48 49 50

51 52 53

54 55 56

57 58 59

60 61 62

63 64 65

66 67 68

69 70 71

72

start CellVision - Remote ... Diskusnet 1 - Firefox

06/06/2005 10:00

## Case 6:

CellScribe - Hematic Review Software - Peripheral Blood and Body Fluid

Order: 4115086693 Slide: 1

Worklist

Order ID	Count	%
411579591	9	4.5
411579280		
411583795		
411582942	2	1.0
411587893		
411587930	23	11.5
411587230	2	1.0
411547894		
411584593	3	1.5
411584730	181	89.5
272892014		
411580829		
411585721		
411580728		
411586354		
411578773	31	15.5
411581476		
411589879		
411587830		
411587721		
411580899	456	-

WBC

- Underfilled
- Neutrophil
- Lymphocyte
- Eosinophil
- Macrophage
- Other
- Total

Non-WBC

- Smudge cell
- Artifact

Not closed

BF comment

DF nøjakk DF karikka affæs - málþó er cellene  
"all" apparatus" andi matstól, á nægri líf celler er til  
/JA

The software interface displays a grid of microscopic images of peripheral blood smears. The images show a high concentration of bacteria and smudge cells, consistent with the text description. The software also provides a detailed count and percentage breakdown for various white blood cell types and non-WBC elements.

Lots of  
bacteria  
and some  
smudge cells.

## Case 6:

- Patient from Dept. of Neurosurgery.
- Woman, 43. Postoperative complication in ventricular chamber. Previously congenital hydrocephalus. Now VP shunt.
- 1 month previously: Surgical removal of infected bone plate.
- Dept. of Microbiology found: A few neutrophils, numerous Gram-positive rods in clusters.
- *Problem: No alarm (abn. Scattergram). Sysmex is involved, and are at the moment looking into the problem in Japan.*

# Case 7:

## ASC: Nucleated cells: $1130 \times 10^6/L$

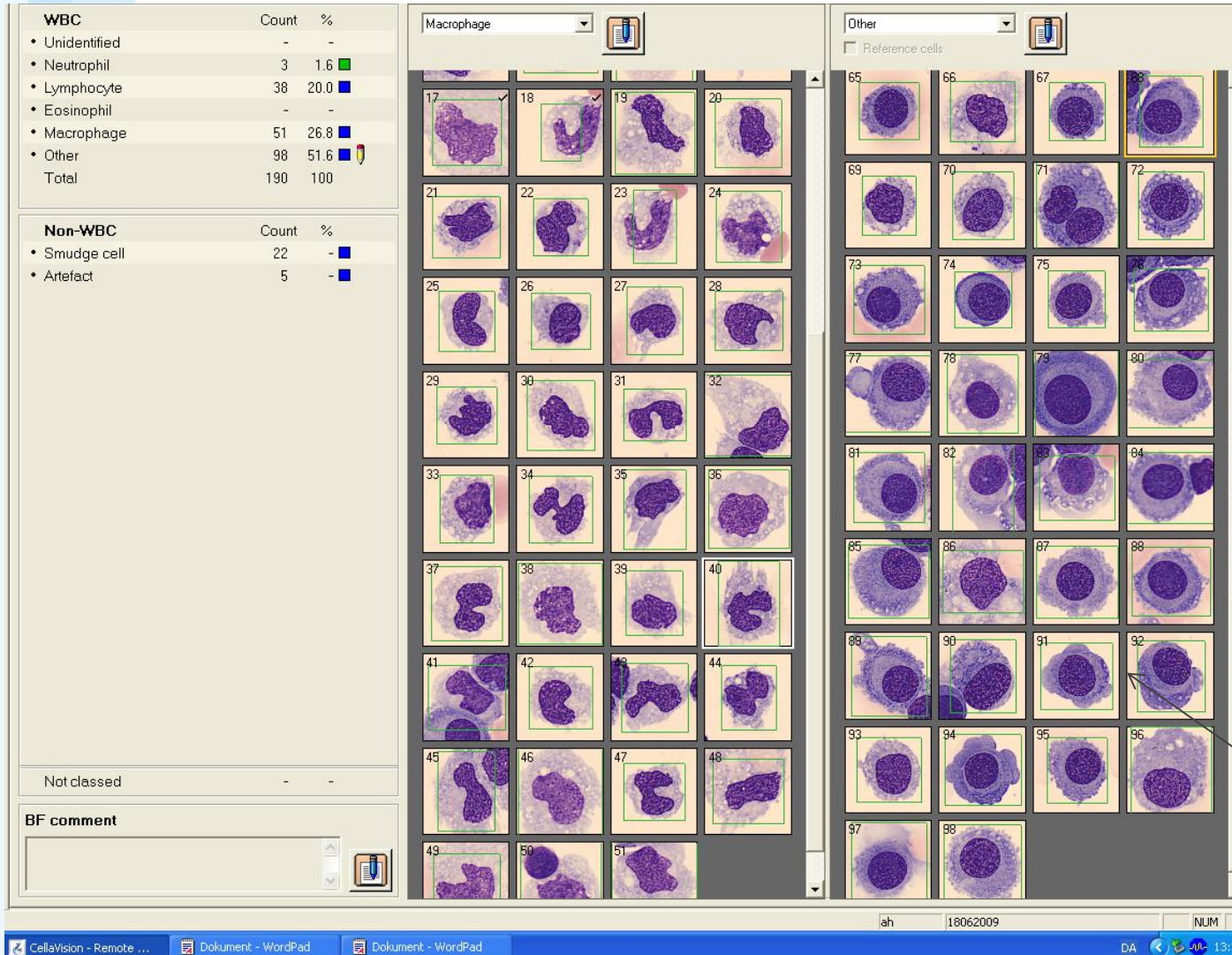
The screenshot displays a hematology software interface. On the left, a table shows the differential count and percentage of various cell types. The main area is divided into two panels: 'Neutrophil' and 'Lymphocyte'. The 'Neutrophil' panel shows three microscopic images of neutrophils. The 'Lymphocyte' panel shows a grid of 38 microscopic images of lymphocytes, numbered 5 through 38. The bottom status bar shows the patient ID 'ah 18062009' and the name 'NUM'.

	Count	%
Identified	-	-
Neutrophil	3	1.6
Lymphocyte	38	20.0
Monocyte	-	-
Eosinophil	51	26.8
Basophil	98	51.6
Total	190	100

WBC	Count	%
Platelet	22	-
Red blood cell	5	-

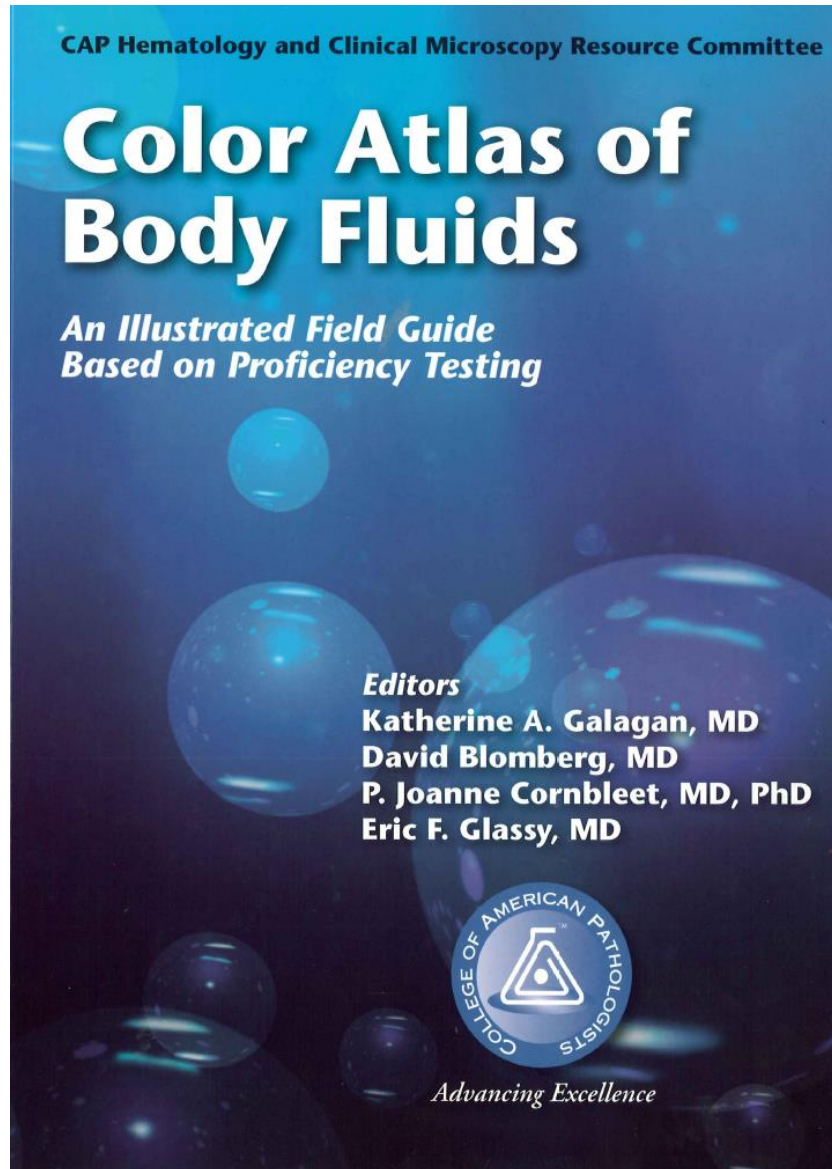
# Case 7: Patient with chronic Hepatitis C (alcoholic)



Dept. of  
Pathology:

Blood – and  
mesothelia  
cells.  
No  
malignancy.

Other =  
Dominated  
by  
Mesothelia  
cells



From CAP

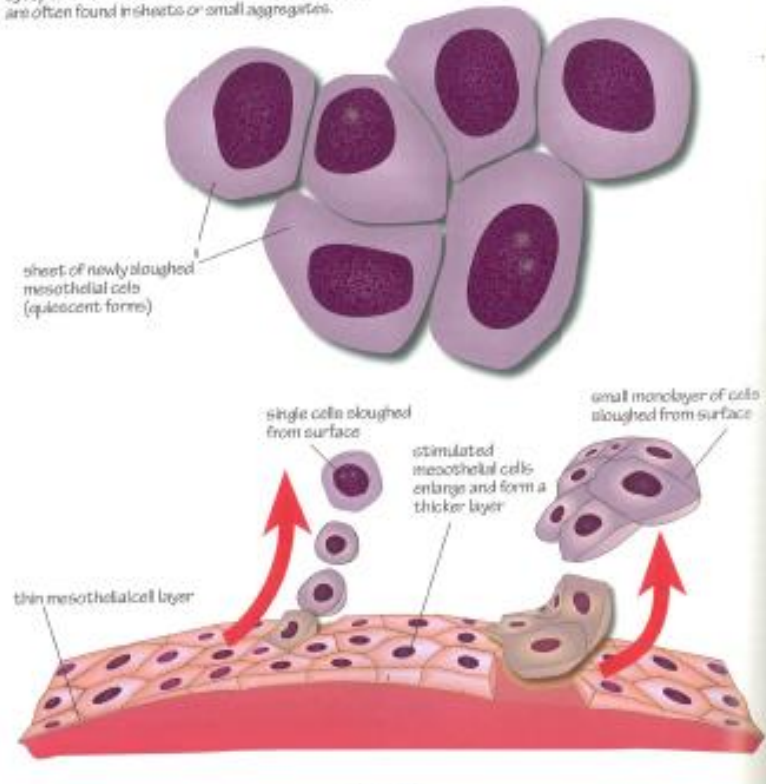
ISBN: 0930304918

**THANK YOU FOR  
YOUR ATTENTION.**

# Mesothelial cells:

## Formation

The serous membranes are surfaced by a single layer of flat resting mesothelial cells. In response to a variety of stimuli, the layer thickens, and single or small sheets of cells may be shed into the serous cavity. At this point, the mesothelial cells are called quiescent. They are small in size, ranging from 20 to 50  $\mu\text{m}$  in diameter. The nucleus is often eccentrically placed and is round to oval with condensed nuclear chromatin, a thick nuclear membrane, and inconspicuous nucleoli. The light blue or dark blue cytoplasm is abundant and lacks vacuoles. The cells are often found in sheets or small aggregates.



”The layer of flat cells of mesodermal origin that lines the embryonic body cavity and gives rise to the squamous cells of the peritoneum, pericardium, and pleura.”