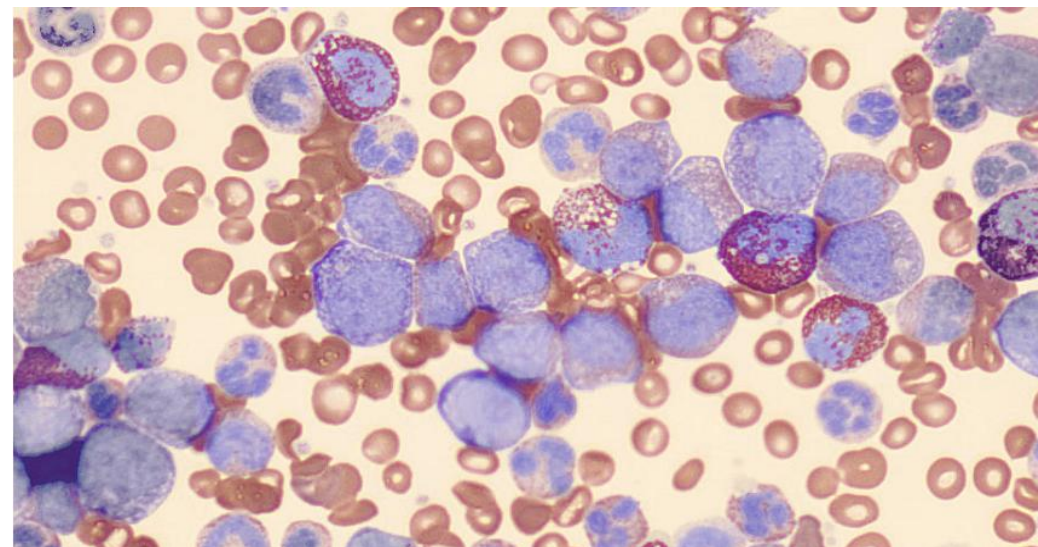
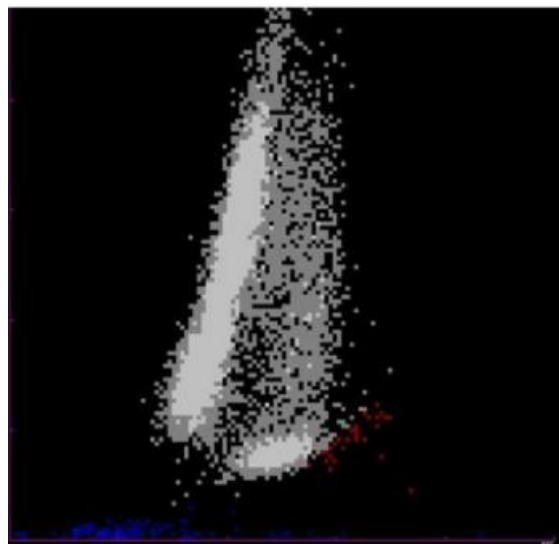


Kompletna krvna slika

– *prvi korak u dijagnostici akutnih leukemija*

Ivana Lapić

Klinički zavod za laboratorijsku dijagnostiku, KBC Zagreb



Top 25 Tests by Volume at Five Referral Hospitals

Rank	AKUH, Nairobi	CA, Bangalore	UCH, Ibadan	UMMC, Kuala Lumpur	Denver Health
1	CBC	CBC ^a	CBC	CBC	CBC
2	Urinalysis	Glucose	Electrolytes, urea, and creatinine	Renal function	Basic metabolic panel ^b
3	Urea, electrolytes	Creatinine	Glucose	Liver function	Glucose
4	Stool microscopy	TSH	Urinalysis	Blood glucose	Urinalysis
5	Glucose	Thyroid function	Blood group and crossmatch	Magnesium serum	<i>Chlamydia</i> detection
6	C-reactive protein	Renal function	Liver function	Lipid profile	HbA _{1c}
7	Malarial parasites	Urinalysis	Lipid profile	PT/INR	Phosphorus
8	Stool <i>Helicobacter pylori</i> antigen	Potassium	Blood film for malaria parasite	APTT	Magnesium
9	Liver function	Liver function	Urine microscopy	Urinalysis	PT/INR
10	Urine microscopy	Platelet count	AFB studies	HbA _{1c}	Comprehensive metabolic panel ^c
11	Surgicals ^d	Urine culture	PT/INR	Blood group	TSH
12	Crossmatch	Lipid profile	Other microscopy	Calcium, phosphorus	Liver function
13	Malaria antigen	PCV	Surgicals	Blood culture ^e	Lipid panel ^f
14	HbA _{1c}	HbA _{1c}	Hb electrophoresis	HBsAg	PTT
15	Lipid profile	Vitamin B ₁₂	Cytology	HIV combo	Troponin-I
16	HIV	Hemoglobin	Syphilis	HCV	Urine culture
17	Thyroid function	Sodium	Blood culture	C-reactive protein	Blood group
18	ESR	Vitamin D	ESR	CKMB	Lactate
19	TSH	Blood group	HIV	ESR	Antibody screen
20	Unit packed RBCs	Calcium	Blood group	Thyroid function	Drugs of abuse screen, urine
21	Pregnancy	Coagulation profile	HCV	Syphilis	Cytology
22	Cytology	CBC with ESR	Stool microscopy	Troponin	Syphilis
23	Calcium	Blood culture	HBsAg	Uric acid serum	Surgicals
24	Blood culture	Electrolytes	HbA _{1c}	Lactate	Blood culture
25	Syphilis	ALT	Phosphorus	Urine culture	Pregnancy





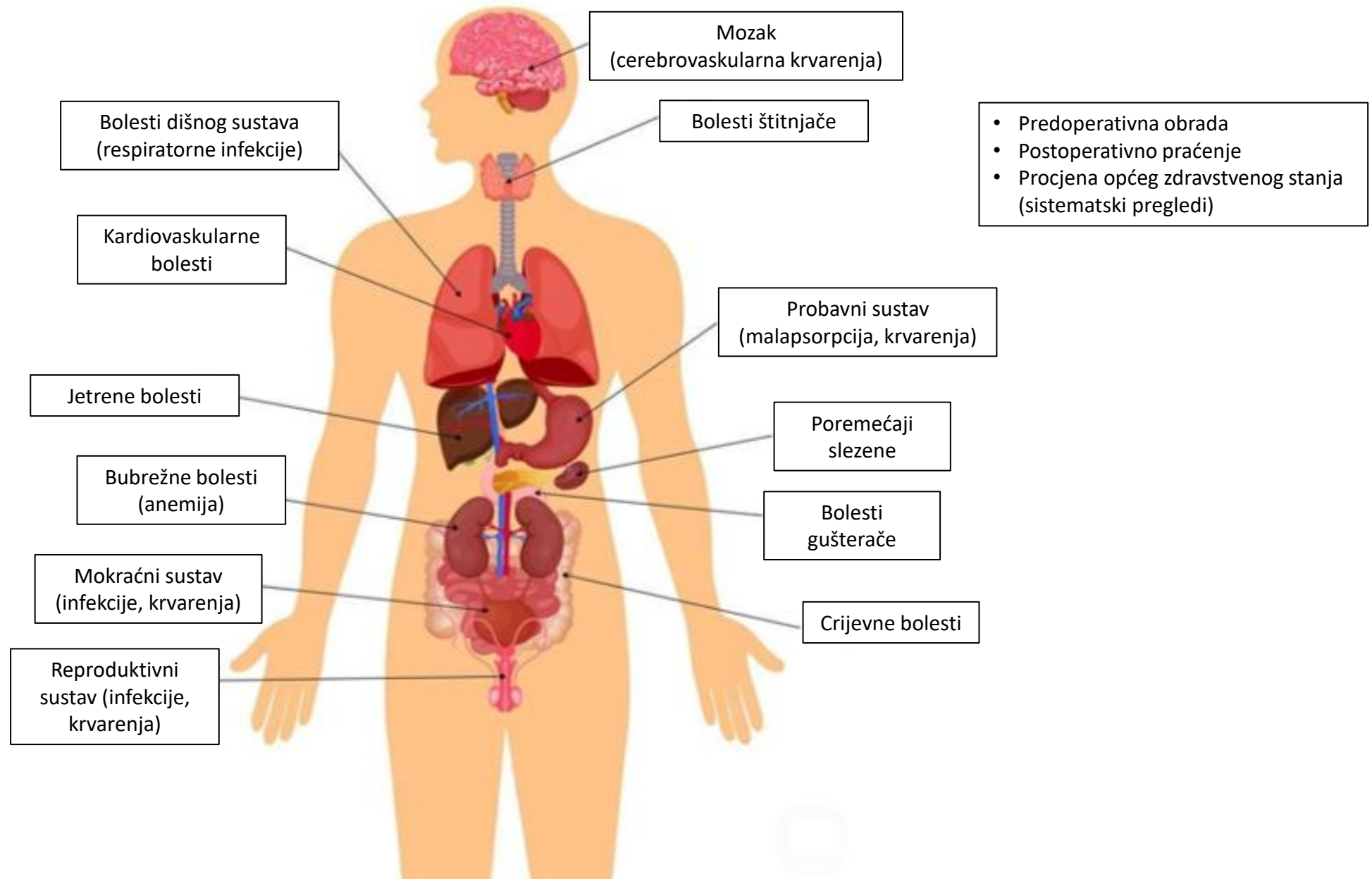
2. Which of the laboratory hematology parameters are performed in your laboratory? (multiple answers possible)

a) CBC	128/129 (99)
b) Morphology differentiation of the peripheral blood smear	110/129 (85)
c) Osmotic resistance of the red blood cells	16/129 (12)
d) ESR	126/129 (98)
e) Rtc count	111/129 (86)

Kompletna krvna slika

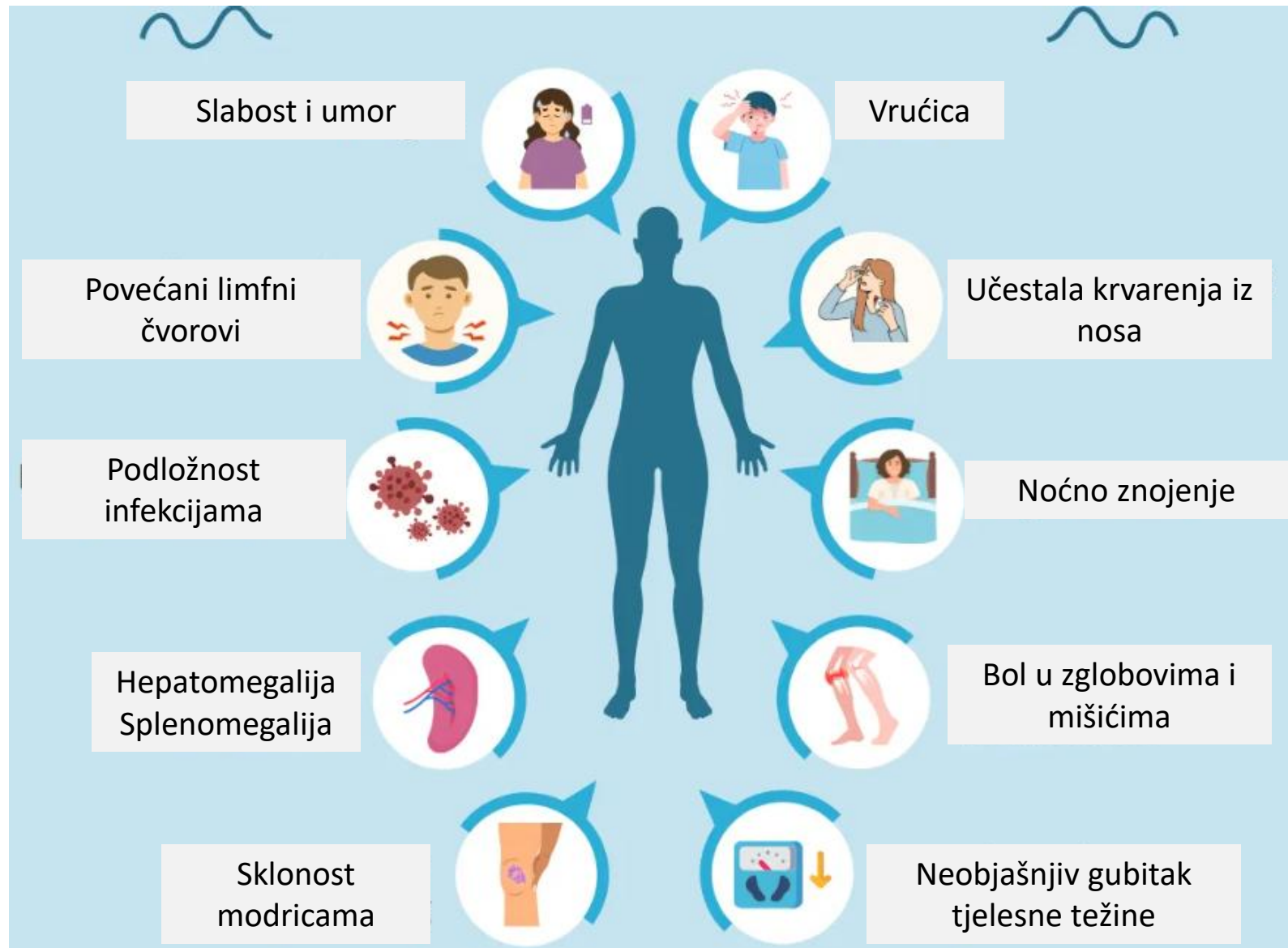
višeparametrijska pretraga

	Rezultat	Jedinica	Referentni interval
(K) Eritrociti	4.84	$\times 10^{12}/L$	3.86 - 5.08
(K) Hemoglobin	142	g/L	119 - 157
(K) Hematokrit	0.422	L/L	0.356 - 0.470
(K) MCV	87.2	fL	83.0 - 97.2
(K) MCH	29.3	pg	27.4 - 33.9
(K) MCHC	336	g/L	320 - 345
(K) RDW	12.0	%	9.0 - 15.0
(K) Retikulociti	16.2	/1000 Erc	5.0 - 21.6
(K) Retikulociti	78	$\times 10^9/L$	22 - 97
(K) Indeks zrelosti retikulocita	0.10		0.02 - 0.18
(K) Eritroblasti	0.0	$\times 10^9/L$	< 0.6
(K) Eritroblasti	0	/100 Lkc	< 3
	Rezultat	Jedinica	Referentni interval
(K) Leukociti	7.4	$\times 10^9/L$	3.4 - 9.7
(K) Eozinofilni granulociti	3.3	%	0 - 7
(K) Bazofilni granulociti	0.5	%	0 - 1
(K) Neutrofilni granulociti	57.6	%	44 - 72
(K) Limfociti	28.1	%	20 - 46
(K) Monociti	10.5	%	2 - 12
(K) Eozinofilni granulociti	0.24	$\times 10^9/L$	0.00 - 0.43
(K) Bazofilni granulociti	0.04	$\times 10^9/L$	0.00 - 0.06
(K) Neutrofilni granulociti (ANC)	4.26	$\times 10^9/L$	2.06 - 6.49
(K) Limfociti	2.08	$\times 10^9/L$	1.19 - 3.35
(K) Monociti	0.78	$\times 10^9/L$	0.12 - 0.84
	Rezultat	Jedinica	Referentni interval
(K) Trombociti	264	$\times 10^9/L$	158 - 424
(K) MPV	9.6	fL	9.0 - 13.0

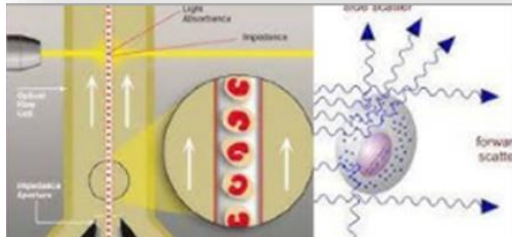


Najvažnija primjena kompletne krvne slike je u početnoj dijagnostici
*benignih i malignih **hematoloških bolesti***

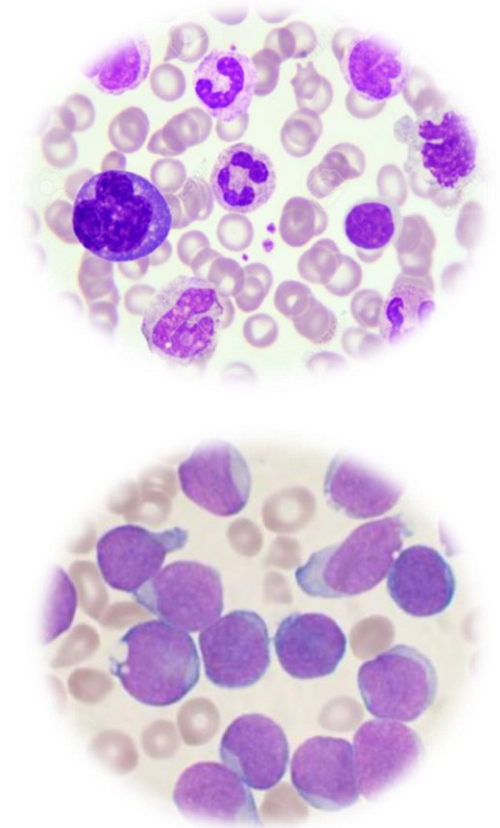
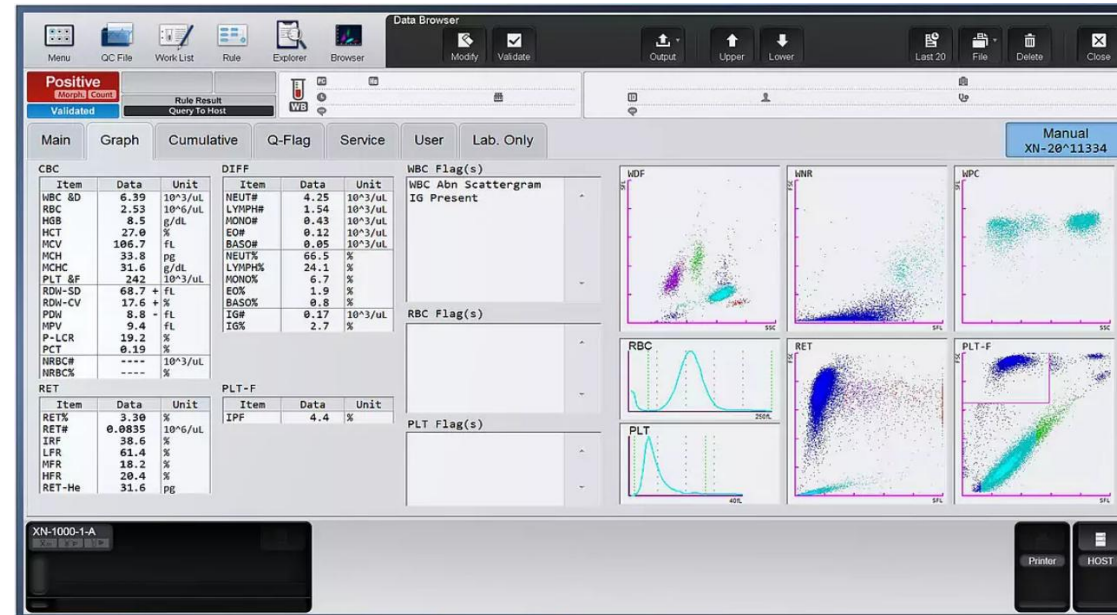
Simptomi akutne leukemije



Nalaz kompletne krvne slike



*Istovremena analiza s više
različitih mjernih tehnologija*



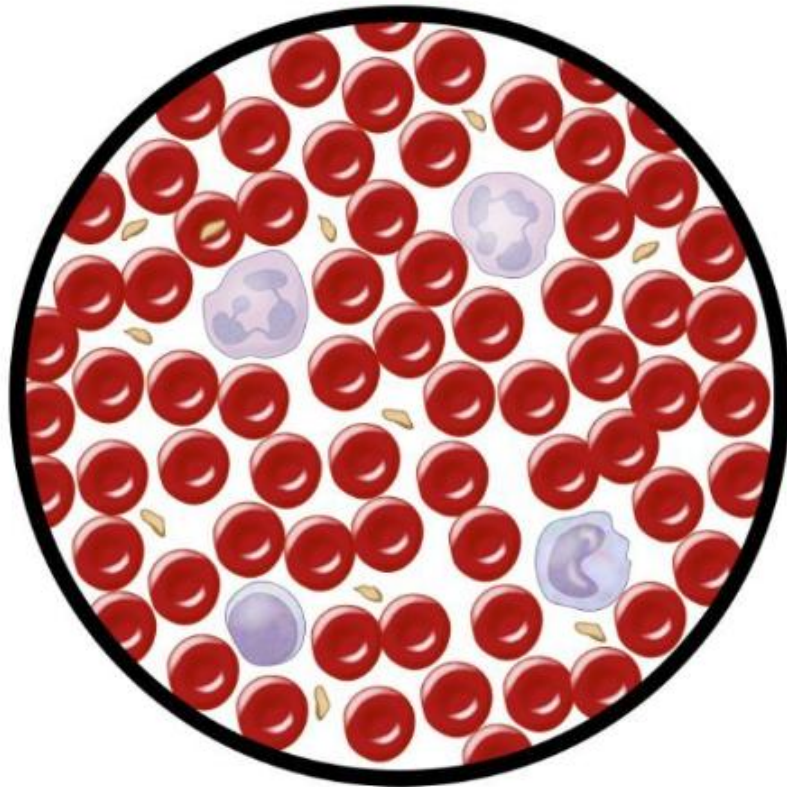
*Poznavanje
morfologije stanica*

*Procjena pouzdanosti dobivenih rezultata s obzirom na grafičke
prikaze (histogrami, citogrami) i poruke upozorenja*

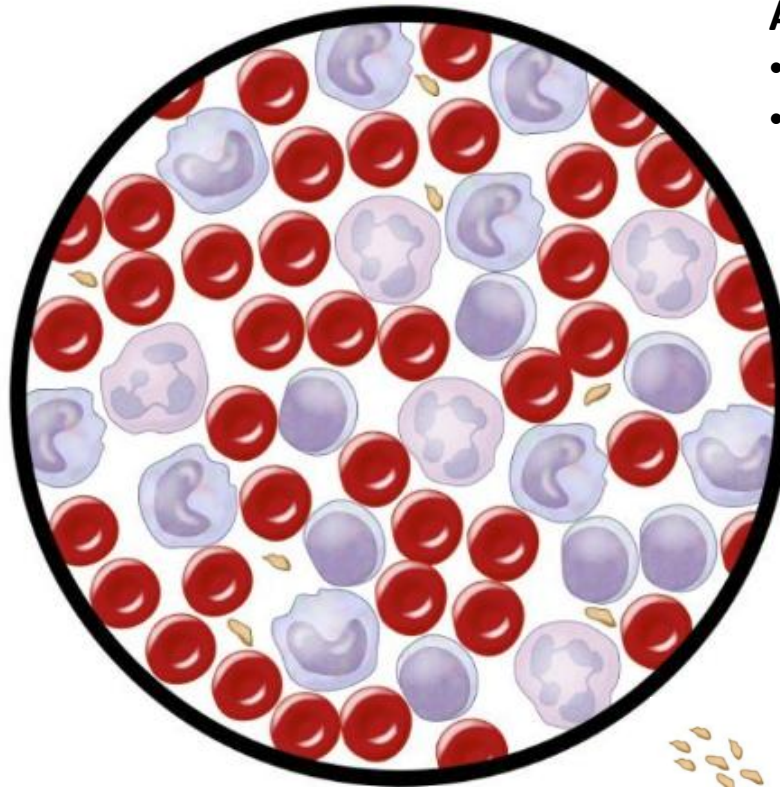
Procjena potrebe za mikroskopskim pregledom razmaza periferne krvi

Karakteristične promjene KKS kod akutnih leukemija

UREDNA KKS



AKUTNA LEUKEMIJA



ANEMIJA

- normocitna, normokromna
- morfološke promjene eritrocita



**LEUKOCITOZA, LEUKOPENIJA ILI
UREDAN BROJ LEUKOCITA**

TROMBOCITOPENIJA

- anizocitoza trombocita



PRISUTAN POVIŠEN BROJ CIRKULIRAJUĆIH BLASTA!!

Prvi nalazi pri dijagnozi – primjer 1

	Rezultat	Jedinica	Referentni interval	Opaska
(K) Eritrociti	3.36	$\times 10^{12}/L$	4.34 - 5.72	
(K) Hemoglobin	97	g/L	138 - 175	
(K) Hematokrit	0.300	L/L	0.415 - 0.530	
(K) MCV	89.3	fL	83.0 - 97.2	
(K) MCH	28.9	pg	27.4 - 33.9	
(K) MCHC	323	g/L	320 - 345	
(K) RDW	17.3	%	9.0 - 15.0	
(K) Eritroblasti	0.1	$\times 10^9/L$	0.0	
(K) Eritroblasti	< 0.4	/100 Lkc	0	
	Rezultat	Jedinica	Referentni interval	Opaska
(K) Leukociti	489.4 !	$\times 10^9/L$	3.4 - 9.7	
	Rezultat	Jedinica	Referentni interval	Opaska
(K) Trombociti	37	$\times 10^9/L$	158 - 424	Trc mikroskopski provjereni
(K) MPV	9.1	fL	9.0 - 13.0	
Napomena	U razmazu periferne krvi prevladavaju mladi oblici stanica do stadija blasta. Potrebna hematološka i citološka obrada.			

	Rezultat	Jedinica	Referentni interval
(P) PV	0.62		> 0.70
(P) PV-INR	1.23		
(P) APTV	25.9	s	20.0 - 30.0
(P) D-Dimeri	>35.20	mg/L FEU	< 0.50

- Hiperkoagulabilno stanje
- Razvoj diseminirane intravaskularne koagulopatije

- Normocitna, normokromna anemija
- Trombocitopenija
- Leukocitoza
 - Hiperviskozni sindrom ili sindrom leukostaze
 - Sindrom lize tumora

	Rezultat	Jedinica	Referentni interval
(P) Glukoza	7.0	mmol/L	4.4 - 6.4
(P) Bilirubin - ukupni	16	$\mu\text{mol}/L$	3 - 20
(P) Ureja	3.6	mmol/L	2.8 - 8.3
(P) Kreatinin	113	$\mu\text{mol}/L$	60 - 104
(P) Alkalna fosfataza	101	U/L	60 - 142
(P) Alanin-aminotransferaza	21	U/L	12 - 48
(P) Gama-glutamil-transferaza	72	U/L	11 - 55
(P) Laktat dehidrogenaza	1184	U/L	< 241
(P) Kalij	3.2	mmol/L	plazma: 3.5 - 4.7
(P) Natrij	143	mmol/L	137 - 146
(P) C reaktivni protein	85.1	mg/L	< 5
Procjena GF prema CKD-EPI formuli	61	mL/min/1.73 m ²	preporučene vrijednosti > 60

- Povišena aktivnost LDH
- Povišeni urati
- Povišen CRP

Prvi nalazi pri dijagnozi – primjer 2

	Rezultat	Jedinica	Referentni interval	Opaska
⌘(K) Eritrociti	2.31	$\times 10^{12}/L$	4.34 - 5.72	
⌘(K) Hemoglobin	86	g/L	138 - 175	
⌘(K) Hematokrit	0.251	L/L	0.415 - 0.530	
⌘(K) MCV	108.7	fL	83.0 - 97.2	
⌘(K) MCH	37.2	pg	27.4 - 33.9	
⌘(K) MCHC	343	g/L	320 - 345	
⌘(K) RDW	15.8	%	9.0 - 15.0	
⌘(K) Eritroblasti	0.0	$\times 10^9/L$	0.0	
⌘(K) Eritroblasti	< 0.4	/100 Lkc	0	
	Rezultat	Jedinica	Referentni interval	Opaska
⌘(K) Leukociti	3.2	$\times 10^9/L$	3.4 - 9.7	
	Rezultat	Jedinica	Referentni interval	Opaska
⌘(K) Trombociti	66	$\times 10^9/L$	158 - 424	Trombociti mikroskopski provjereni
⌘(K) MPV	10.5	fL	9.0 - 13.0	
Napomena U razmazu periferne krvi prisutni blasti. Potrebna hematološka i citološka obrada.				

	Rezultat	Jedinica	Referentni interval
⌘(P) PV	0.88		> 0.70
⌘(P) PV-INR	1.06		
⌘(P) APTV	21.7	s	20.0 - 30.0

- Uredni koagulacijski nalazi

- Makrocitna anemija
- Trombocitopenija
- Leukopenija

	Rezultat	Jedinica	Referentni interval
⌘(P) Glukoza	10.5	mmol/L	4.4 - 6.4
⌘(P) Bilirubin - ukupni	10	$\mu\text{mol}/L$	3 - 20
⌘(P) Bilirubin - konjugirani	4	$\mu\text{mol}/L$	< 5
⌘(P) Ureja	5.9	mmol/L	2.8 - 8.3
⌘(P) Kreatinin	54	$\mu\text{mol}/L$	60 - 104
⌘(P) Alkalna fosfataza	64	U/L	60 - 142
⌘(P) Alanin-aminotransferaza	27	U/L	12 - 48
⌘(P) Gama-glutamil-transferaza	27	U/L	11 - 55
⌘(P) Laktat dehidrogenaza	186	U/L	< 241
⌘(P) Kalij	4.5	mmol/L	plazma: 3.5 - 4.7
⌘(P) Natrij	139	mmol/L	137 - 146
⌘(P) C reaktivni protein	< 1.0	mg/L	< 5
Procjena GF prema CKD-EPI formuli	111	mL/min/1,73 m ²	preporučene vrijednosti > 60

- Uredan LDH
- Uredan CRP

Table 1. AML and related neoplasms and acute leukemias of ambiguous lineage

AML and related neoplasms	
AML with recurrent genetic abnormalities (requiring ≥10% blasts in BM or PB)* • APL with t(15;17)(q24.1;q21.2)/PML::RARA† • AML with t(8;21)(q22;q22.1)/RUNX1::RUNX1T1 • AML with inv(16)(p13.1;q22) or t(16;16)(p13.1;q22)/CBFB::MYH11 • AML with t(9;11)(p21.3;q23.3)/MLLT3::KMT2A‡ • AML with t(6;9)(p22.3;q34.1)/DEK::NUP214 • AML with inv(3)(q21.3;q26.2) or t(3;3)(q21.3;q26.2)/GATA2, MECOM(EVI1)§ • AML with other rare recurring translocations • AML with mutated NPM1 • AML with in-frame bZIP mutated CEBPA¶ • AML with t(9;22)(q34.1;q11.2)/BCR::ABL1*	Myeloid sarcoma Acute leukemia of ambiguous lineage • Acute undifferentiated leukemia • MPAL with t(9;22)(q34.1;q11.2)/BCR::ABL1 • MPAL with t(v;11q23.3)/KMT2A-rearranged • MPAL, B/myeloid, not otherwise specified • MPAL, T/myeloid, not otherwise specified
Categories designated AML (if ≥20% blasts in BM or PB) or MDS/AML (if 10-19% blasts in BM or PB) • AML with mutated TP53# • AML with myelodysplasia-related gene mutations Defined by mutations in ASXL1, BCOR, EZH2, RUNX1, SF3B1, SRSF2, STAG2, U2AF1, and/or ZRSR2 • AML with myelodysplasia-related cytogenetic abnormalities** • AML not otherwise specified	Myeloid proliferations related to Down syndrome • Transient abnormal myelopoiesis associated with Down syndrome • Myeloid leukemia associated with Down syndrome Blastic plasmacytoid dendritic cell neoplasm
Diagnostic qualifiers†† Therapy-related‡‡ • Prior chemotherapy, radiotherapy, immune interventions Progressed from MDS • MDS should be confirmed by standard diagnostics and >3 mo prior to AML diagnosis Progressed from MDS/MPN (specify type) • MDS/MPN should be confirmed by standard diagnostics and >3 mo prior to AML diagnosis Germline predisposition (specify type)	

Döhner H, et al. Diagnosis and management of AML in adults: 2022 recommendations from an international expert panel on behalf of the ELN. Blood. 2022;140:1345-1377.



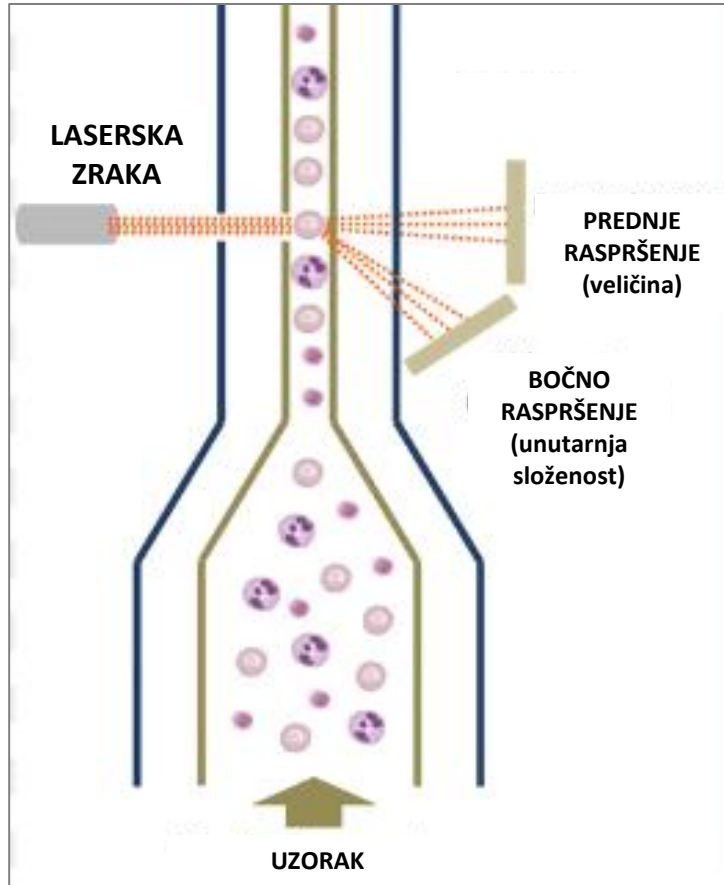
Postojanje blasta u perifernoj krvi mora trenutno poslužiti kao **alarm** te bez iznimke zahtijeva pažnju i daljnu detaljnu hematološku obradu bolesnika!

Table 25. Classification of AML with percentage of blasts required for diagnosis

Acute promyelocytic leukemia (APL) with t(15;17)(q24.1;q21.2)/PML::RARA ≥ 10%
APL with other RARA rearrangements* ≥ 10%
AML with t(8;21)(q22;q22.1)/RUNX1::RUNX1T1 ≥ 10%
AML with inv(16)(p13.1;q22) or t(16;16)(p13.1;q22)/CBFB::MYH11 ≥ 10%
AML with t(9;11)(p21.3;q23.3)/MLLT3::KMT2A ≥ 10%
AML with other KMT2A rearrangements† ≥ 10%
AML with t(6;9)(p22.3;q34.1)/DEK::NUP214 ≥ 10%
AML with inv(3)(q21.3;q26.2) or t(3;3)(q21.3;q26.2)/GATA2; MECOM(EVI1) ≥ 10%
AML with other MECOM rearrangements‡ ≥ 10%
AML with other rare recurring translocations (see supplemental Table 5) ≥ 10%
AML with t(9;22)(q34.1;q11.2)/BCR::ABL1§ ≥ 20%
AML with mutated NPM1 ≥ 10%
AML with in-frame bZIP CEBPA mutations ≥ 10%
AML and MDS/AML with mutated TP53† 10-19% (MDS/AML) and ≥ 20% (AML)
AML and MDS/AML with myelodysplasia-related gene mutations 10-19% (MDS/AML) and ≥ 20% (AML) Defined by mutations in ASXL1, BCOR, EZH2, RUNX1, SF3B1, SRSF2, STAG2, U2AF1, or ZRSR2
AML with myelodysplasia-related cytogenetic abnormalities 10-19% (MDS/AML) and ≥ 20% (AML) Defined by detecting a complex karyotype (≥ 3 unrelated clonal chromosomal abnormalities in the absence of other class-defining recurring genetic abnormalities), del(5q)/t(5q)/add(5q), -7/del(7q), +8, del(12p)/t(12p)/add(12p), i(17q), -17/add(17p) or del(17p), del(20q), and/or idic(X)(q13) clonal abnormalities
AML not otherwise specified (NOS) 10-19% (MDS/AML) and ≥ 20% (AML)
Myeloid sarcoma

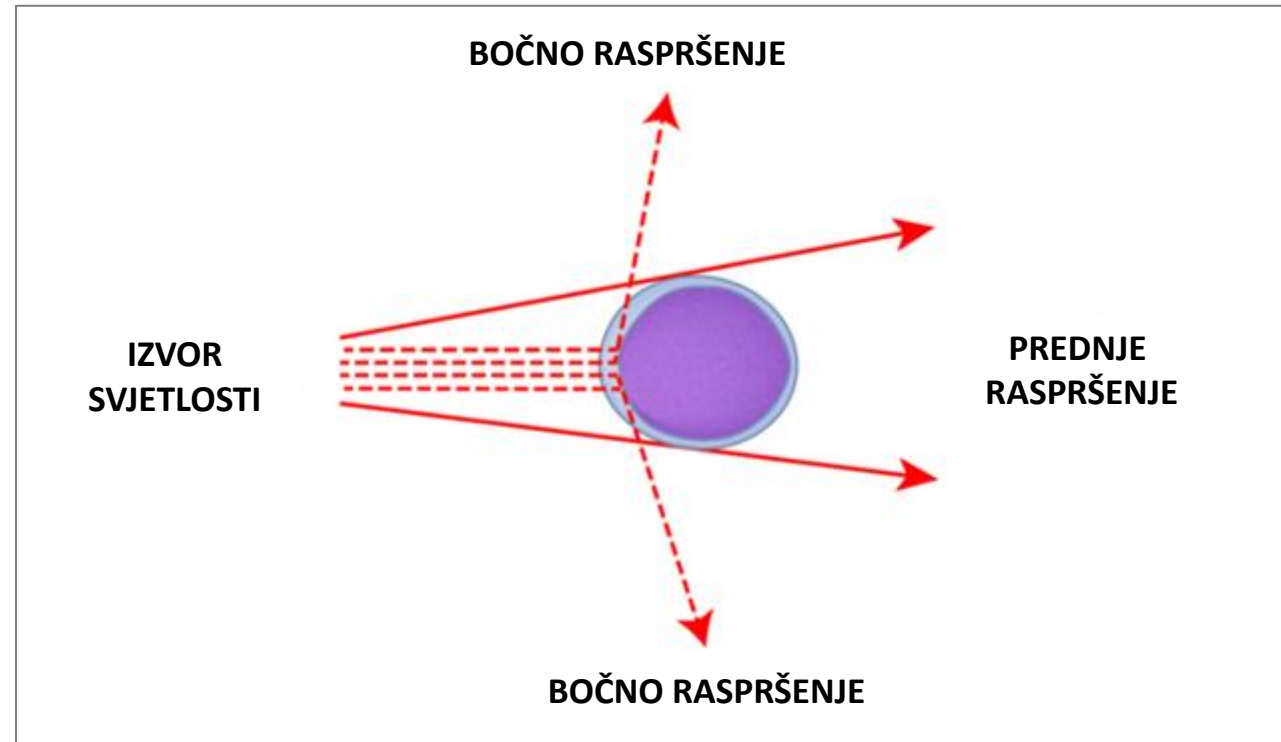
Arber DA, et al. International Consensus Classification of Myeloid Neoplasms and Acute Leukemias: integrating morphologic, clinical, and genomic data. Blood. 2022;140:1200-28.

DKS s hematološkog analizatora



HIDRODINAMIČKO FOKUSIRANJE

OPTIČKO RASPRŠENJE



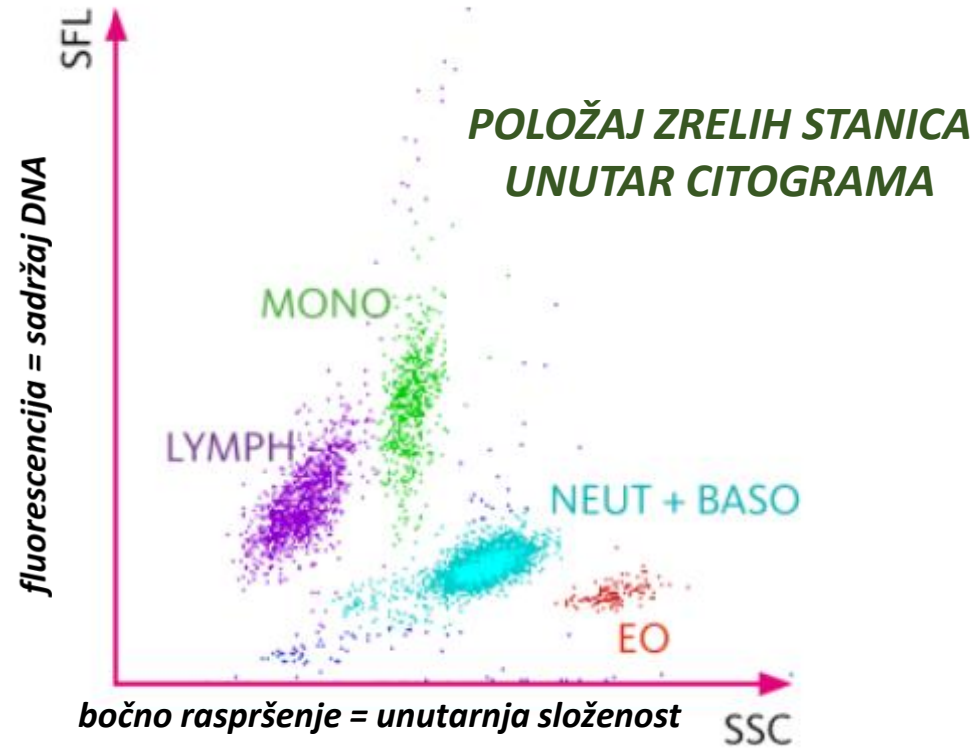
+

FLUORESCENCIJA

AKTIVNOST MPO

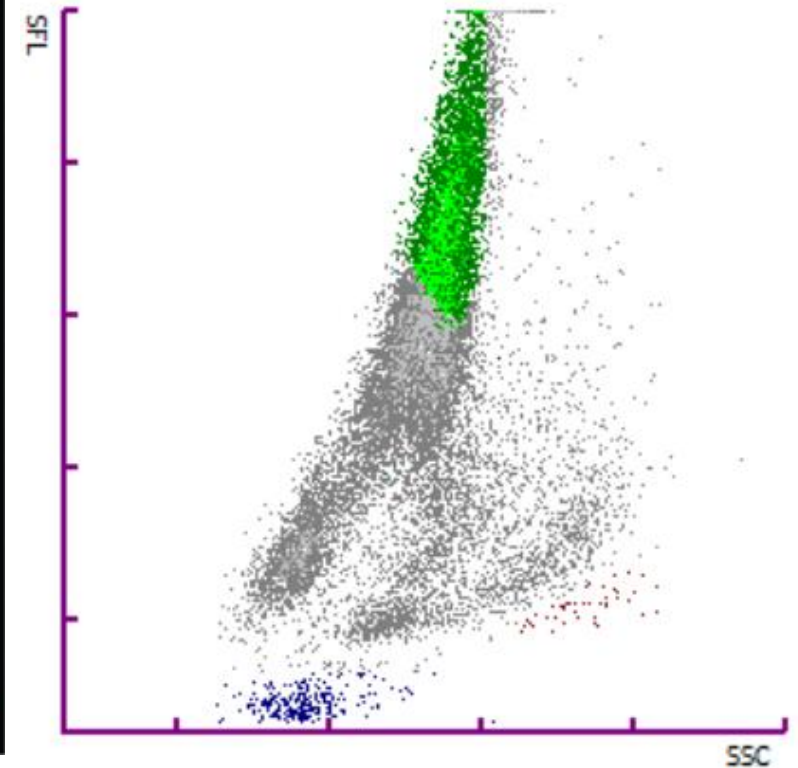
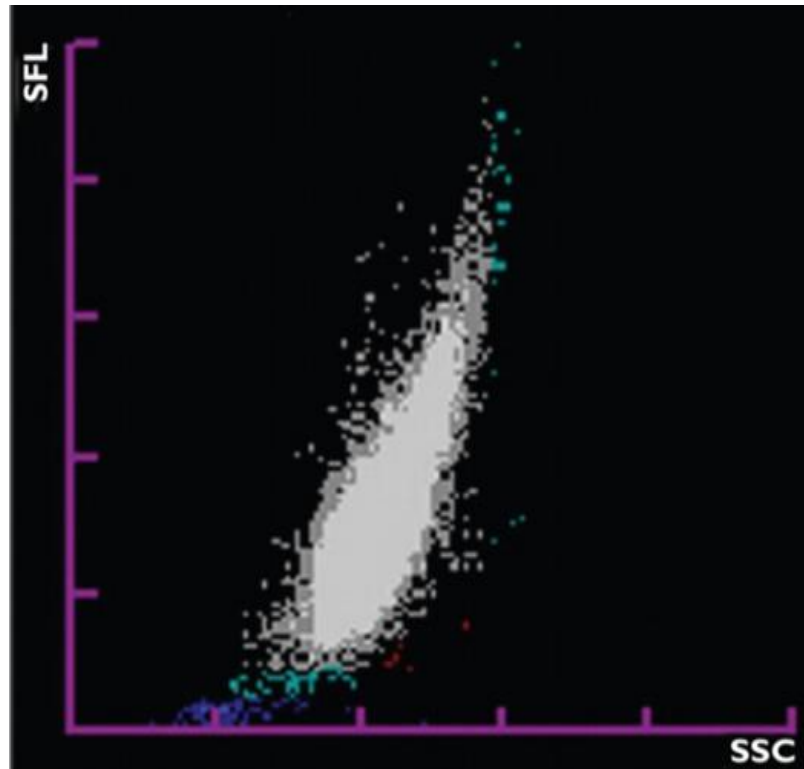
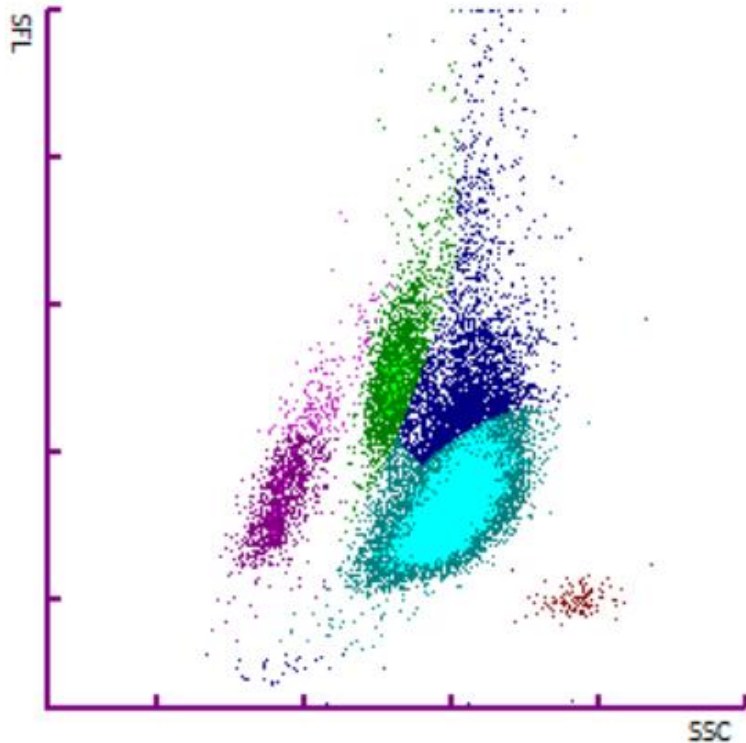
RASAP SVJETLOSTI U VIŠE SMJEROVA

DKS s hematološkog analizatora



Promijenjen izgled citograma

- Preklapanje populacija stanica
- Promjena položaja leukocita unutar citograma
- Pojava specifične populacije leukocita koja ne odgovara uobičajenim obrascima
- Promijenjen intenzitet signala



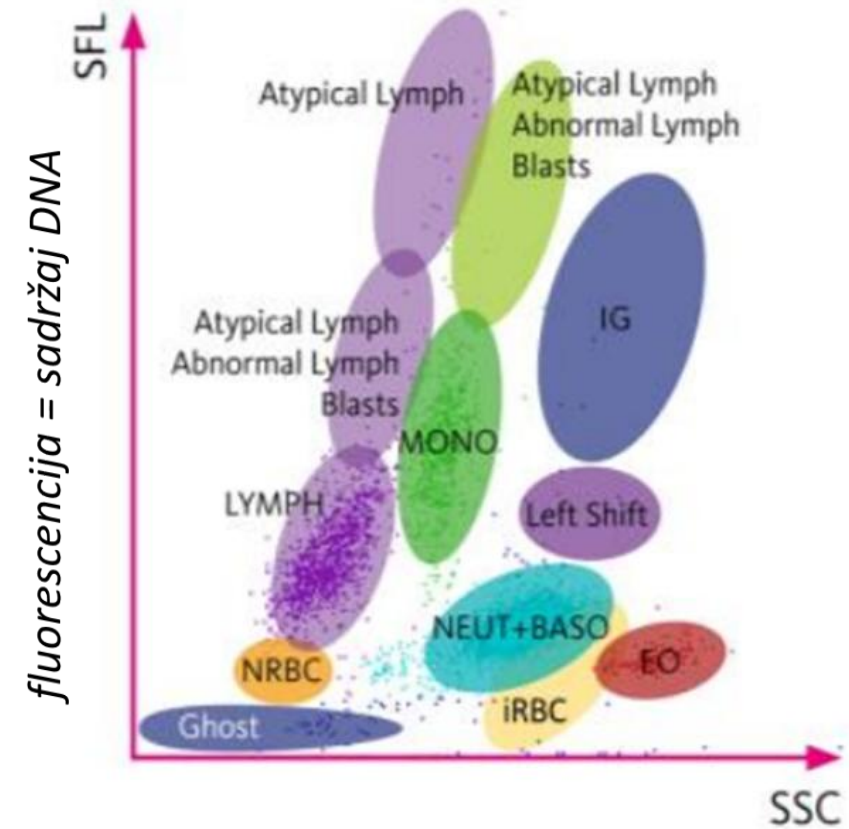
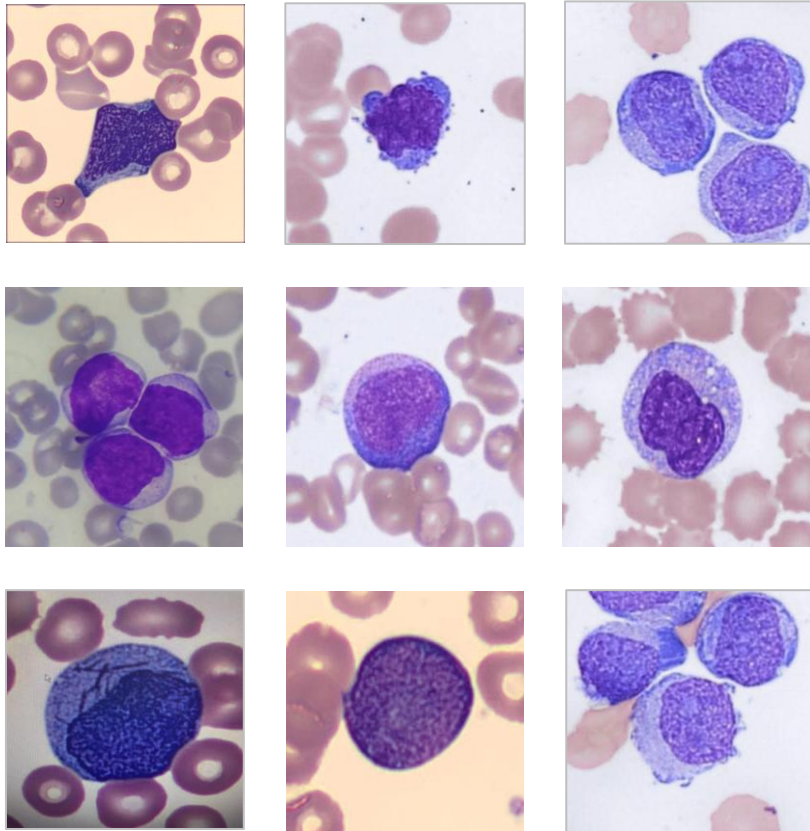
Poruke upozorenja za leukocite

Četiri skupine:

- sumnja na prisutnost **nezrelih granulocita** (engl. *immature granulocytes*)
- **skretanje u lijevo** (engl. *left shift*)
- sumnja na prisutnost **atipičnih ili promijenjenih limfocita** (engl. *atypical/variant lymphocytes*)
- sumnja na prisutnost **blasta**

Proizvođač	Poruke upozorenja za leukocite	
Sysmex	Blasts? IG Present WBC Abn Scattergram	Left Shift Abn Lympho? Atypical Lympho?
Beckman Coulter	Left Shift Imm Grans Variant Lymphs	Overlaps (LY/MO, MO/NE, NE/LY, NE/EO) Large cells
Abbott	Left Shift BLASTS Variant LYMPH	IG count
Siemens	Atypical Lymphocytes Immature Granulocytes Blasts	Left Shift Reactive Lymph – IM?
Mindray	Blasts Abn Lymph/blasts Abn Promyelocyte/blast?	

Varijabilna morfologija blasta



bočno raspršenje = unutarnja složenost

Oana Roxana Oprea, Elena-Cristina Preda*, Bogdana Dorcioman, Hannelore Doris Bucur and Minodora Dobreanu

Hematology instruments don't speak the same language: a comparison study between flagging messages of sysmex XN-1000 and alinity H

Table 1: WBC-related flagging performance of Sysmex XN-1000 and Alinity hq in comparison with peripheral blood smear findings.

	Sysmex XN-1000/PBS				Alinity hq/PBS			
	Left shift	IG present	Blast/Abn lympho	Atypical lympho	Left shift	IG count	Blast	VAR LYM
TP	11	54	9	14	31	53	7	20
TN	162	113	100	138	142	128	155	114
FP	0	16	87	23	9	3	32	44
FN	23	13	0	21	14	12	2	18
Se, %	32.35 (17.39–50.53)	80.60 (69.11–89.24)	100 (66.37–100)	40 (23.87–57.89)	68.89 (53.35–81.83)	81.54 (69.97–90.80)	77.78 (39.99–97.19)	52.63 (35.82–69.02)
Sp, %	100 (96.63–100)	87.60 (80.64–92.74)	53.48 (46.05–60.79)	85.71 (79.34–90.72)	94.04 (88.99–97.24)	97.71 (93.45–99.53)	82.9 (76.71–87.99)	72.15 (64.47–78.98)
PPV, %	100 (61.52–100)	19.48 (7.94–38.32)	9.38 (4.38–17.05)	37.84 (22.46–55.24)	77.5 (61.55–89.16)	94.64 (85.13–98.88)	17.95 (7.54–33.53)	31.25 (20.24–44.06)
NPV, %	87.57 (81.93–91.95)	99.18 (96.34–99.95)	100 (96.38–100)	86.79 (80.52–91.63)	91.03 (85.4–95.01)	91.43 (85.51–95.49)	98.73 (95.47–99.85)	86.36 (79.31–91.71)
p-Value	<0.01 ^a	<0.01	<0.01 ^a	<0.01	<0.01	<0.01 ^a	<0.01 ^a	<0.01
Accuracy, %	88.27 (82.91–92.41)	85.20 (79.45–89.86)	55.61 (48.36–62.69)	77.55 (71.06–83.19)	88.27 (82.91–92.41)	92.35 (87.69–95.65)	82.65 (76.61–87.68)	68.37 (61.36–74.81)

PBS, peripheral blood smear; TP, true positive; TN, true negative; FP, false positive; FN, false negative; PPV, positive predictive value; NPV, negative predictive value; Se, sensitivity; Sp, specificity; IG, immature granulocytes; Abn Lympho, abnormal lymphocytes; Atypical Lympho, atypical lymphocytes; VAR LYM, variant lymphocytes. ^aValue computed with Fisher's exact test.

KVALITATIVNI KRITERIJI

SUSPECT FLAGS												
24	Suspect flag (except ImmG/Band)	Flag +	and	first time	and	adult			Slide Review			
25	Suspect flag	Flag +	and	first time	and	child			Slide Review			
26	WBC unreliability Flag	Flag +	any						Check sample integrity and rerun sample	If persists, review instrument output	Slide review with manual diff if indicated	
27	RBC fragment	Flag +	any						Slide Review			
28	Dimorphic RBC	Flag +	and	first time					Slide Review			
29	Lyse resistant RBC	Flag +	any						Review WBC histogram/cytogram	Validate by lab SOP (consider incorrect retic count)	eg. Review smear for abnormal RBC morphology	
30	PLT clump flag	any count							Check sample for clots	Slide review (PLT estimate)	If clumps persist, follow lab SOP	
31	Platelet Flags	PLT & MPV flags except plt clumps							Slide Review			
32	Immature granulocyte flag	Flag +	and	first time					Slide Review			
33	Immature granulocyte flag	Flag +	and	previous confirmed result	and	positive delta fail for WBC			Slide Review			
34	Left shift flag	Flag +							Follow lab SOP			
35	Atypical/Variant lymphs	Flag +	and	first time					Slide Review			
36	Atypical/Variant lymphs	Flag +	and	previous confirmed result	and	positive delta fail for WBC			Slide Review			
37	Blast flag	Flag +	and	first time					Slide Review			
38	Blast flag	Flag +	and	previous confirmed result	and	delta pass or negative delta for WBC	and	within 3-7 days	Follow lab SOP			
39	Blast flag	Flag +	and	previous confirmed result	and	positive delta fail for WBC			Slide Review			
40	NRBC flag	Flag +							Slide Review	If positive, enumerate NRBC count, correct WBC if appropriate		



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KVANTITATIVNI KRITERIJI

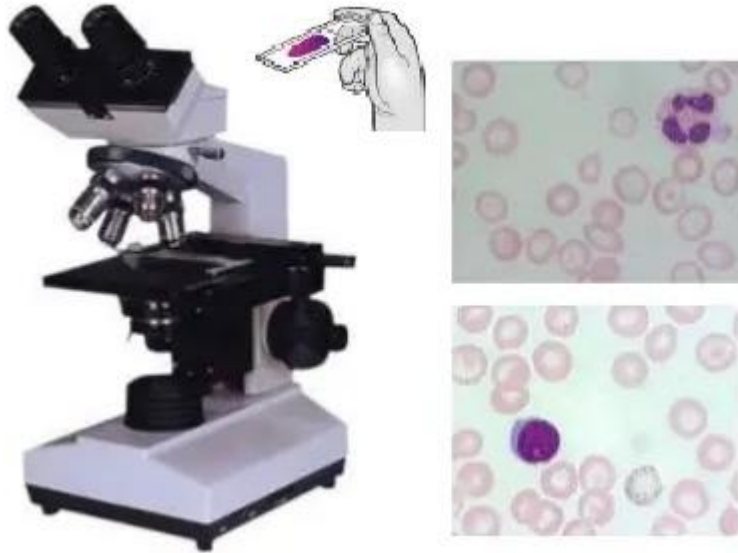
DIFFERENTIAL												
16	No diff or incomplete diff											Manual Diff and Slide Review
17	Neut #	<1.0 or >20.0	and	first time								Slide Review
18	Lymph #	<5.0 (adult) or >7.0 (<12 yrs old)	and	first time								Slide Review
19	Mon #	<1.5 (adult) or >3.0 (<12 yrs old)	and	first time								Slide Review
20	Eos #	>2.0	and	first time								Slide Review
21	Baso #	>0.5	and	first time								Slide Review

5	WBC	<4.0 OR >30.0	and	first time								Slide Review
6	WBC	<4.0 OR >30.0	and	delta failed	and	within 3 days						Slide Review



Mikroskopski pregled razmaza periferne krvi

Svjetlosna mikroskopija



- referentna metoda kojom je potrebno diferencirati 200 leukocita u razmazu periferne krvi
- u praksi se uglavnom provodi diferenciranje na 100 leukocita

Digitalna mikroskopija



TABLE 2 Situations in which CellaVision has limitations and for which a manual microscopic review should be considered

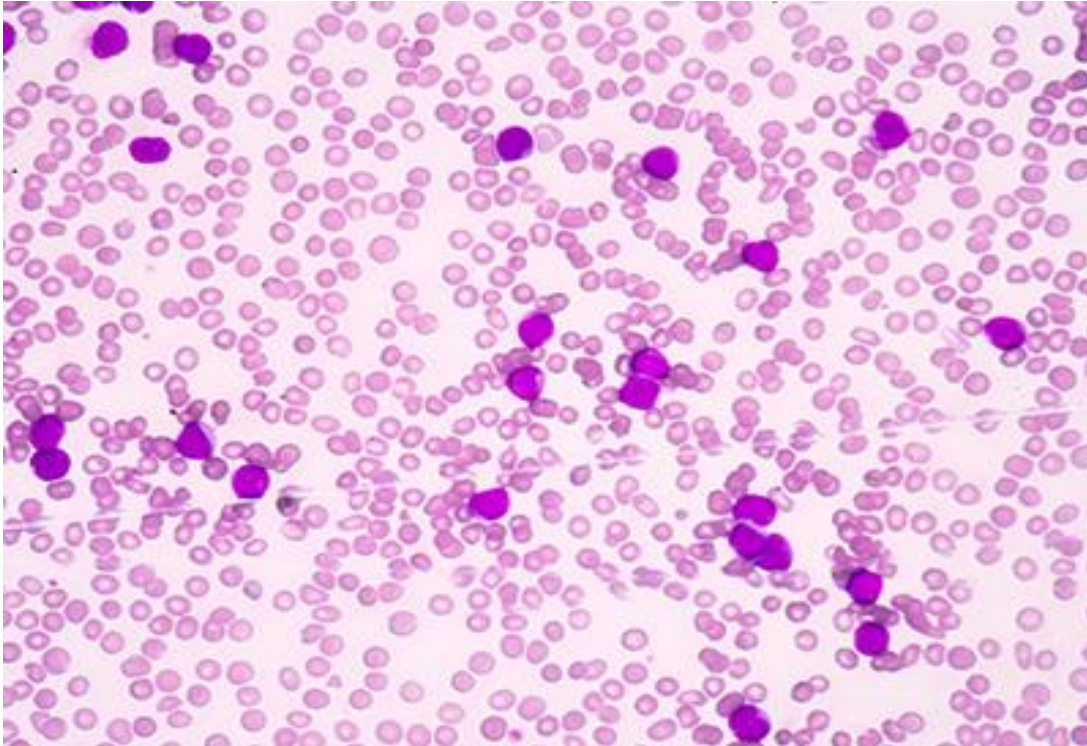
All samples from newborns and from patients with leukemia.

Suspicion of the presence of pathological cell types, including blasts, plasma cells, and immature granulocytes.

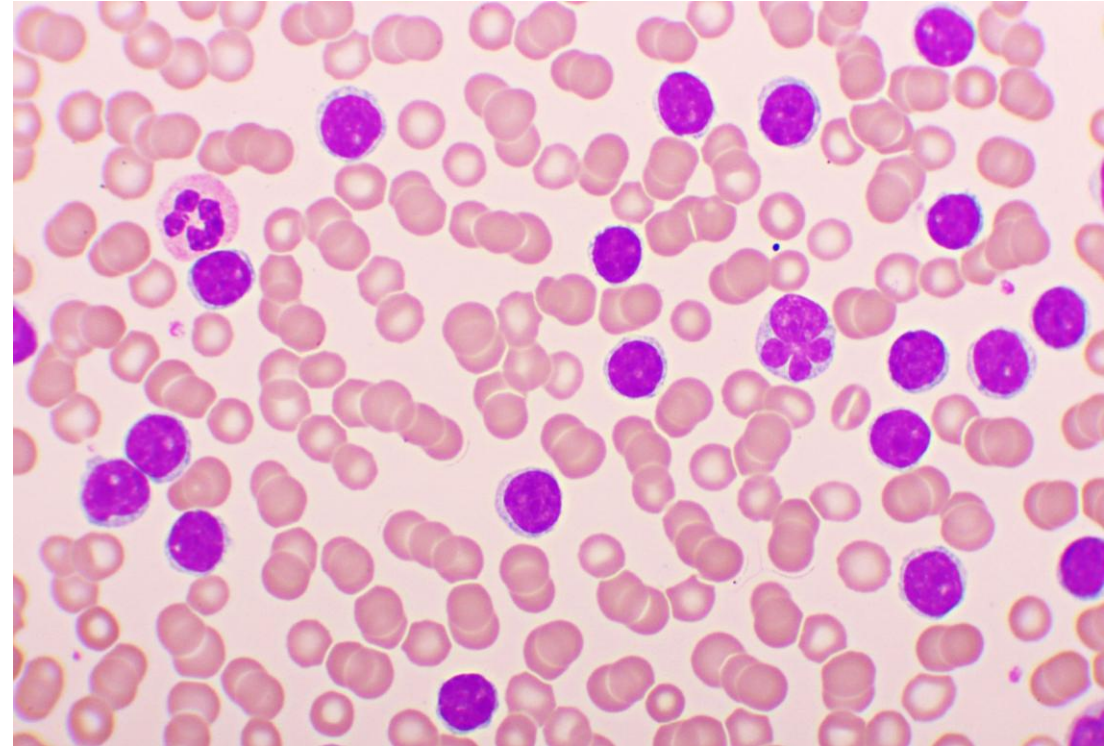
Suspected dysplastic cells.

***pri dijagnozi**

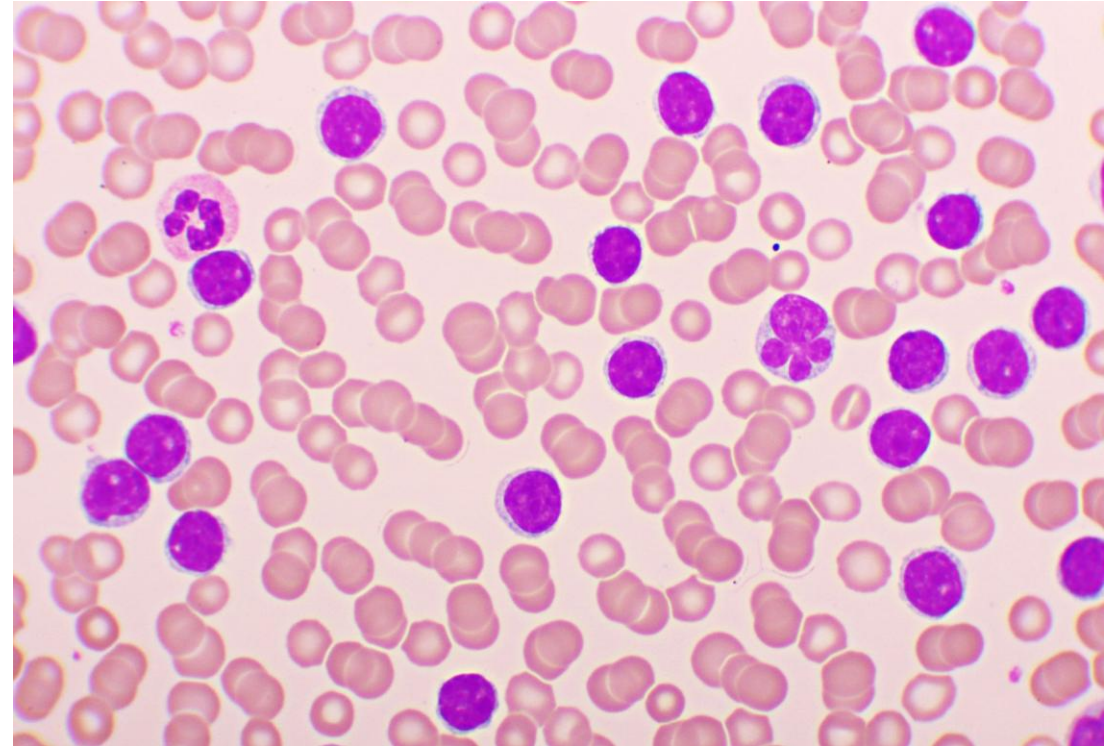
Blasti



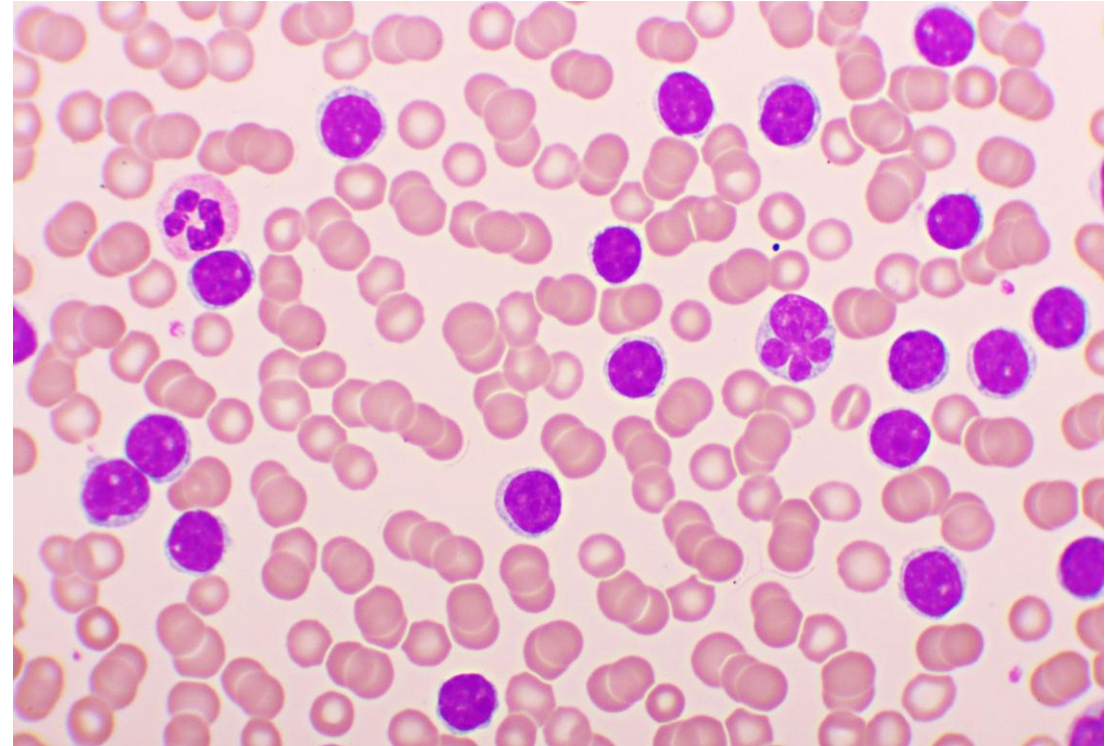
MIJELOBLASTI



MEGAKARIOBLASTI



LIMFOBLASTI



MONOBLASTI

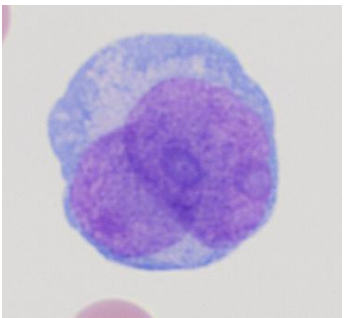
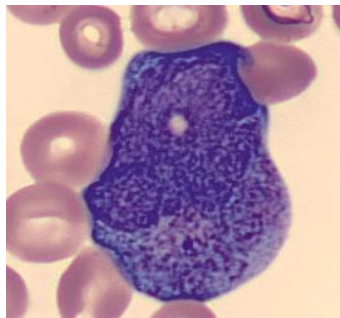
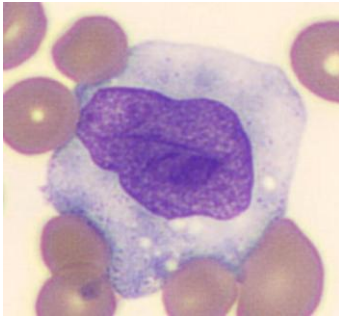
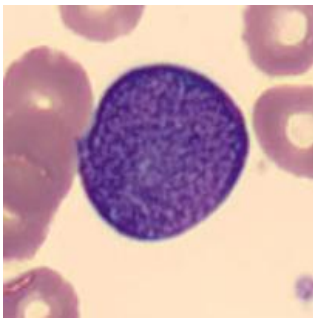
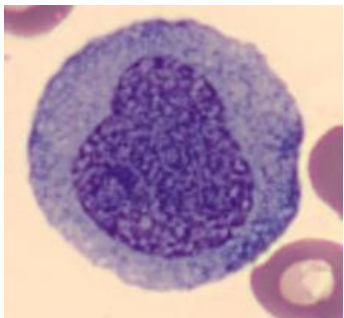
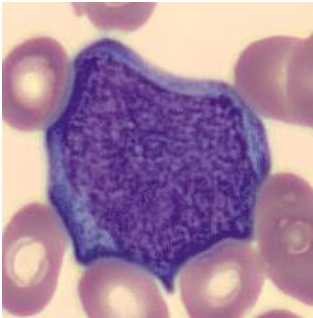
- **EKVIVALENTI BLASTIMA**

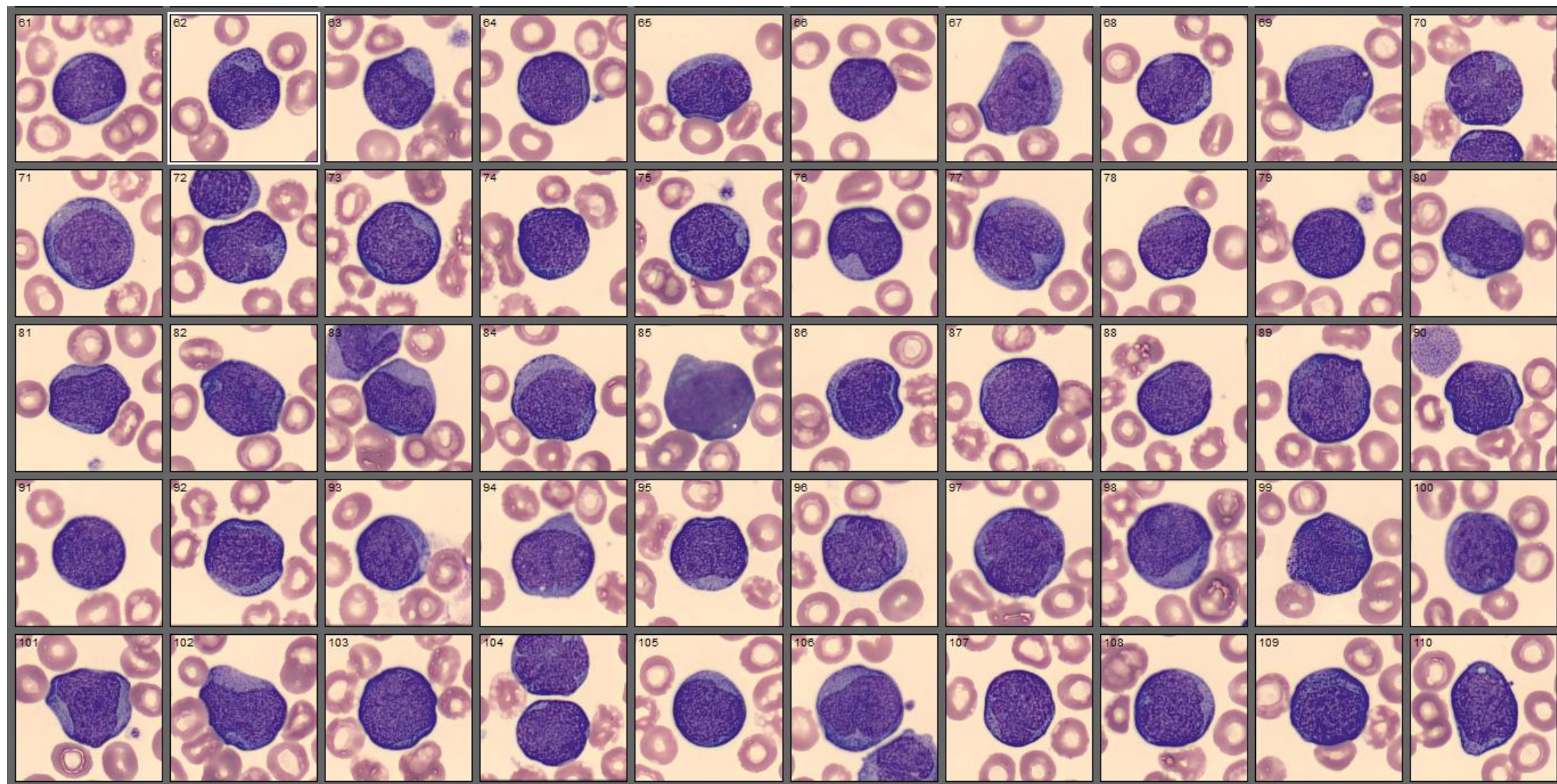
- **PROMONOCITI** kod akutne monocitne leukemije
- **ATIPIČNI PROMIJELOCITI** kod akutne promijelocitne leukemije

Blasti

	MIJELOBLAST	MONOBLAST	LIMFOBLAST	PROMONOCIT	HIPERGRANULIRANI PROMIJELOCIT	HIPOGRANULIRANI PROMIJELOCIT
Jezgra	Okrugla ili ovalna jezgra, veliki omjer jezgre i citoplazme	Okrugla ili ovalna, može imati uleknuće ili biti preklapajuća	Centralno položena i okrugla velik omjer	Uleknutu jezgru	Ovalna jezgra ekscentrično položena	Bilobularna jezgra
Kromatin	fino raspršen, zrnati	Fino raspršen	Fino raspršen	Fino raspršen	Fino raspršen	Raspršen
Jezgrice	prisutne (2 – 5)	prisutne (2 – 5)	prisutne (2 – 5)	prisutne (2 – 5)	Rijetko prisutne	Prisutne
Citoplazma	bazofilna, mogu biti prisutne granule	bazofilna, mogu biti prisutne granule	bazofilna, mogu biti prisutne granule	Bazofilna i zrnata, s nježnim azurofilnim granulama	Bazofilna, izražene granule različitih veličina i obojenja	Bazofilna, granulacija vrlo slabo vidljiva ili neuočljiva

- Veće stanice
- Bilobularna ili multilobularna jezgra
- U jezgri vidljive jezgrice
- Fini kromatin
- Bazofilna citoplazma (sa ili bez azurofilnih granula)





Pregledom razmaza periferne krvi ne može se potvrditi tip blasta – izvještavaju se kao „blasti”

Nedvosmisleno izveštavanje na nalazu

	Rezultat	Jedinica	Referentni interval	Opaska
⌘(K) Eritrociti	2.54	x10 ¹² /L	4.07 - 5.42	
⌘(K) Hemoglobin	79	g/L	118 - 149	
⌘(K) Hematokrit	0.232	L/L	0.354 - 0.450	
⌘(K) MCV	91.3	fL	76.5 - 92.1	
⌘(K) MCH	31.1	pg	24.3 - 31.5	
⌘(K) MCHC	341	g/L	304 - 346	
⌘(K) RDW	20.5	%	11.6 - 14.3	
⌘(K) Eritroblasti	0.2	x10 ⁹ /L	0.0	
⌘(K) Eritroblasti	1.7	/100 Lkc	0	
	Rezultat	Jedinica	Referentni interval	Opaska
⌘(K) Leukociti	12.0	x10 ⁹ /L	4.4 - 11.6	
	Rezultat	Jedinica	Referentni interval	Opaska
⌘(K) Trombociti	90	x10 ⁹ /L	178 - 420	Trombociti mikroskopski proviereni
⌘(K) MPV	11.8	fL	9.0 - 13.0	
Napomena	U razmazu periferne krvi prisutni blasti. Potrebna hematološka i citološka obrada.			

	Rezultat	Jedinica	Referentni interval
⌘(K) Eritrociti	3.18	x10 ¹² /L	4.34 - 5.72
⌘(K) Hemoglobin	94	g/L	138 - 175
⌘(K) Hematokrit	0.279	L/L	0.415 - 0.530
⌘(K) MCV	87.7	fL	83.0 - 97.2
⌘(K) MCH	29.6	pg	27.4 - 33.9
⌘(K) MCHC	337	g/L	320 - 345
⌘(K) RDW	16.6	%	9.0 - 15.0
⌘(K) Retikulociti	4.6	/1000 Erc	5.0 - 21.6
⌘(K) Retikulociti	15	x10 ⁹ /L	22 - 97
⌘(K) Indeks zrelosti retikulocita	0.12		0.02 - 0.18
⌘(K) Eritroblasti	0.1	x10 ⁹ /L	0.0
⌘(K) Eritroblasti	1.1	/100 Lkc	0
	Rezultat	Jedinica	Referentni interval
⌘(K) Leukociti	9.0	x10 ⁹ /L	3.4 - 9.7
⌘(K) Eozinofilni granulociti	0.0	%	0 - 7
⌘(K) Bazofilni granulociti	0.0	%	0 - 1
⌘(K) Nesegmentirani granulociti	0.9	%	0 - 2
⌘(K) Segmentirani granulociti	3.6	%	44 - 72
⌘(K) Limfociti	41.9	%	20 - 46
⌘(K) Monociti	1.8	%	2 - 12
⌘(K) Blasti	51.8 !	%	
⌘(K) Eozinofilni granulociti	0.00	x10 ⁹ /L	0.00 - 0.15
⌘(K) Bazofilni granulociti	0.00	x10 ⁹ /L	0.00 - 0.06
⌘(K) Nesegmentirani granulociti	0.08	x10 ⁹ /L	0.00 - 0.19
⌘(K) Segmentirani granulociti	0.32	x10 ⁹ /L	2.06 - 6.49
⌘(K) Limfociti	3.77	x10 ⁹ /L	1.19 - 3.35
⌘(K) Monociti	0.16	x10 ⁹ /L	0.12 - 0.84
⌘(K) Blasti	4.66	x10 ⁹ /L	
	Rezultat	Jedinica	Referentni interval
⌘(K) Trombociti	9 !	x10 ⁹ /L	158 - 424
⌘(K) MPV	/	fL	9.0 - 13.0

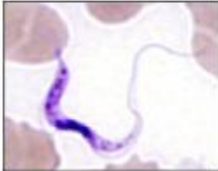
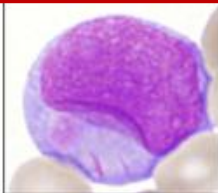
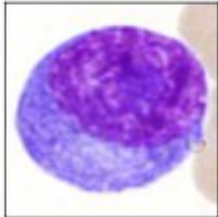
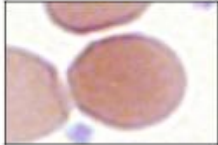


Critical values in Hematology

A. MCFARLANE^{*†}, B. ASLAN^{*†}, A. RABY^{*†}, G. BOURNER[‡], R. PADMORE[§]

Table 2. Summary of the critical values for common hematology parameters

Parameter	Lower limit	Upper limit
Leukocyte count ($\times 10^9/L$)		
Median	2.0	40
5–95th percentile	0.5–2.5	20–50
N	154	158
Hemoglobin (g/L)		
Median	69	200
5–95th percentile	50–90	180–200
N	179	145
Platelet count ($\times 10^9/L$)		
Median	50	1000
5th–95th percentile	20–70	750–1000
N	177	143

Morphology	Percent of labs reporting results as critical ($n = 174$)
	Malaria: 94%
	Parasites other than malaria: 84%
	Blast cells: 74%
	Sickle cells: 48%
	Schistocytes: 39%
	Plasma cells: 37%
	Spherocytes: 22%

Sve karakteristične promjene KKS-a kod akutnih leukemija smatraju se **kritičnim vrijednostima** koje zahtijevaju neodgodivo javljanje!

Opinion Paper

Sabrina Buoro, Giorgio Da Rin*, Alessandra Fanelli and Giuseppe Lippi

Harmonization of interpretative comments in laboratory hematology reporting: the recommendations of the Working Group on Diagnostic Hematology of the Italian Society of Clinical Chemistry and Clinical Molecular Biology (WGDH-SIBioC)

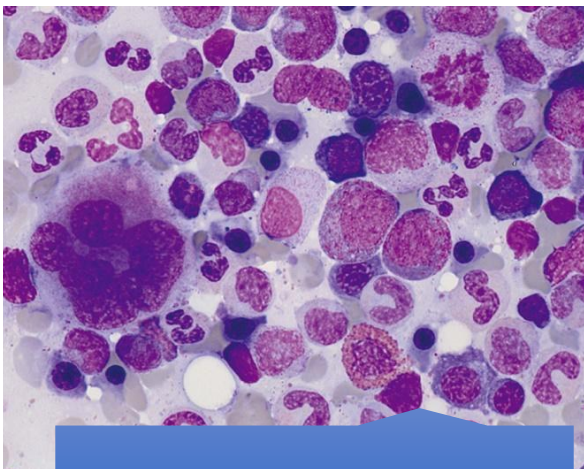
2BL	Blast with cytoplasmic granulation ...%	The <u>urgent communication</u> of these cases is only necessary at the first observation [19]
3BL	Blast without cytoplasmic granulation ...%	The <u>urgent notification of</u> these cases is only necessary at the first observation, with blast count >20% [19]; the notification is also suggested when blast count is <20% [14]
4BL	Blast without granulation, but with vacuolation cytoplasmic ...%	The <u>urgent communication</u> of these cases is only necessary at the first observation [14]
5BL	Some [or numerous] with Auer bodies	This comment should be used to integrate comments 2BL and 3BL (e.g. blast with cytoplasmic granulation...%. Some of which are with Auer bodies)
6BL	Blasts with many Auer bodies “en faggot” ...	The <u>urgent communication</u> of these cases is necessary [19]
7BL	Blast without granulation, but with nucleus shape	The <u>urgent communication</u> of these cases is necessary [19]

-
- **Prisutnost blasta treba jasno i nedvosmisleno izvijestiti na nalazu**

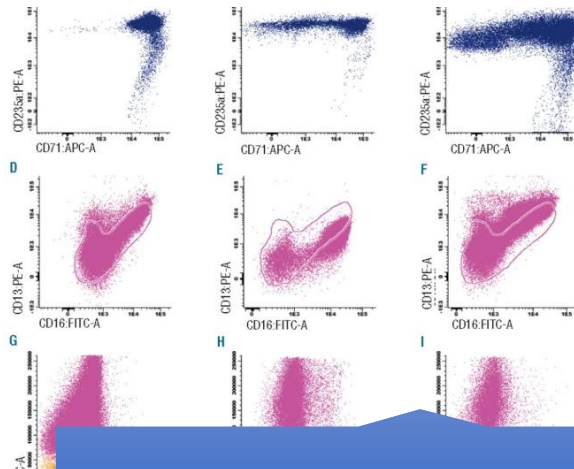


2. Which of the laboratory hematology parameters are performed in your laboratory? (multiple answers possible)

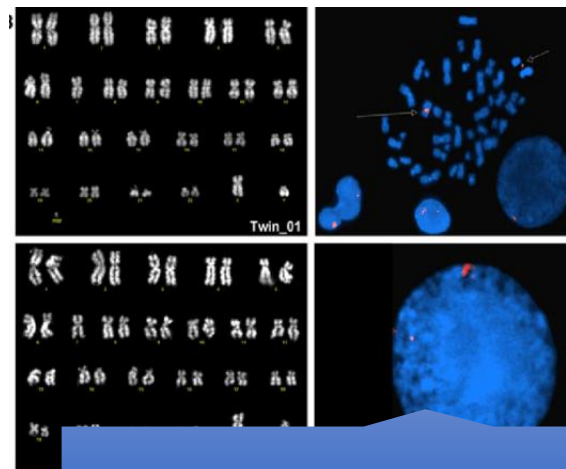
- | | |
|---|--------------|
| a) CBC | 128/129 (99) |
| b) Morphology differentiation of the peripheral blood smear | 110/129 (85) |
| c) Osmotic resistance of the red blood cells | 16/129 (12) |
| d) ESR | 126/129 (98) |
| e) Rtc count | 111/129 (86) |



CITOLOGIJA



IMUNOFENOTIPIZACIJA



CITOGENETIKA



MOLEKULARNA
DIJAGNOSTIKA

Hvala na pažnji!