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**Yumizen**  
Solutions for Laboratories

Clinical Case  
**Studies**

**H2500**

**H1500**

Explore the future

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**HORIBA**



**Doctor Gilles Bonicelli,**

Laboratory Physician, specialist in Hematology,  
Hemostasis, Clinical Chemistry and Blood Gas.

**ALPHABIO**

European Laboratory  
1 rue Melchior Guinot, 13003 Marseille, France

**European Hospital**

6 rue Désirée Clary, 13003 Marseille, France







# Thanks to

HORIBA Medical is pleased and proud to thank Doctor Gilles Bonicelli and the Alphabio Team who collected the following cases and contributed to this presentation.





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# Foreword





HORIBA Medical is pleased to be releasing a new set of high range blood counters, the Yumizen H1500 and Yumizen H2500. This generation brings the proven stability of the DHHS flow cell design and thiazole orange fluorescent reticulocyte analysis together with a new parameter for platelet assessment using our unique optical extinction (PLT-Ox) measurement. The PLT-Ox signal provide superior separation between platelets and red cell microcytes and allows for platelet counting by a second channel. Please consider this only the start of things to come in the Yumizen way. This case study booklet is to assist all users to rapidly familiarize the laboratory scientists and physicians with the Yumizen H1500 and Yumizen H2500 data display.

The key to optimal use of any cytometer or blood counter is the subtle use of details provided by careful review of the histograms and data matrix displays. Like with so many aspects of diagnostic medicine, it is important to familiarize yourself with the normal or healthy blood picture. It is through knowledge of normal that we learn about the abnormal and can recognize diseases specific patterns. This diverse collection of case studies derived from the first independent performance evaluation of the Yumizen H2500 instrument in the Marseille hospital laboratory. We hope this collection of common and uncommon hematologic findings assist you in finding the Yumizen way (fun and joy) to better laboratory hematology practice.



# Normal blood

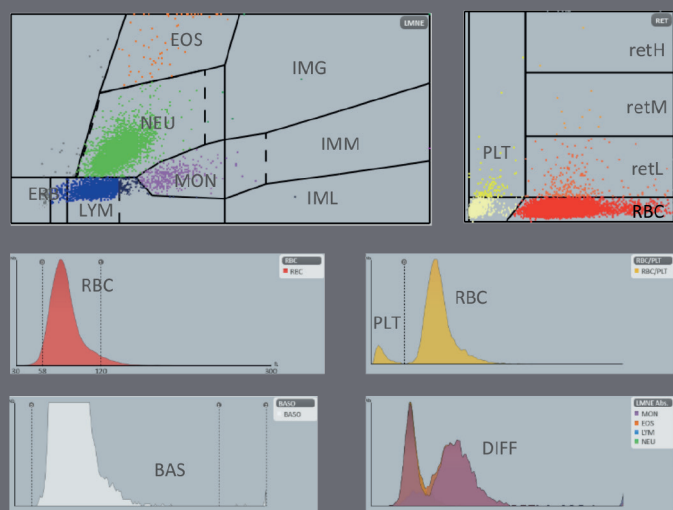
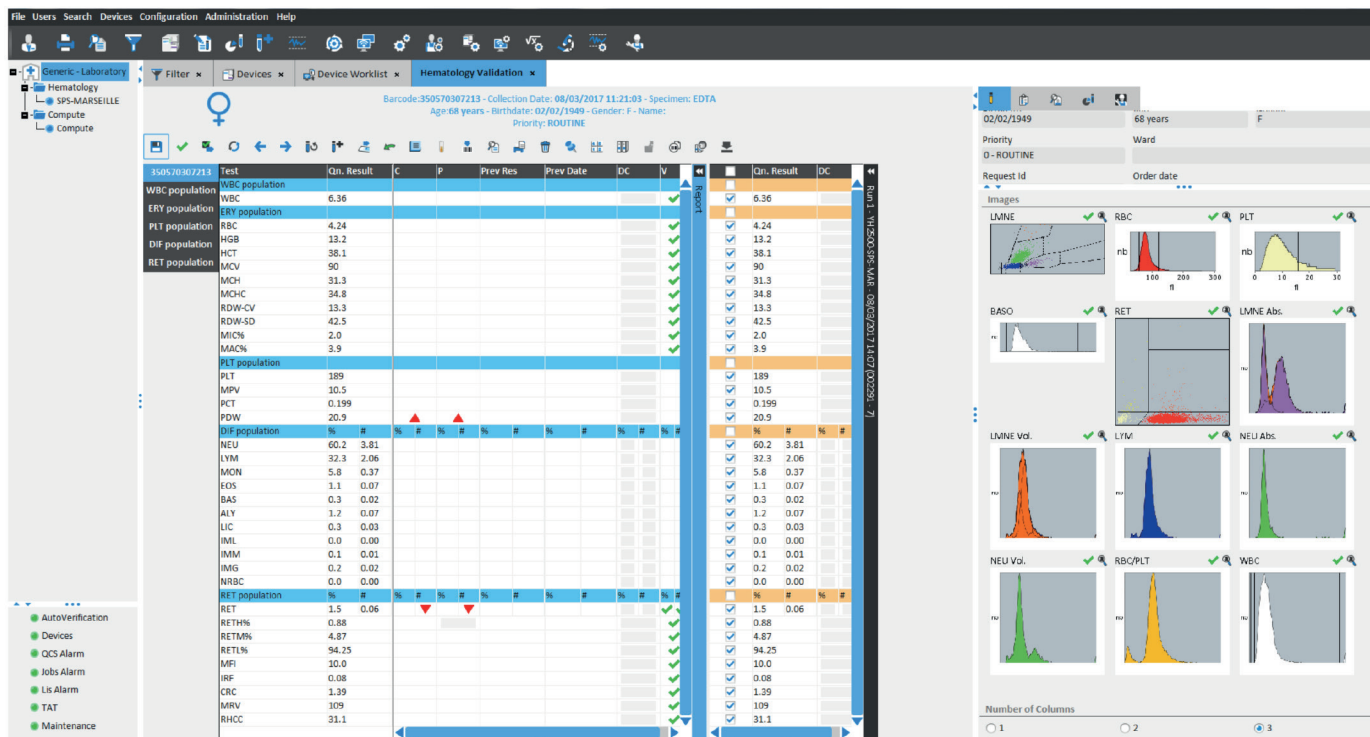
**Female patient, 68 years old.**

Cardiology care unit.

Hypothyroidism TSH 10 mIU/L

The TSH (Thyroid Stimulating Hormone) is a hormone produced by the hypophysis which regulates the thyroid gland. The high value of TSH means that the number of thyroid hormone produced is too low. The TSH has effects in cardiovascular disorders.

Normal values 0.38 to 5.33 mIU/L.

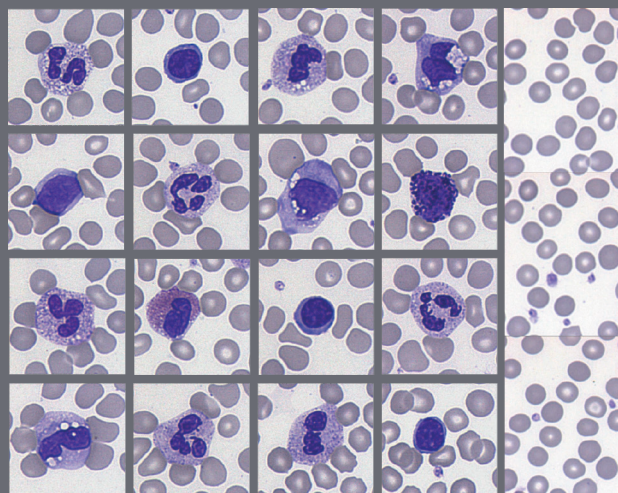


## Manual DIFF

NEU% 59.2  
LYM% 32.1  
MON% 7.2  
EOS% 1.1  
BAS% 0.4

**RBC morphology:** Normal morphology.

**PLT morphology:** Normal morphology.

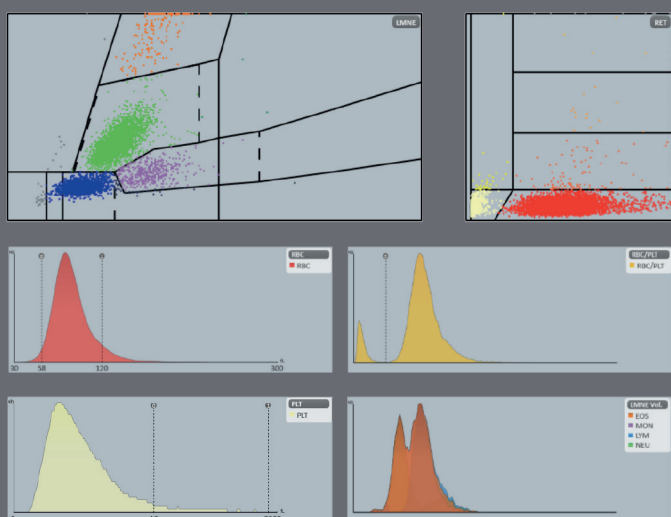
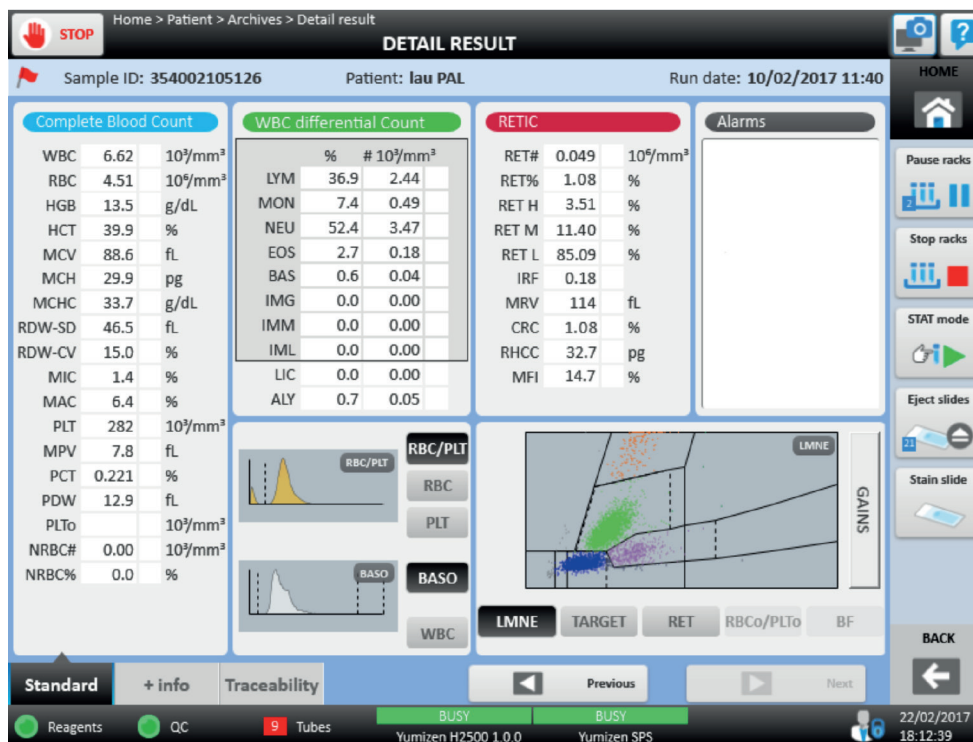




# Normal blood

Female patient, 36 years old.

Out patient.

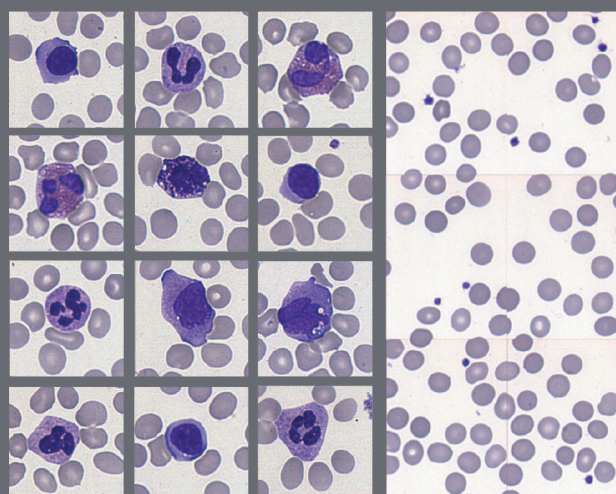


## Manual DIFF

NEU% 58.9  
LYM% 29.9  
MON% 6.4  
EOS% 3.9  
BAS% 0.9

RBC morphology: Normal morphology.

PLT morphology: Normal morphology.

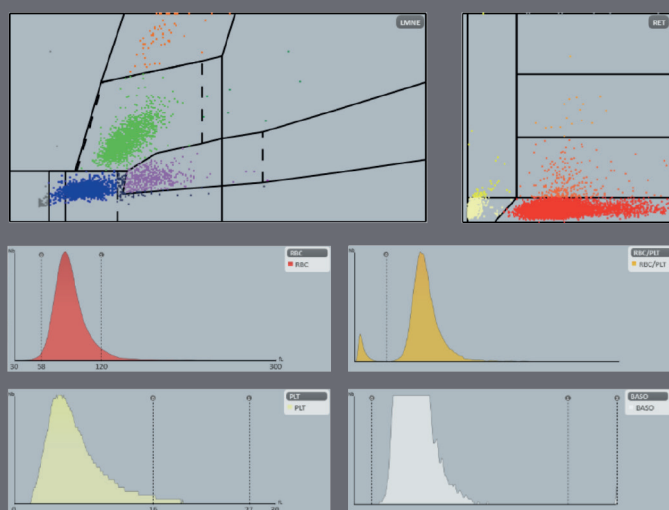
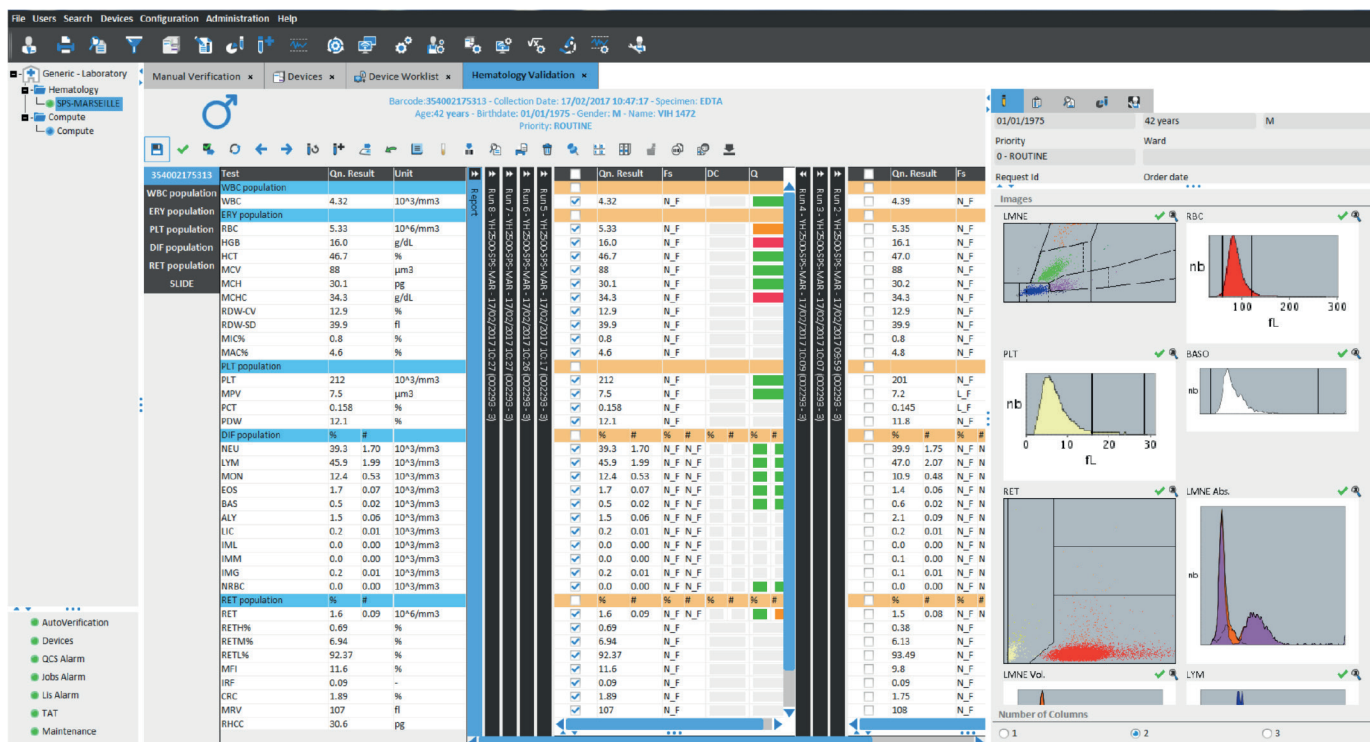


# Normal blood

Male patient, 42 years old.

Infectious diseases unit.

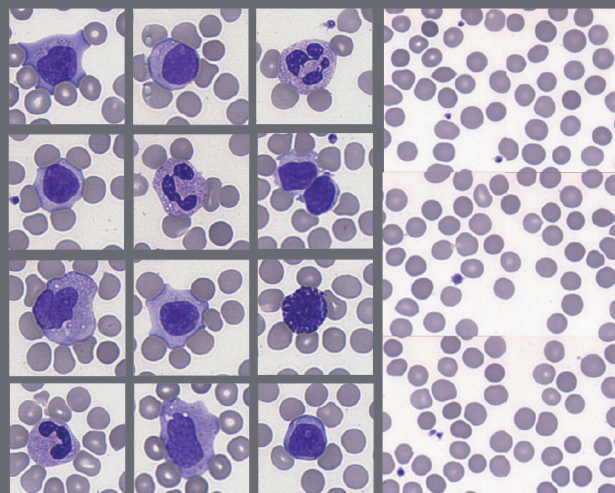
Human Immunodeficiency Virus.



## Manual DIFF

NEU% 39.6  
LYM% 49.8  
MON% 8.6  
EOS% 1  
BAS% 1

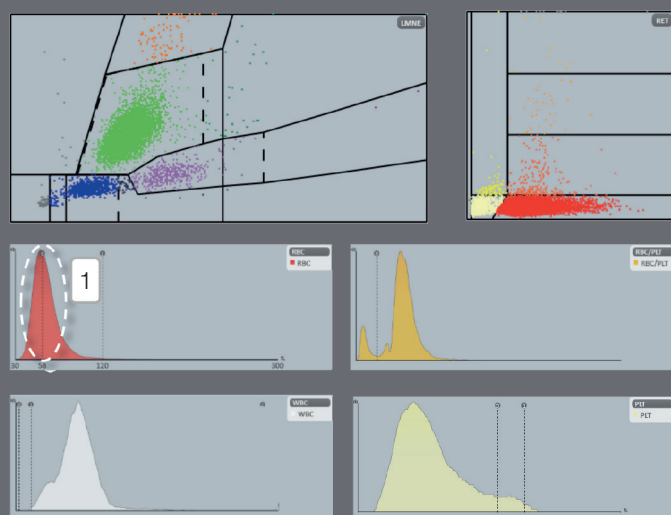
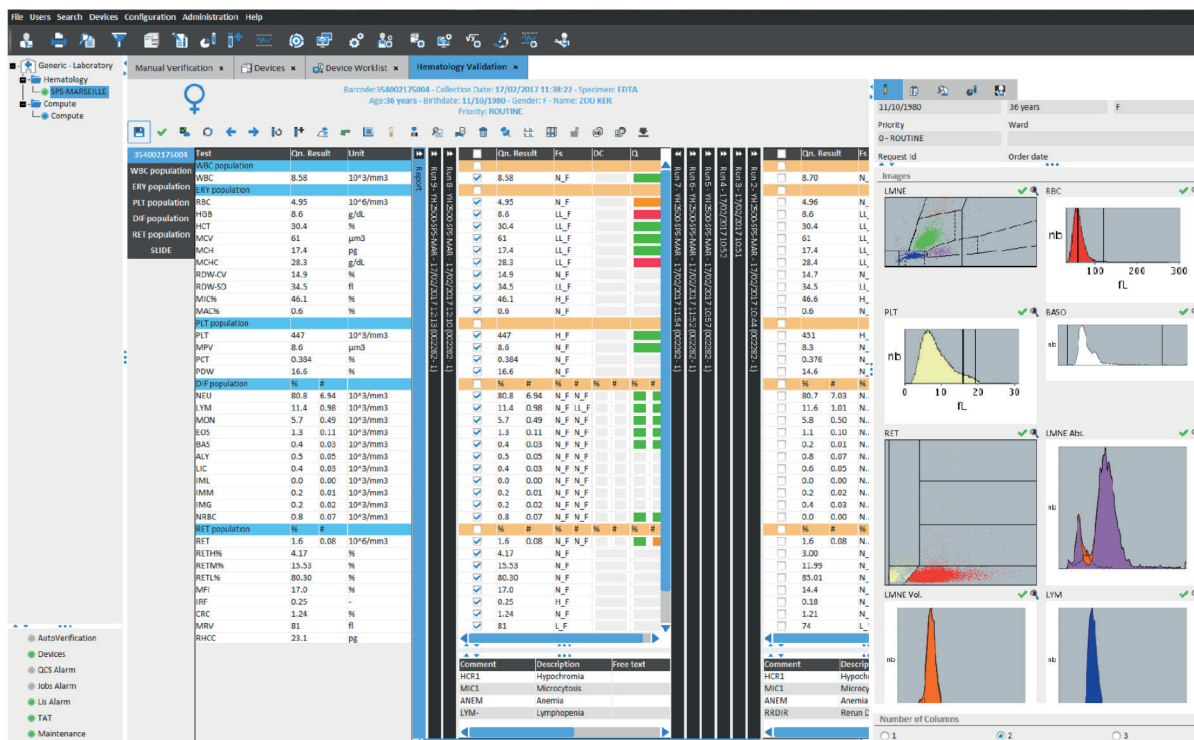
WBC morphology:  
Few large lymphocytes.



# Microcytic hypochromic anemia

Female patient, 36 years old.

Emergency care unit.  
Microcytic, hypochromic,  
non-regenerative anemia.

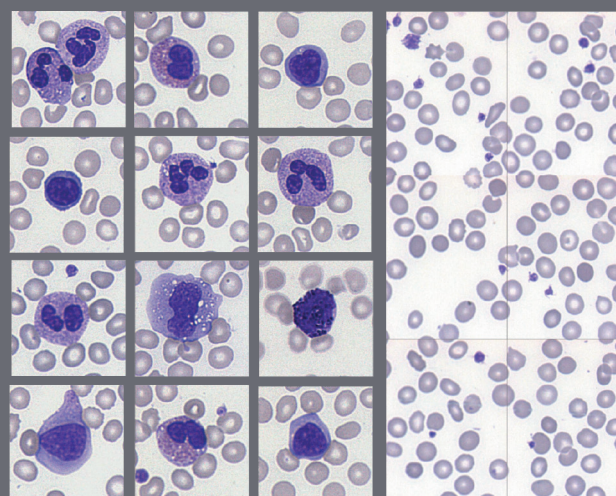


## Manual DIFF

NEU% 84  
LYM% 10.9  
MON% 3.5  
EOS% 1.6

## RBC morphology:

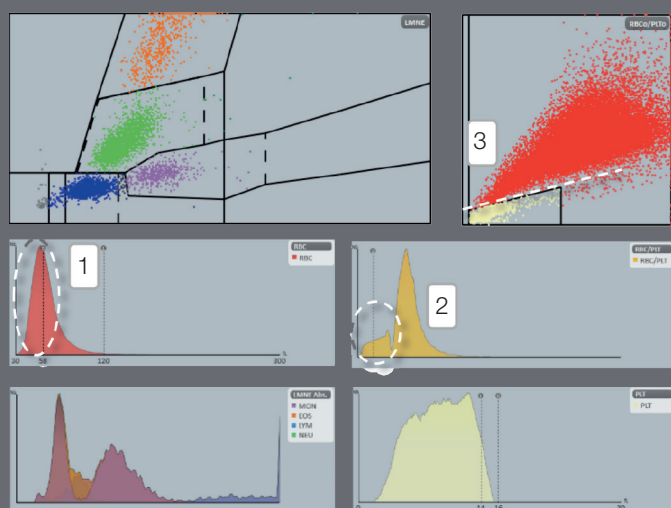
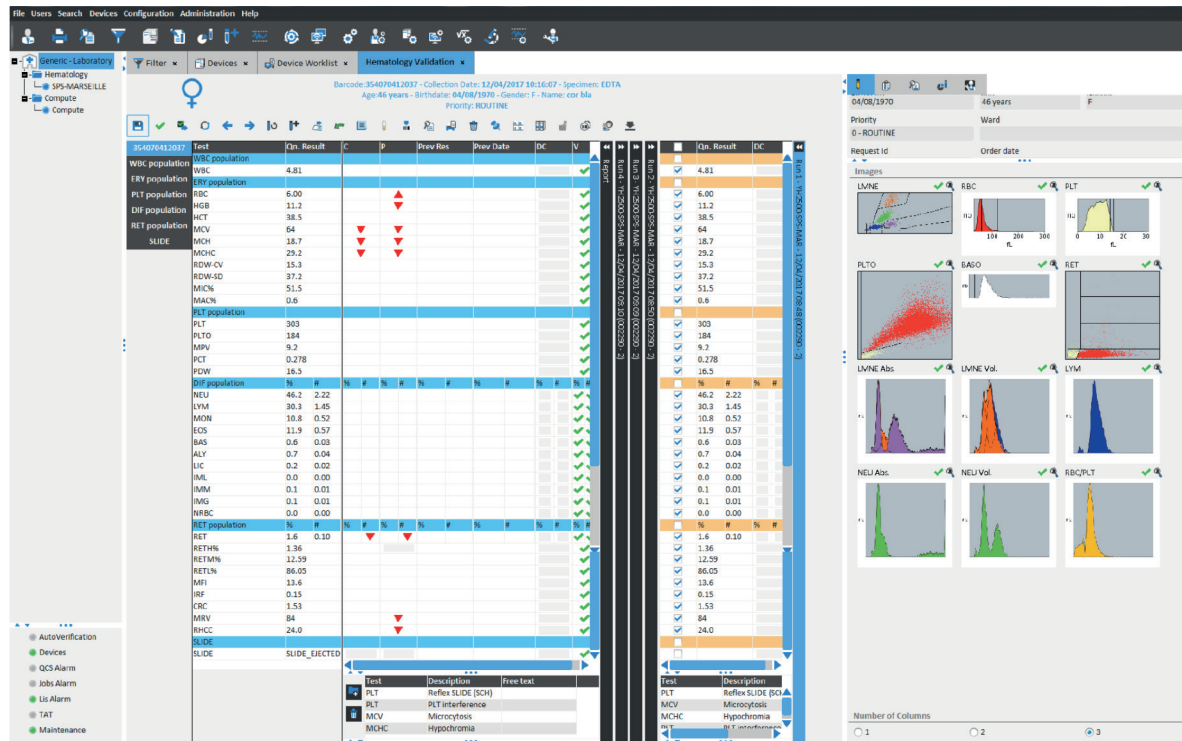
Microcytosis, hypochromasia,  
anisocytosis, slight poikilocytosis





# Microcytic anemia

Female patient, 46 years old.

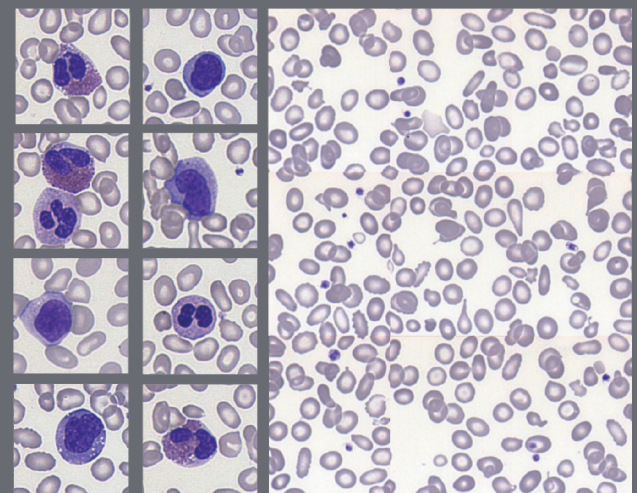


1. On the RBC histogram we observe the presence of microcytic population. The Yumizen H2500 is able to give the number of microcyte cells: 51.5 % of the total RBC population have a maximum volume of 58 fl.
2. On the RBC/PLT histogram, we observe the valley between the both population and the bad position of the threshold in impedance. The impedance value of PLT is rejected and an automatic PLTo is performed.
3. On the PLTo scattergram we observe the separation between the PLT population and the RBC population in the optical axis. The PLT value is correct.

## Manual DIFF

NEU% 54.2  
LYM% 25.4  
MON% 9.9  
EOS% 10.1  
BAS% 0.4

**RBC morphology:**  
*Poikilocytosis +++, hypochromia, anisocytosis, tear drops cells.*



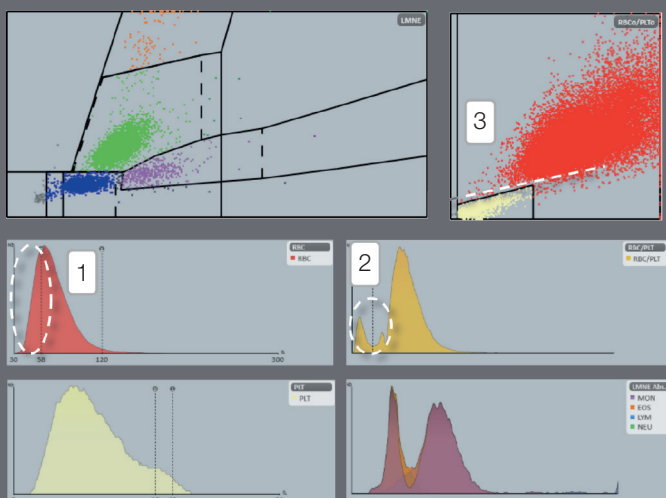
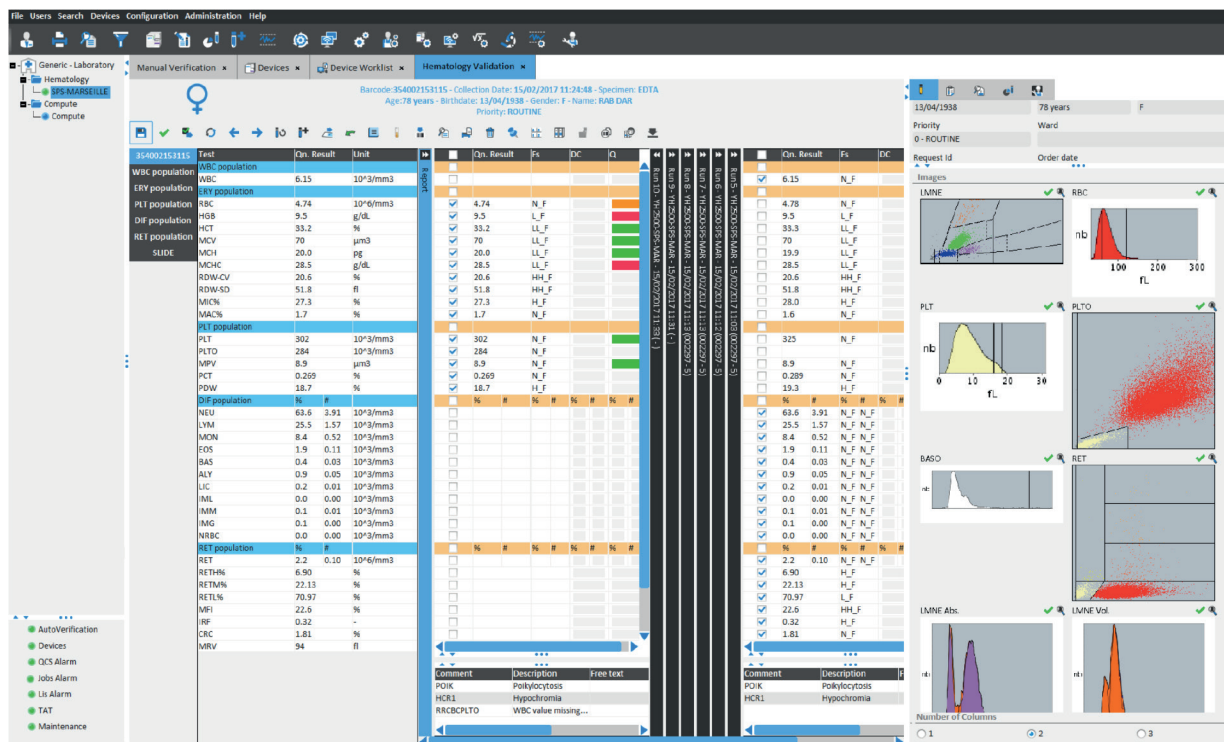
# Beta thalassemia

**Female patient, 78 years old.**

Digestive surgery unit.

Heterozygous beta thalassemia.

Microcytic hypochromic anemia.



1. On the RBC histogram we observe the presence of microcytic population.
2. On the RBC/PLT histogram, we observe the valley between the both population and the bad position of the threshold in impedance. The impedance value of PLT is rejected and an automatic PLTo is performed.
3. On the PLT scattergram we observe the separation between the PLT population and the RBC population in the optical axe. The PLT value is correct.

## Manual DIFF

NEU% 67.9

Meta% 0.5

LYM% 20.2

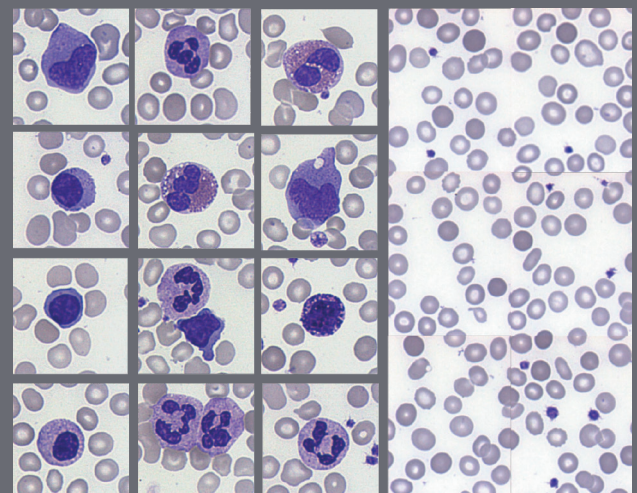
MON% 5.0

EOS% 4.1  
EAO% 2.2

BAS% 2.3

### RBC morphology:

*Anisocytosis, polychromatophilia, microcytes.*

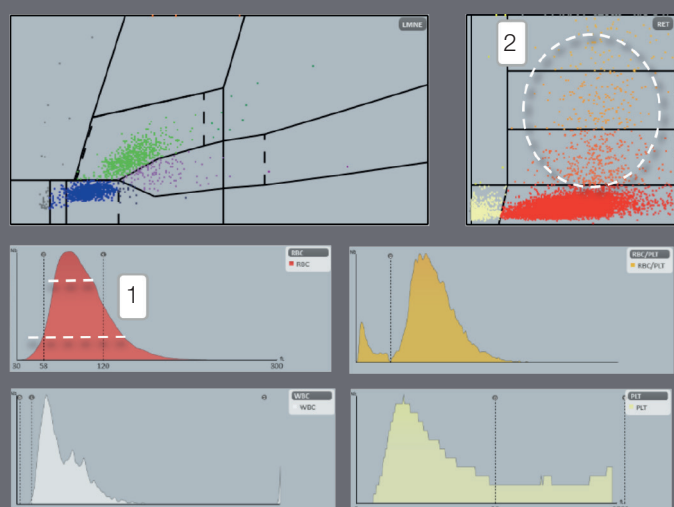
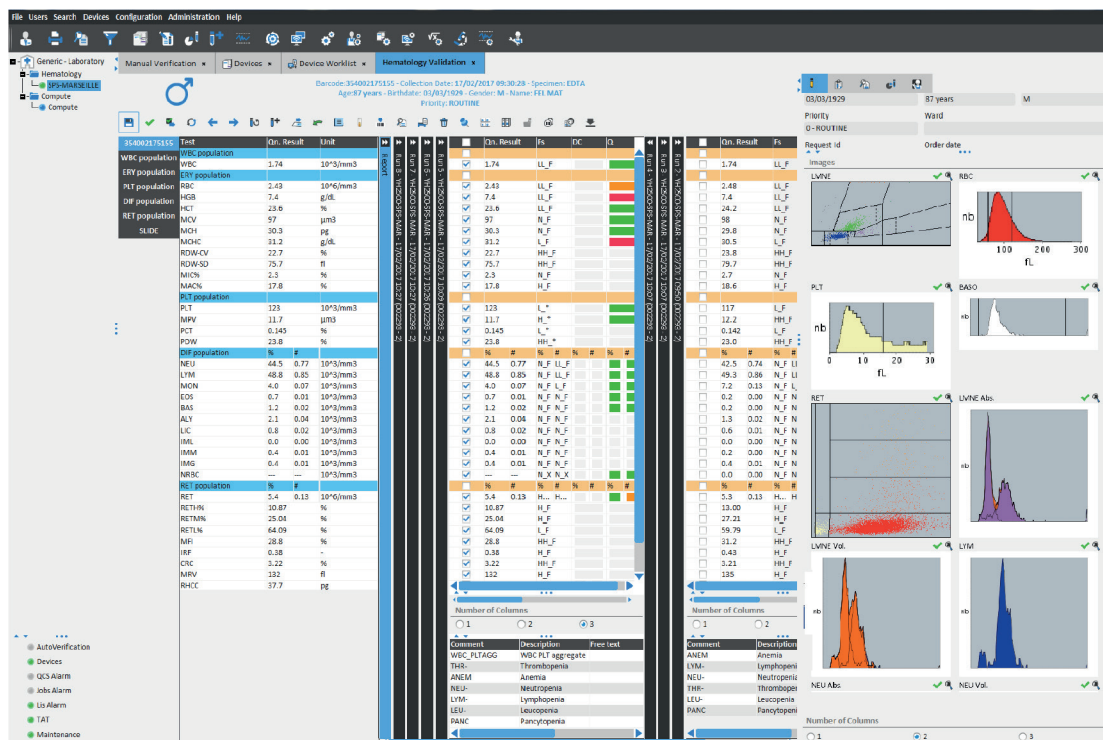


# Hereditary elliptocytosis

**Male patient, 88 years old.**

Oncology-Hematology department.

Hereditary elliptocytosis is an autosomal dominant disorder. Homozygous patients are rare and clinical expression of heterozygotes is variable with anemia and splenomegaly.

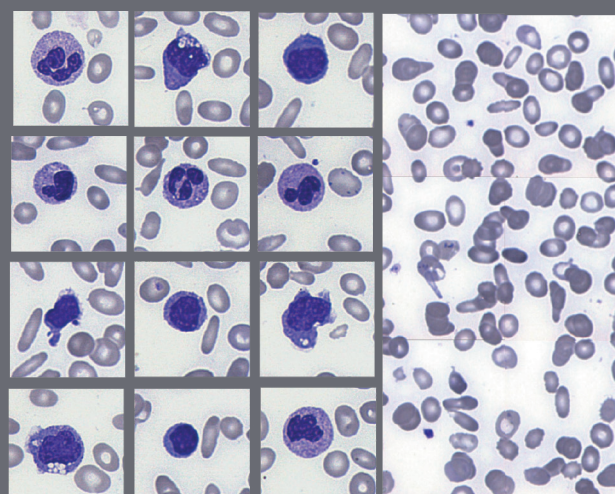


1. On the RBC histogram, we observe the large distribution of RBC with the macrocytic population.
2. On the RET scattergram, we observe the high number of reticulocytes with 11% of RET H, 25% of RET M and IRF = 0.38 all representative of the bone marrow regeneration.

## Manual DIFF

NEU% 47.1  
LYM% 50.0  
MON% 2.9

**RBC morphology:**  
Elliptocytosis, basophilic stippling,  
anisocytosis, poikilocytosis.



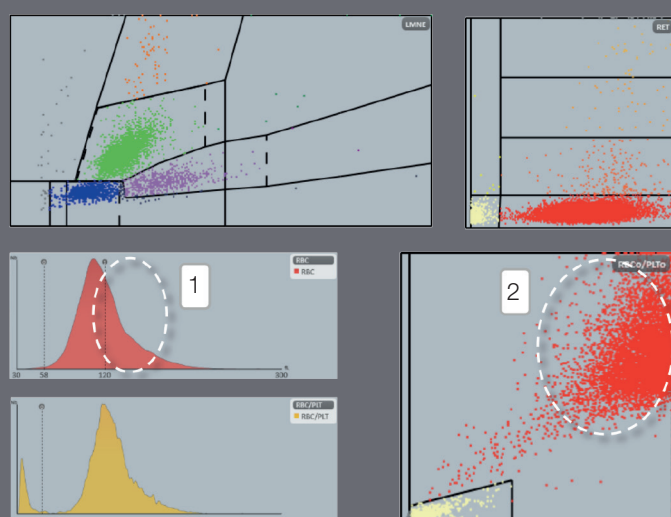
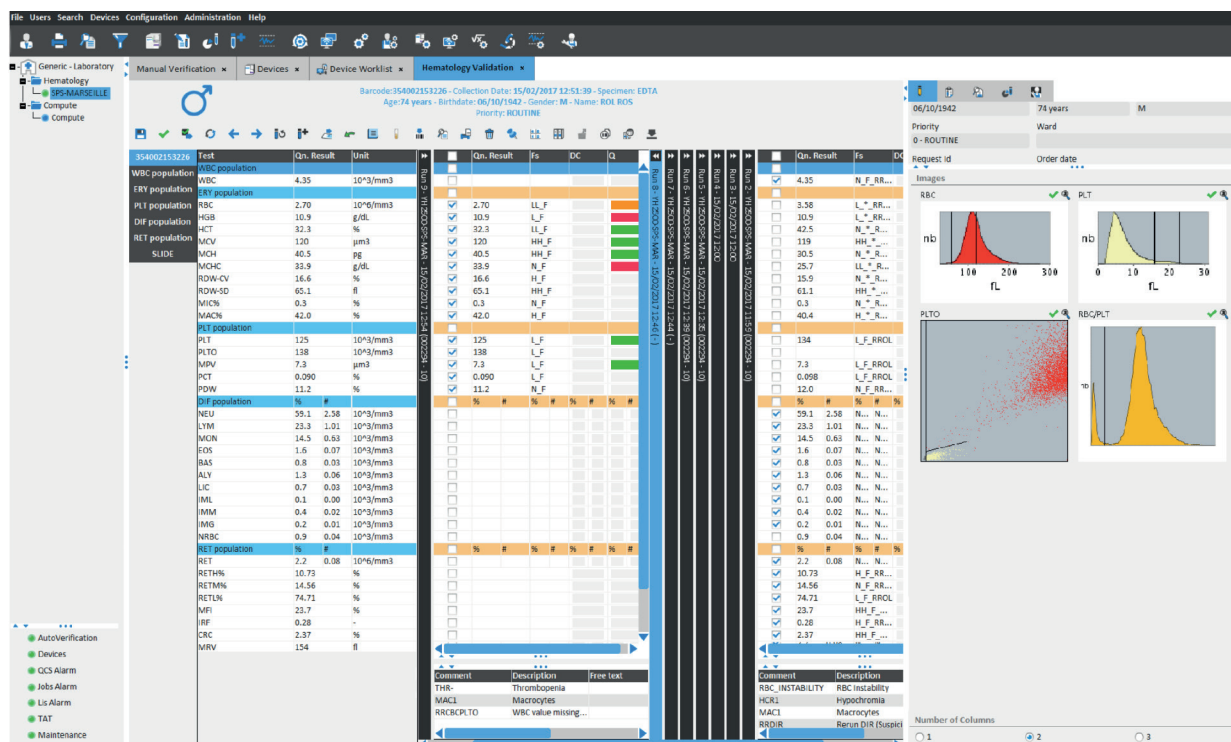


# Megaloblastic anemia

Male patient, 74 years old.

Dialysis care unit.

Macrocytic, normochromic anemia.



1. On the RBC histogram we observe the presence of macrocytic population. The Yumizen H2500 is able to give the number of macrocyte cells: 42% of the total RBC population have a minimum volume of 147 fl.
2. On the PLTo scattergram, we observe the RBC population position is moved to the right of the graph. That is representative to the macrocytic population.

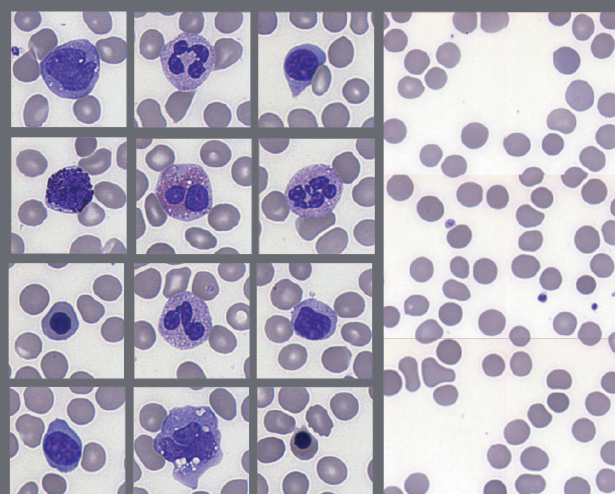
## Manual DIFF

NEU% 68  
LYM% 18.3  
MON% 11.9  
EOS% 1.2  
BAS% 0.6

ERB% 1.2

## RBC morphology:

Macrocytosis, anisocytosis.



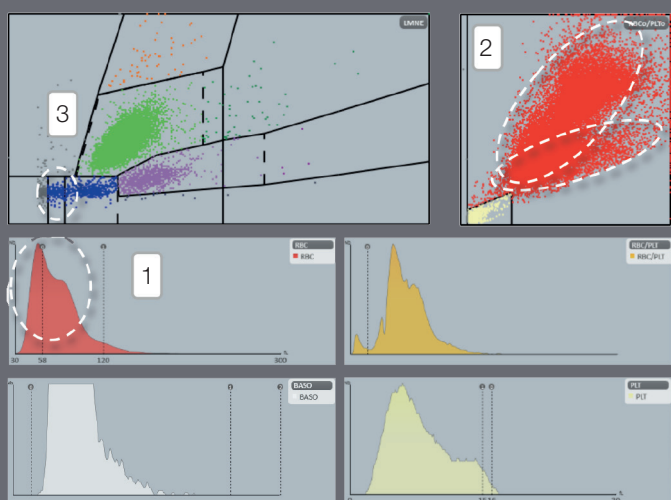
# RBC double population

**Male patient, 86 years old.**

Digestive surgery care unit.  
PT 17s (52%), CRP 69 mg/L,  
hypoalbuminemia.

The coagulation factors are synthesized by the liver. PT (prothrombin time) is used to determine the clotting tendency of blood and also the liver damage. PT normal range > 10-11 sec (corresponds to > 70%).

CRP (C-reactive protein) is a sensitive marker of inflammation. Normal range < 5 mg/L. Albumins are produced by the liver, they carry elements of the blood like clotting factors or hormones. Hypoalbuminemia is a sign of the liver failure.

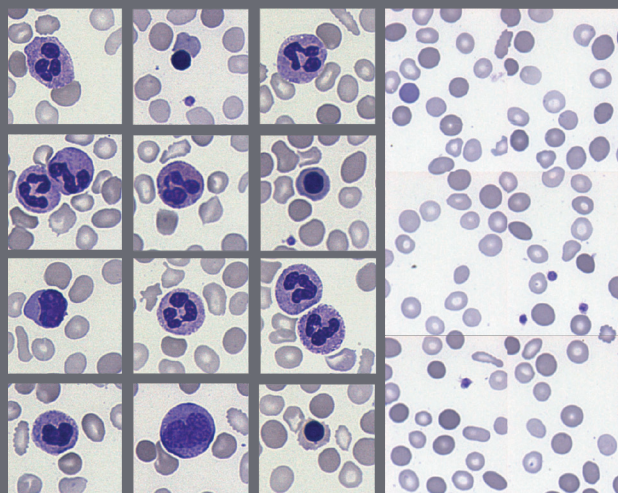


## Manual DIFF

NEU% 86.9  
LYM% 4.2  
MON% 8.5  
EOS% 0.4  
ERB% 7

## RBC morphology:

Anisocytosis, poikilocytosis,  
polychromatophilia.





# RBC agglutination (monoclonal IgG lambda)

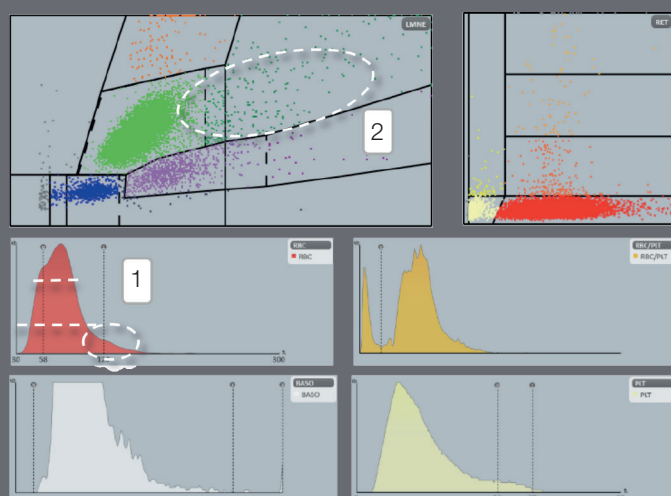
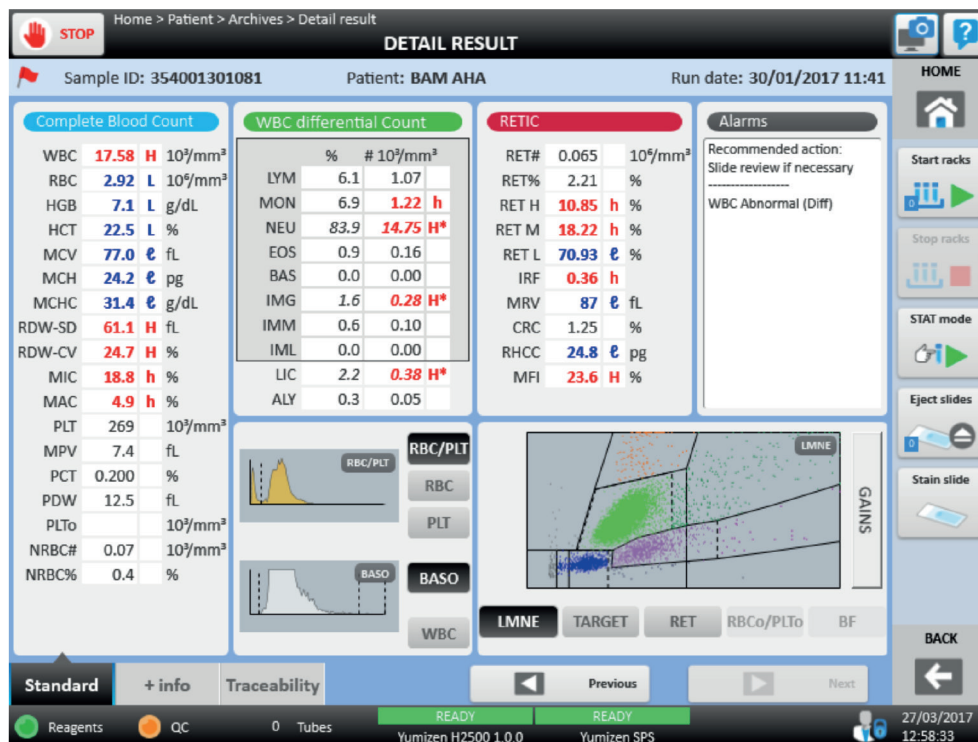
**Male patient, 72 years old.**

Medicine care unit.

Suspicion of hepatic neoplasia.

AFP (Alpha fetoprotein) 75 µg/L.

Alpha-fetoprotein is a protein naturally produced by the yolk sac and the developing fetal liver. It is found in fetal and maternal blood (during pregnancy). In the newborn, the rate decreases a few weeks after birth. In adults, AFP may reappear in some diseases, mostly liver or tumor. Adult normal range < 10 µg/L.



1. On the RBC histogram, we observe the large distribution of RBC with the microcytic population. We also observe on the right foot of the curve the presence of the RBC agglutinations. The curve present a double peak maybe representative of a double population due to a RBC transfusion.
2. On the DIFF scattergram, we observe a few immature granulocytic population.

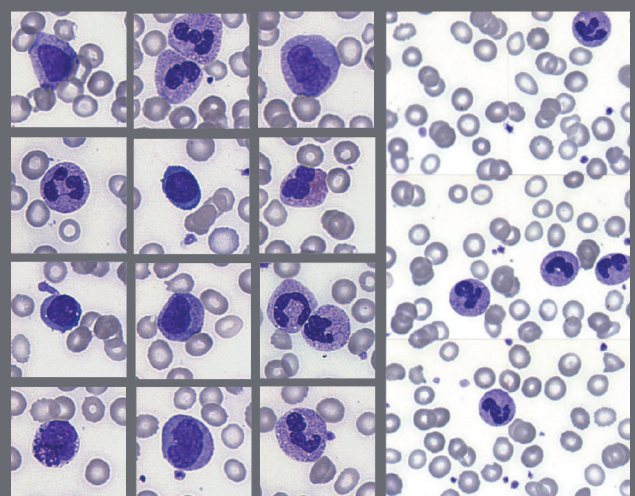
## Manual DIFF

NEU% 90.7  
LYM% 4.5  
MON% 2.7  
EOS% 0.9  
BAS% 0.4

Myelo% 0.9

### RBC morphology:

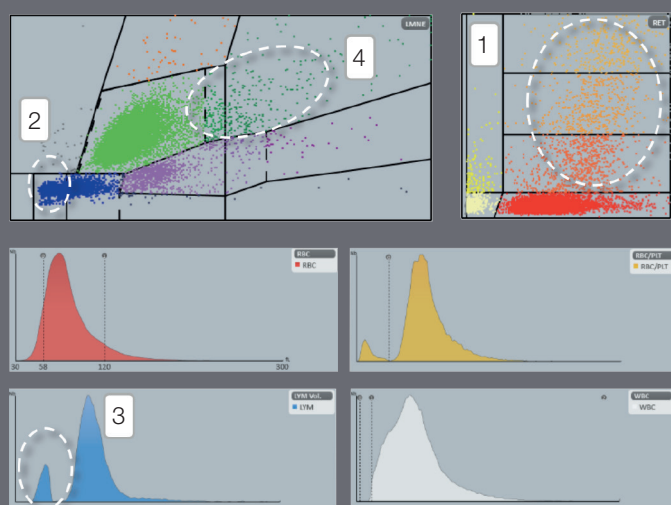
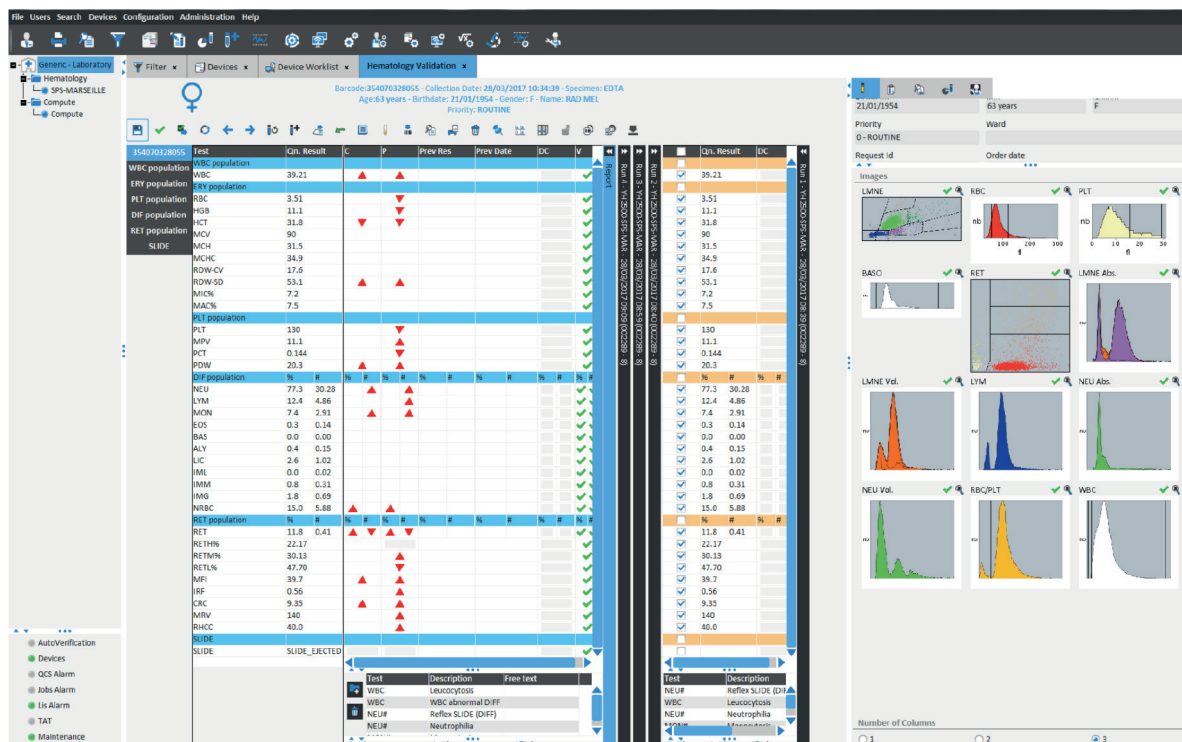
Anisocytosis, hypochromia,  
red cells agglutinations.



# Reticulocytosis

Female patient, 62 years old.

Normocytic, normochromic, regenerative anemia.



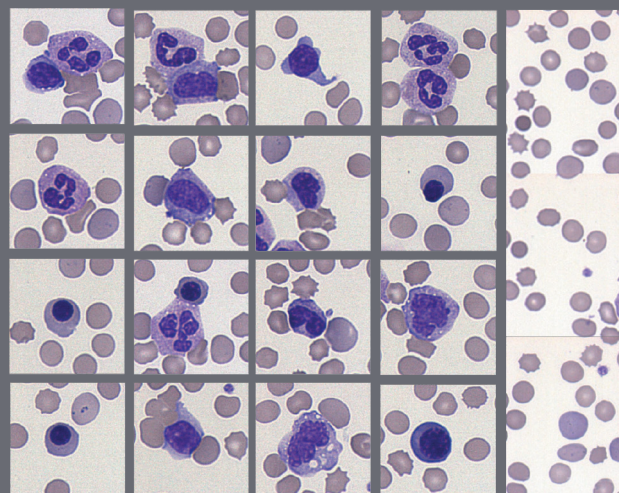
1. On the RET histogram, we observe the reticulocyte population with the high regenerative activity : RET H, RET M and IRF.
2. On the DIFF scattergram we observe the presence of erythroblast population which confirms the regenerative activity of the bone marrow.
3. On the Lymphocyte distribution histogram, we observe a peak on the left of the Lymphocyte population which correspond to the erythroblast population.
4. On the DIFF scattergram we observe the presence of few immature granulocytic cells which confirms also the regenerative activity of the bone marrow.

## Manual DIFF

NEU% 84.4  
LYM% 10.3  
MON% 5.3  
Meta% 1.9  
Myelo% 0.9

ERB% 9.7

**RBC morphology:**  
Anisocytosis, macrocytes,  
basophilic stipplings.

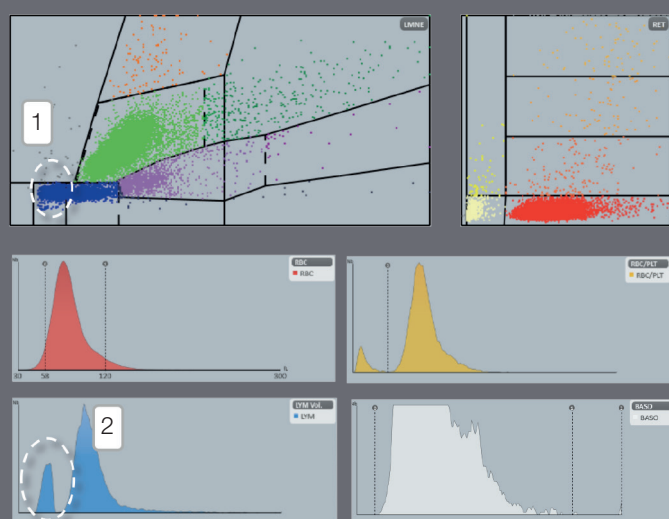
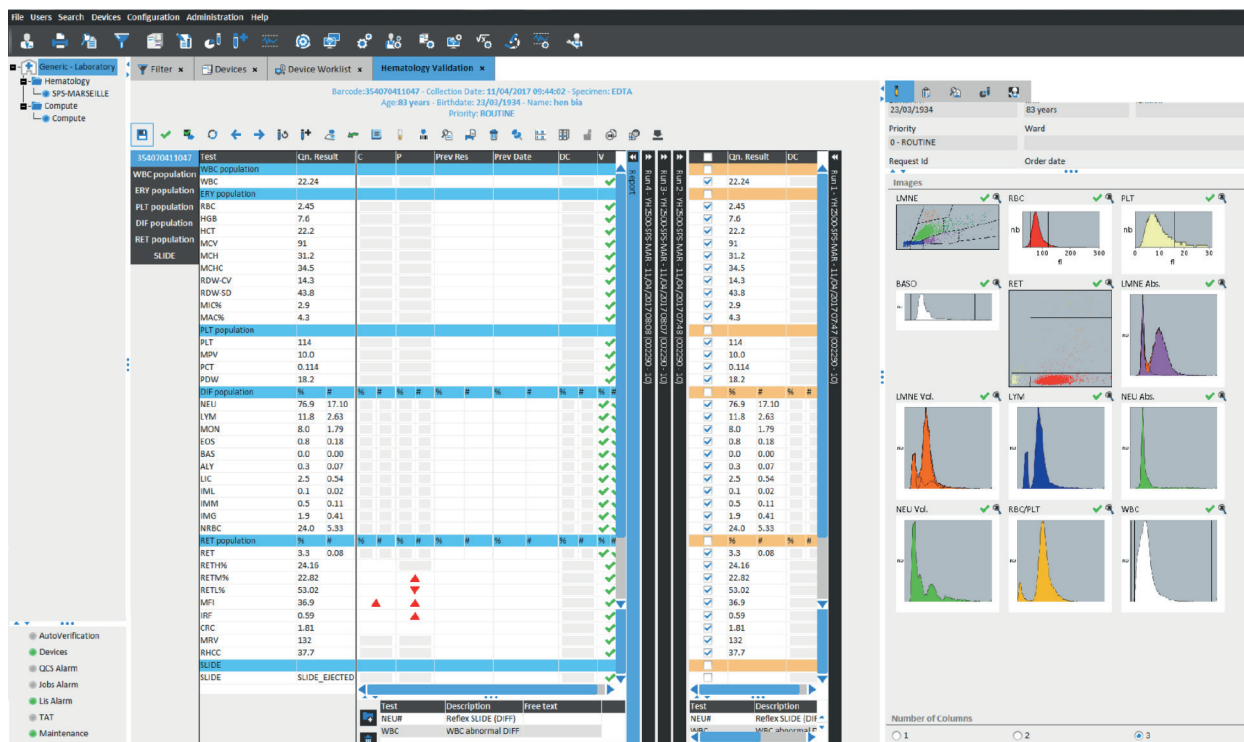




# Erythroblastosis

**Male patient, 83 years old.**

Normocytic, normochromic, non-regenerative  
(reticulocytes: 80 G/L) anemia.



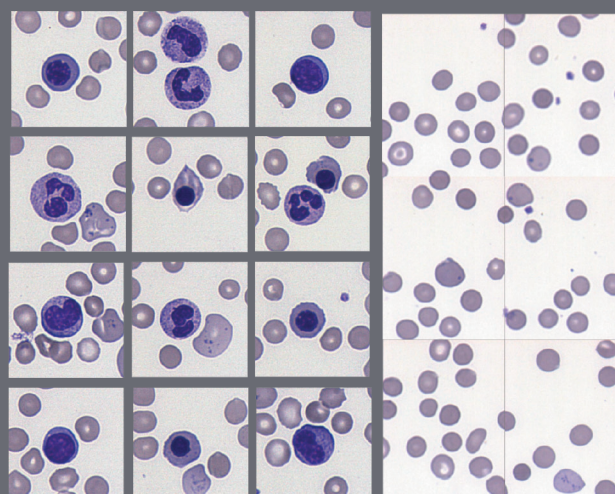
1. On the DIFF scattergram we observe the presence of erythroblast population. The number of erythroblast is measured and the population is not included in the WBC counting.
2. On the Lymphocyte distribution histogram, we observe a peak on the left of the Lymphocyte population which correspond to the erythroblast population.

## Manual DIFF

NEU% 88.0  
LYM% 4.3  
MON% 4.3  
Meta% 3.4  
ERB% 22.1

## RBC morphology:

Anisocytosis, macrocytes, Jolly bodies, basophilic stipplings.

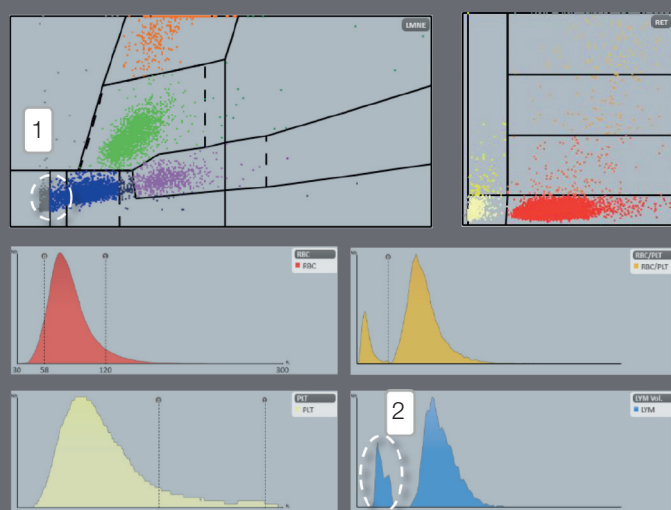
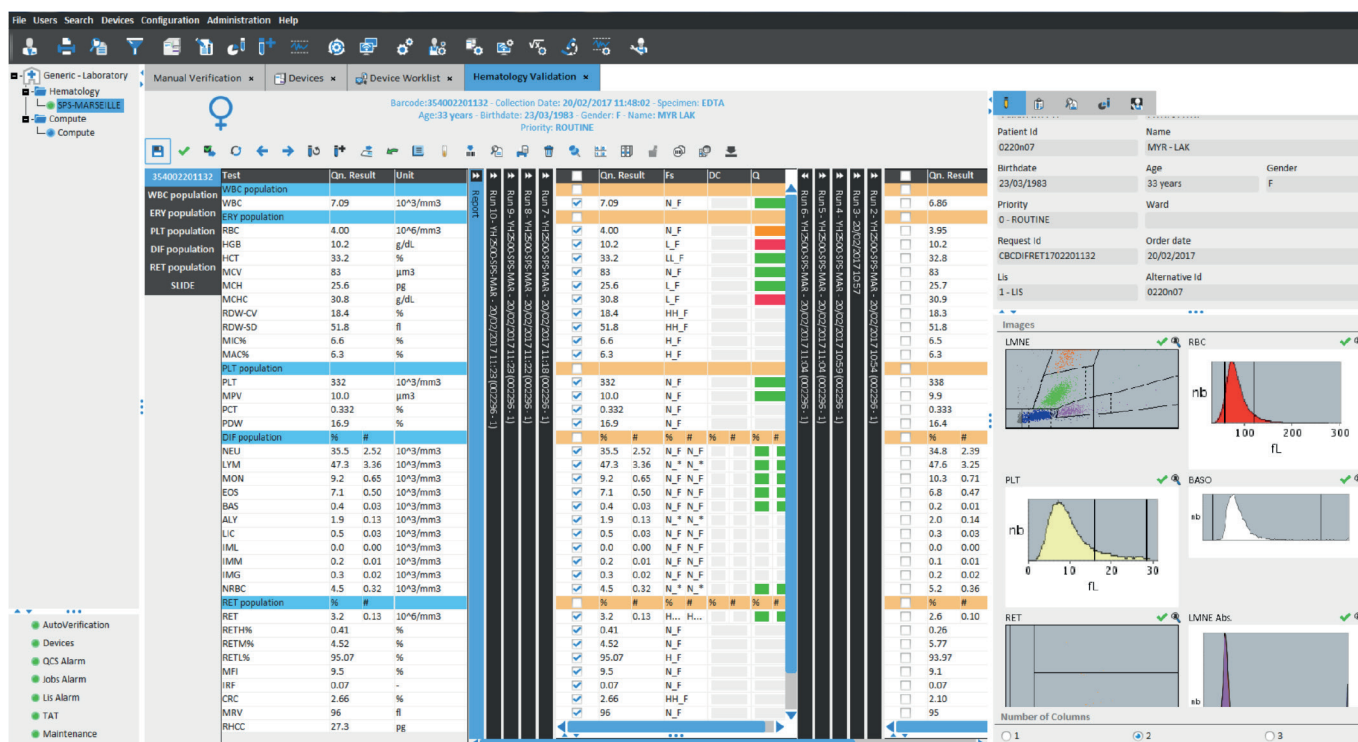


# Erythroblastosis

Female patient, 33 years old.

Medicine care unit.

Disease previous in Onco-hematology.



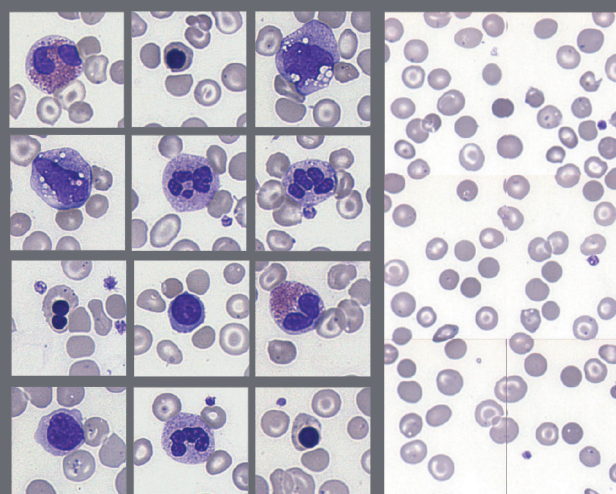
1. On the DIFF scattergram we observe the presence of erythroblast population. The number of erythroblast is measured and the population is not included in the WBC counting.
2. On the Lymphocyte distribution histogram, we observe a peak on the left of the Lymphocyte population which correspond to the erythroblast population.

## Manual DIFF

NEU% 41.2  
LYM% 44.7  
MON% 9.6  
EOS% 4.5  
ERB% 5.6

## RBC morphology:

Anisocytosis, target cells,  
basophilic stippling.





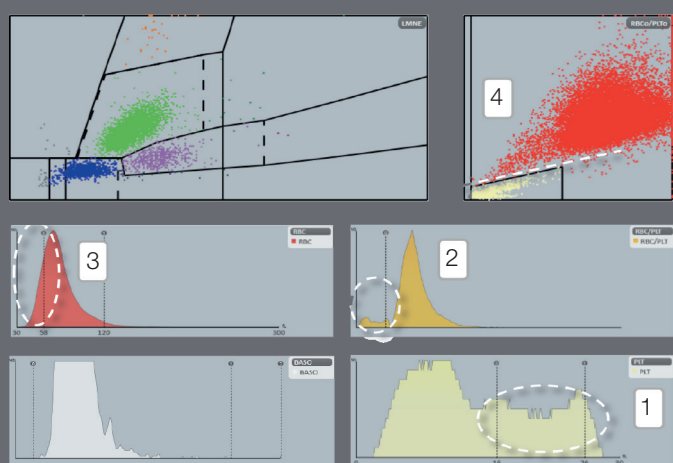
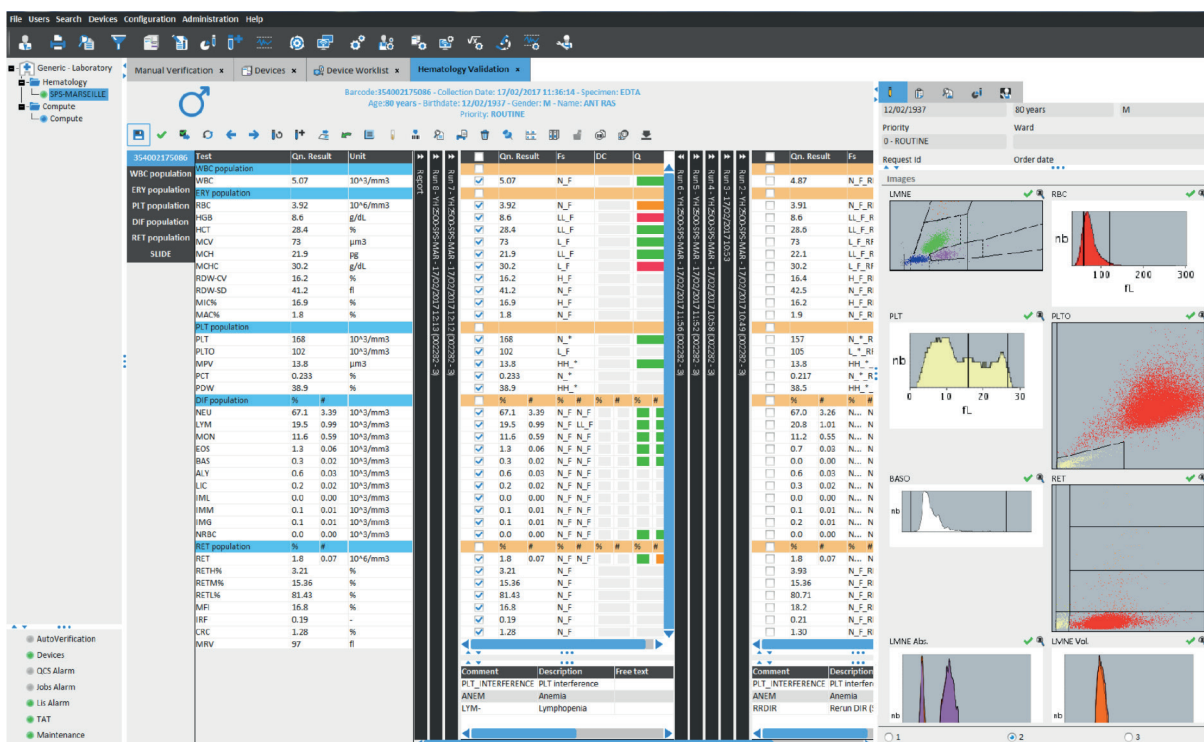
# Interference RBC/PLT

## Male patient, 79 years old.

Cardiology intensive care unit.  
Hypothyroidism TSH 8 mIU/L  
(historic TSH 17 mIU/L)

The TSH (Thyroid Stimulating Hormone) is a hormone produced by the hypophysis which regulates the thyroid gland. The high value of TSH means that the number of thyroid hormone produced is too low. The TSH has effects in cardiovascular disorders.

Normal values 0.38 to 5.33 mIU/L.

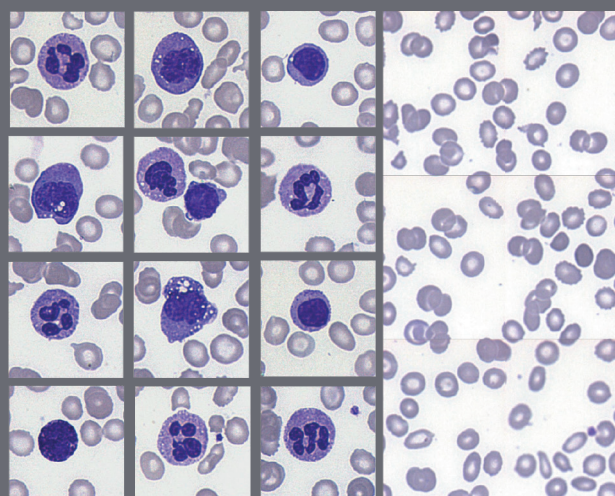


1. On the PLT histogram, we observe no valley in the macroplatelets area. The MPV is artificially increased by the RBC interference.
2. On the RBC/PLT histogram, we observe the valley between the both population and the bad position of the threshold in impedance. The impedance value of PLT is rejected and an automatic PLTo is more correct.
3. On the RBC histogram we observe the presence of microcytic population. Associated with low reticulocyte response, the hypoproliferative microcytic anemia is typical of hypothyroidism.
4. On the PLTo scattergram we observe the separation between the PLT population and the RBC population in the optical axis. The PLTo value is correct.

## Manual DIFF

NEU% 68.7  
LYM% 23.1  
MON% 7.5  
BAS% 0.7

**RBC morphology:**  
Poikilocytosis, slight microcytosis,  
anisocytosis.

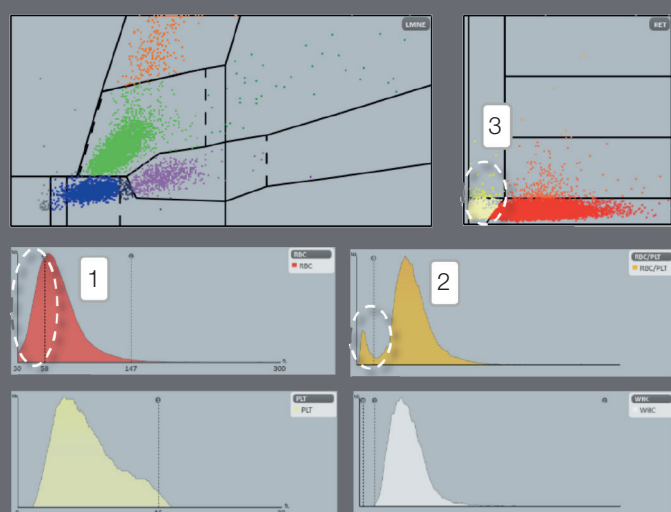
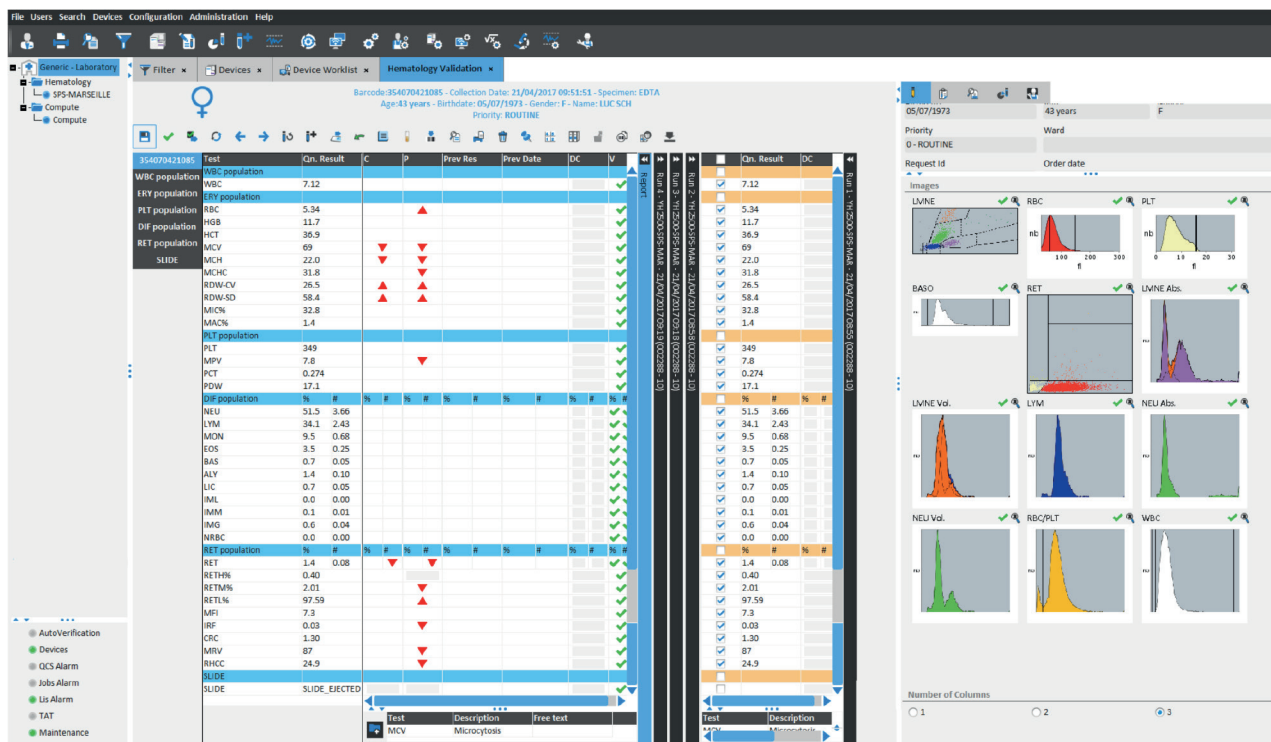




# Plasmodium malariae

Female patient, 44 years old.

Low parasitemia: 1.0 /100 RBC.

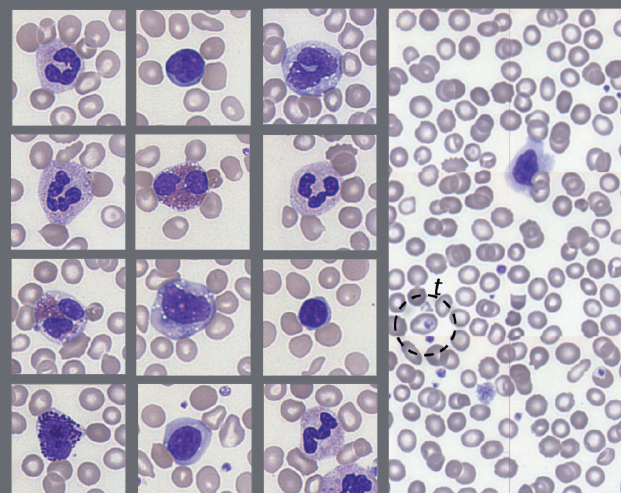


1. On the RBC histogram we observe the presence of microcytic population. The Yumizen H2500 is able to give the number of microcyte cells: 32.8 % of the total RBC population have a maximum volume of 58 fl.
2. On the RBC/PLT histogram, we observe the valley between the both population and the position of the threshold.
3. On the Reticulocyte scattergram we observe the separation between the PLT population and the RBC population.

## Manual DIFF

NEU% 63.9  
LYM% 27.4  
MON% 3.2  
EOS% 3.7  
BAS% 1.8

**RBC morphology:**  
Microcytosis, hypochromia, poikilocytosis.  
Presence of some trophozoite forms (t).  
**WBC morphology:**  
Presence of some hyperbasophil lymphocytes.



# Plasmodium vivax

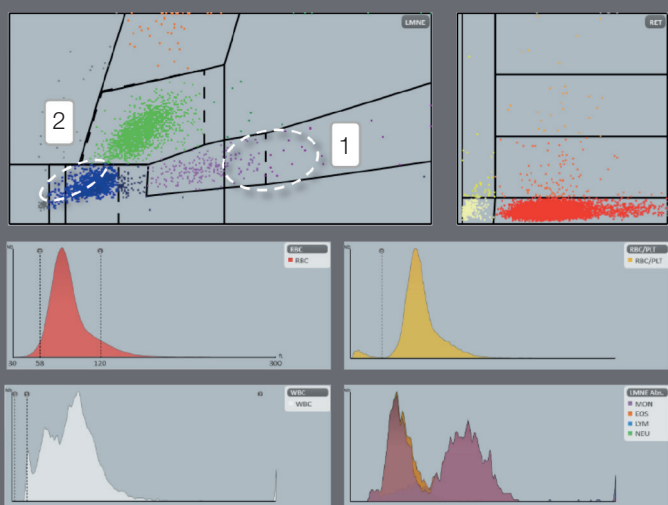
**Male patient, 65 years old.**

Medicine care unit.

Plasmodium vivax gametocyte stage.

CRP 200 mg/L.

The CRP (C-reactive protein) is a sensitive marker of inflammation. Normal range < 5 mg/L.



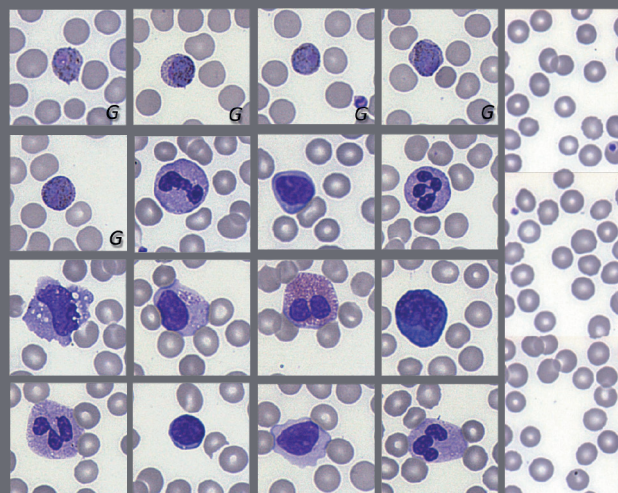
1. On previous studies, we observed in case of Plasmodium Vivax, the presence of a slightly immature monocyte population and the deviation of the lymphocyte population to the top of the LYM area (2), probably corresponding to the gametocytes.

## Manual DIFF

NEU% 77.2  
LYM% 19.4  
MON% 1.7  
EOS% 1.1  
ALY% 0.6

## WBC morphology:

Presence of numerous gametocyte forms (G) of the plasmodium vivax.  
Presence of some hyperbasophil lymphocytes.

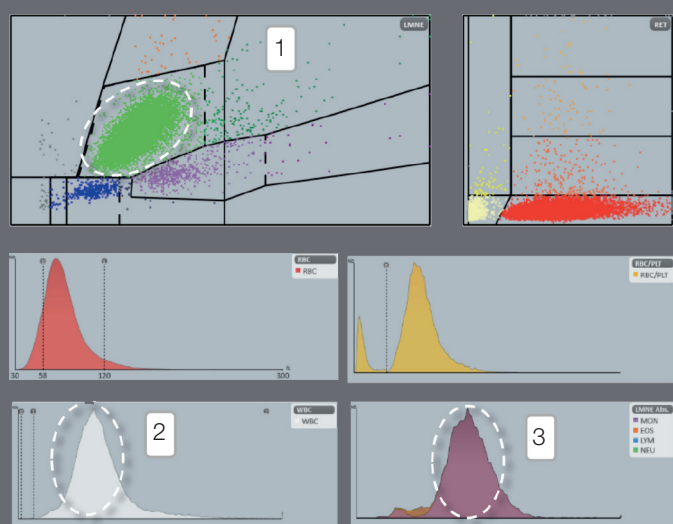
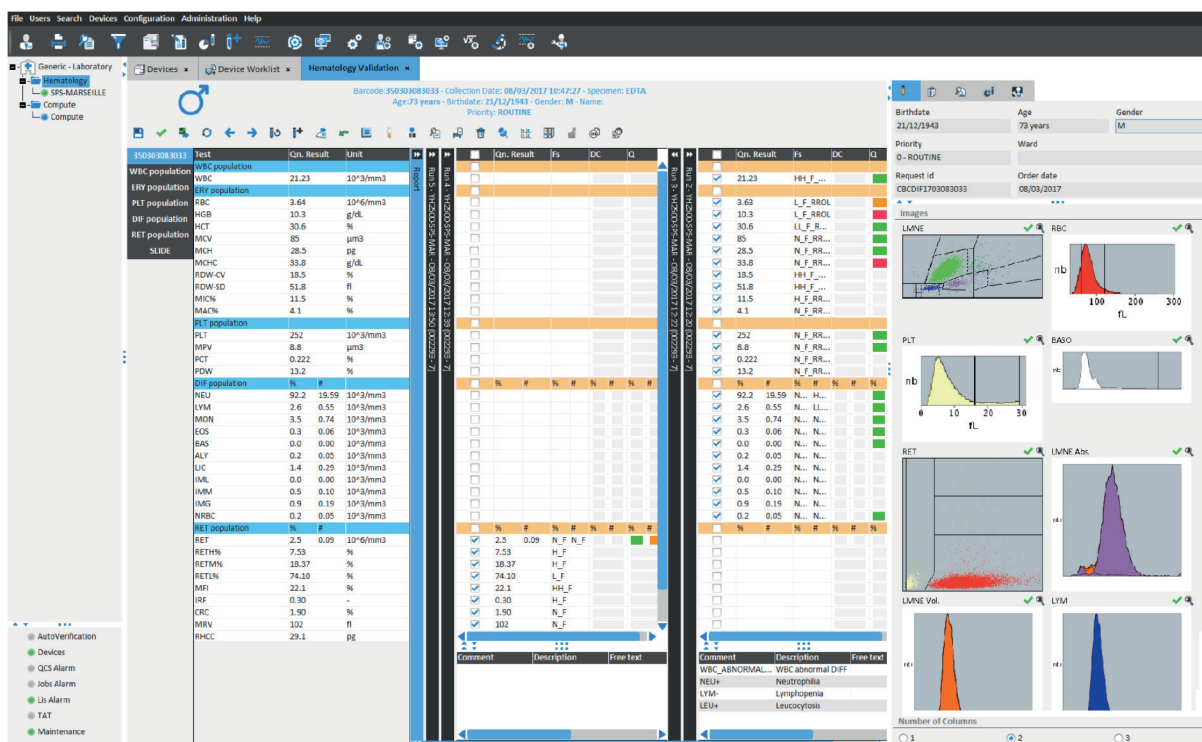


# Neutrophilia

**Male patient, 73 years old.**

Cardiology care unit.  
Troponin 0.16 µg/L.

The troponin is a marker of muscle injury. The troponin is increased in case of myocardial infarction, and also pulmonary embolism, myocardial inflammation, chronic heart failure or end-stage of renal disease.  
Normal range < 0.04 µg/L.

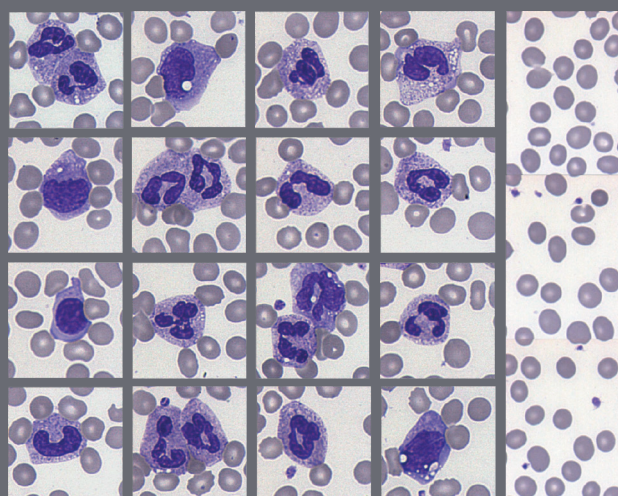


1. On the DIFF scattergram, we observe the neutrophil population. We also can observe the small quantity of the other populations.
2. On the WBC histogram, we observe the peak of the granulocytes with the neutrophils and the quasi absence of lymphocytes.
3. On the LMNE histogram, the peak of the neutrophils is confirmed.

## Manual DIFF

NEU% 93.7  
LYM% 0.9  
MON% 5.4

**RBC morphology:**  
Normal morphology.

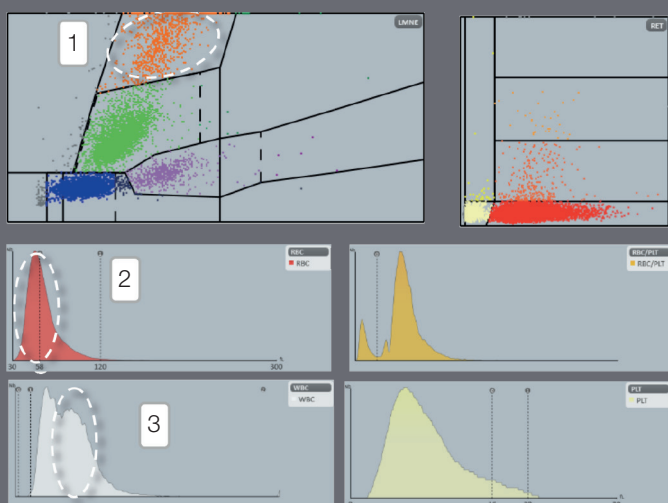
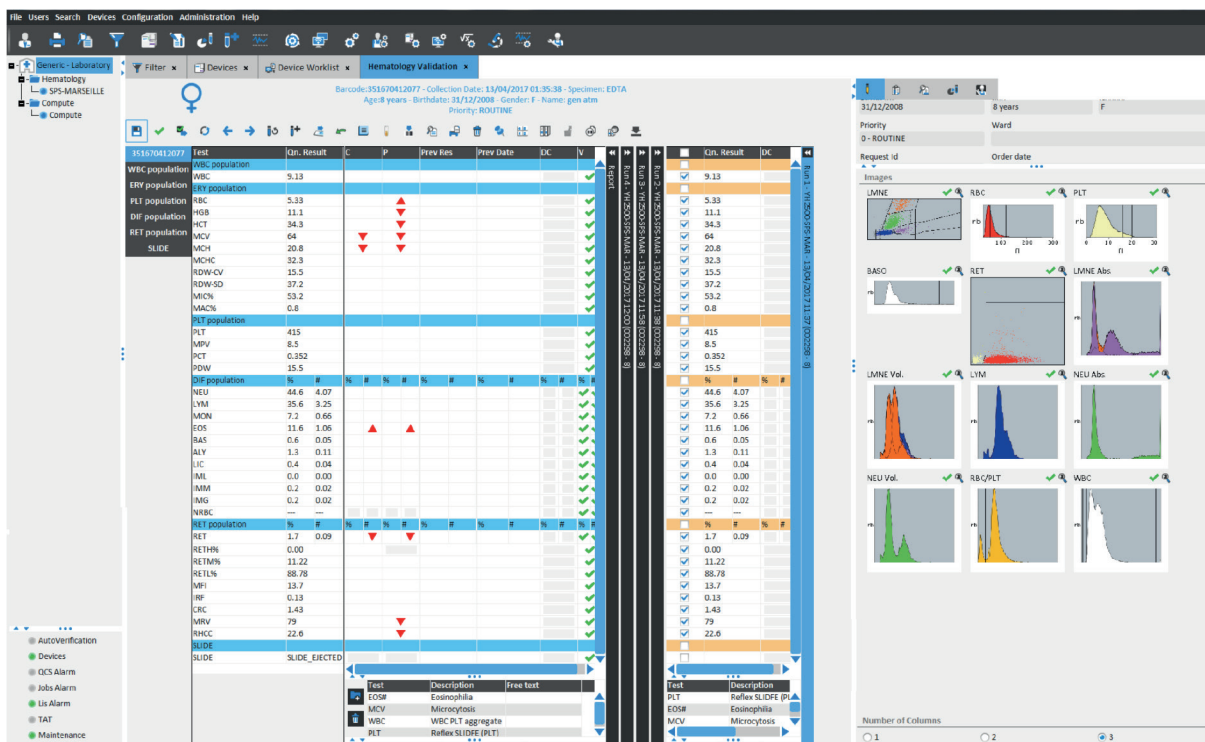




# Eosinophilia

Female patient, 8 years old.

Microcytic, hypochromic anemia.



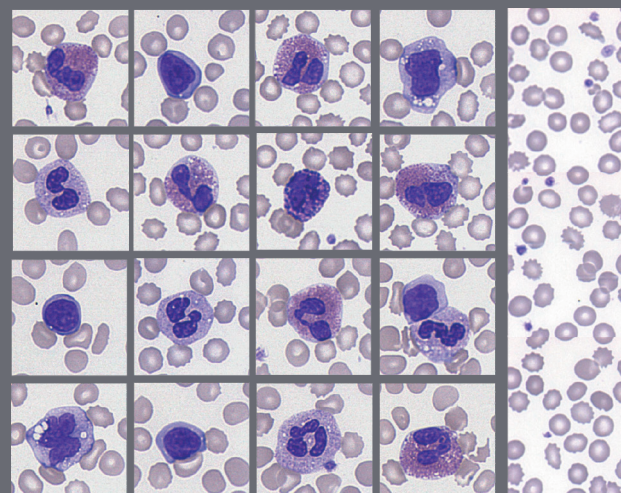
1. On the DIFF scattergram we observe the presence of eosinophil population.
2. On the RBC histogram we observe the presence of the microcytic population. The Yumizen H2500 is able to give a value of microcyte cells: 53.2% of the total RBC population have a maximum volume of 58 fl.
3. On the WBC distribution histogram, we observe the ratio of the granulocyte population that contains the eosinophils.

## Manual DIFF

NEU% 31.9  
LYM% 46.9  
MON% 3.9  
EOS% 15.4  
BAS% 1.9

## RBC morphology:

Microcytosis.  
Echinocyte artefacts due to the age of the sample.

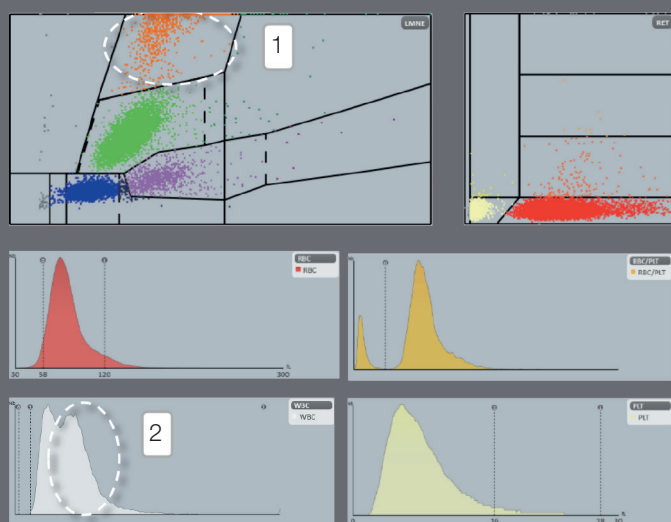
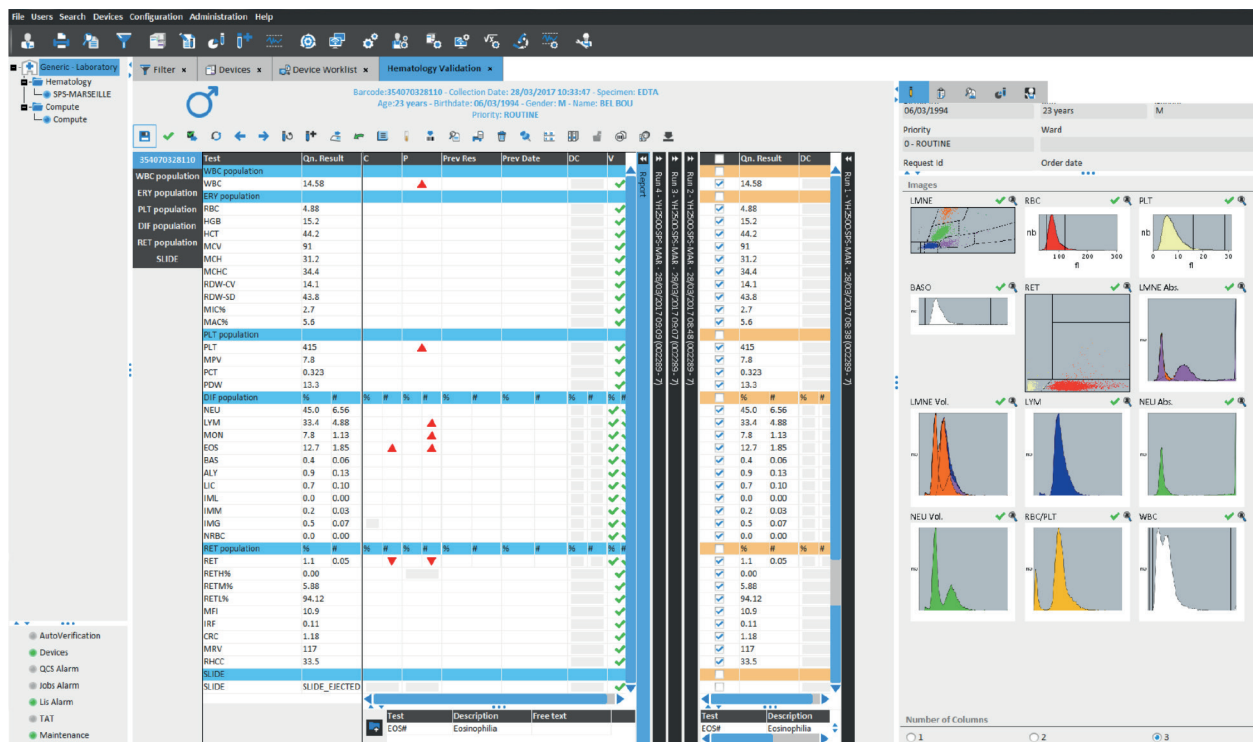


# Eosinophilia

**Male patient, 22 years old.**

Moderate eosinophilia.

Allergy in a patient sensitive to spring pneumallergens.

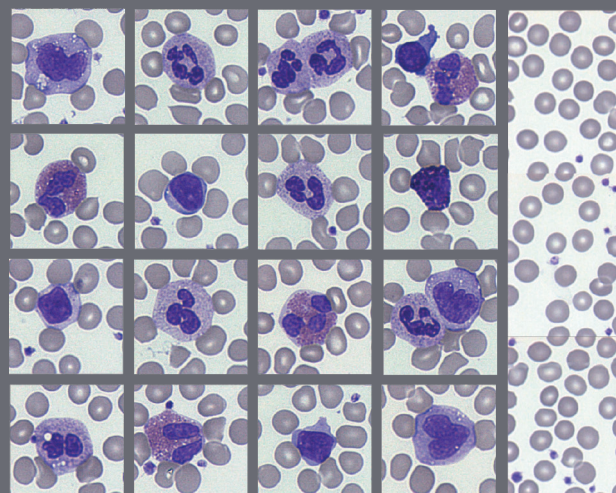


1. On the DIFF scattergram, we observe the eosinophil population. The granulations of the eosinophil provide a high optical absorbance and then are differentiated of the neutrophils.
2. On the WBC histogram, we observe the peak of the granulocytes where the eosinophils are included.

## Manual DIFF

NEU% 48.9  
LYM% 33.3  
MON% 7.1  
EOS% 9.8  
BAS% 0.9

**RBC morphology:**  
*Normal morphology.*

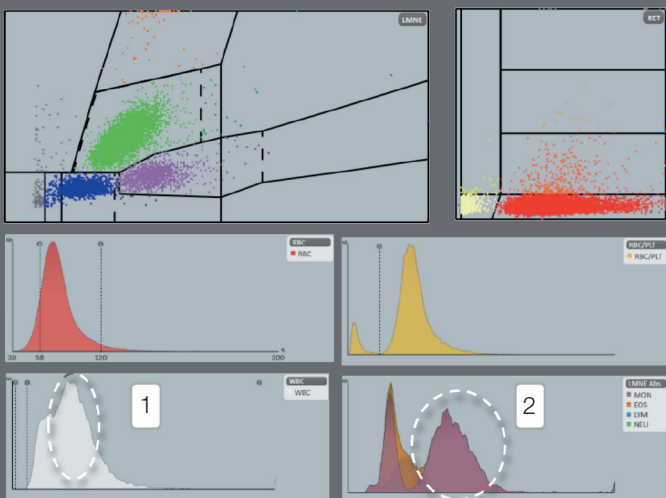
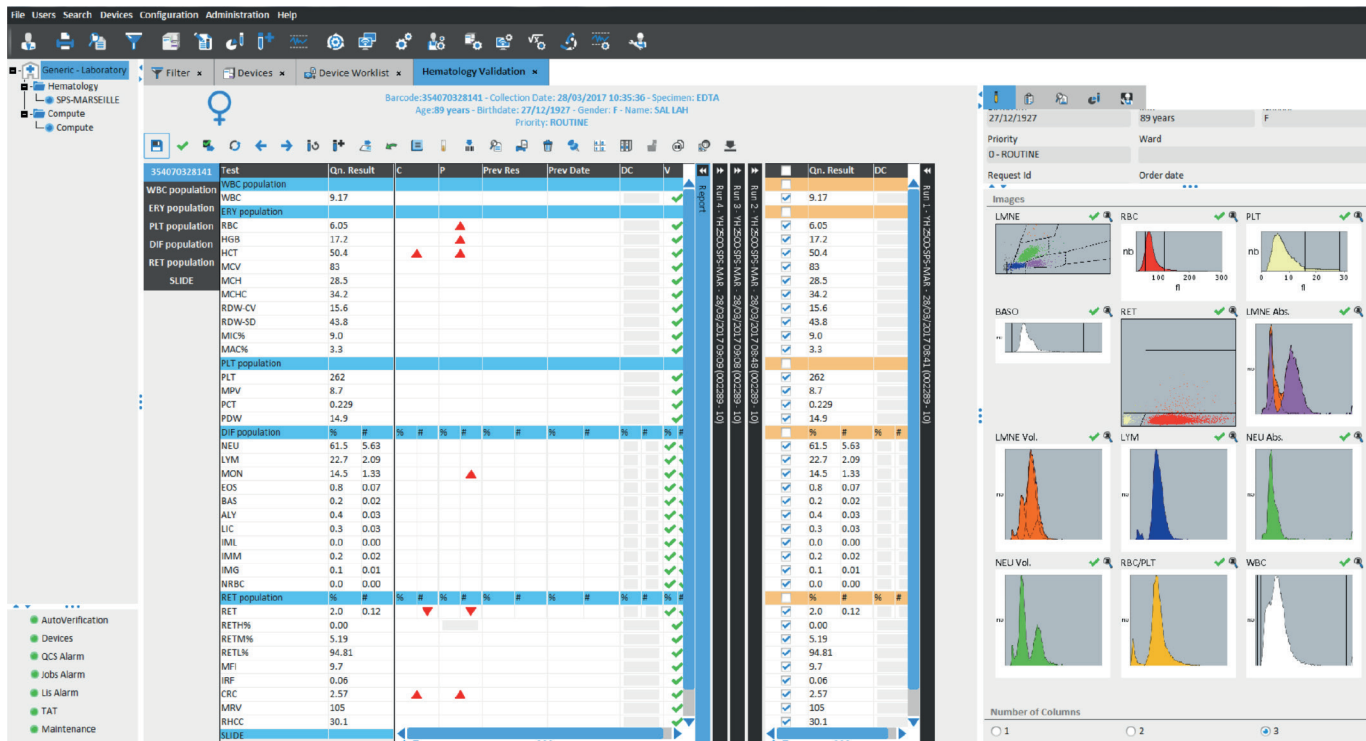


# Monocytosis

**Female patient, 89 years old.**

Moderate monocytosis.

Cardiology intensive care unit.

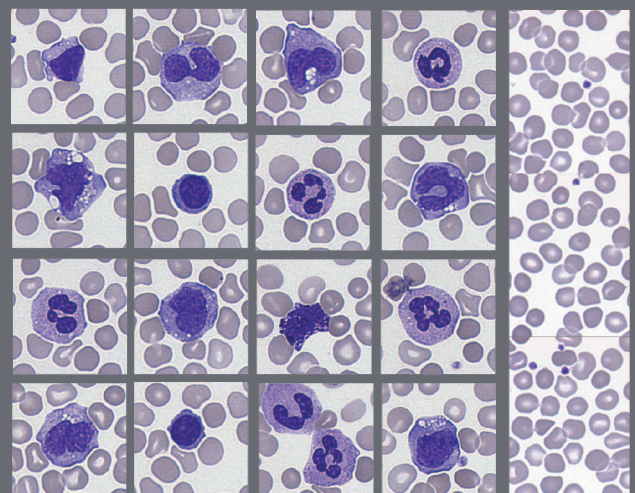


1. On the WBC histogram we observe the presence of monocyte population : there is no valley between the lymphocytes and the granulocytes.
2. On the LMNE histogram, we observe the peak of the monocyte population.

## Manual DIFF

NEU% 65.7  
LYM% 21.9  
MON% 11  
BAS% 1.4

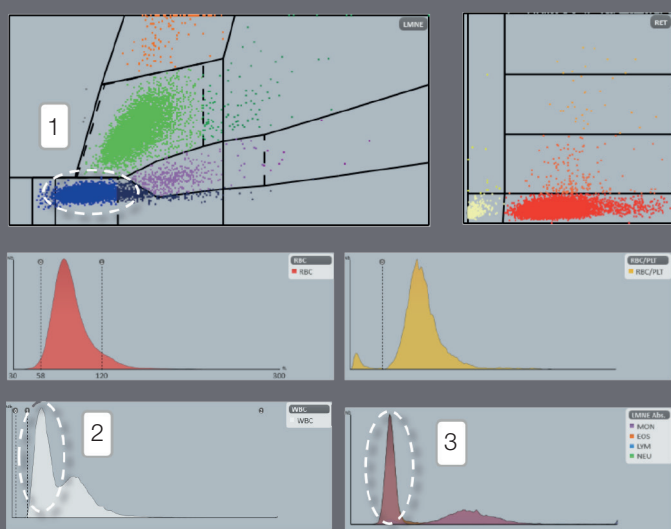
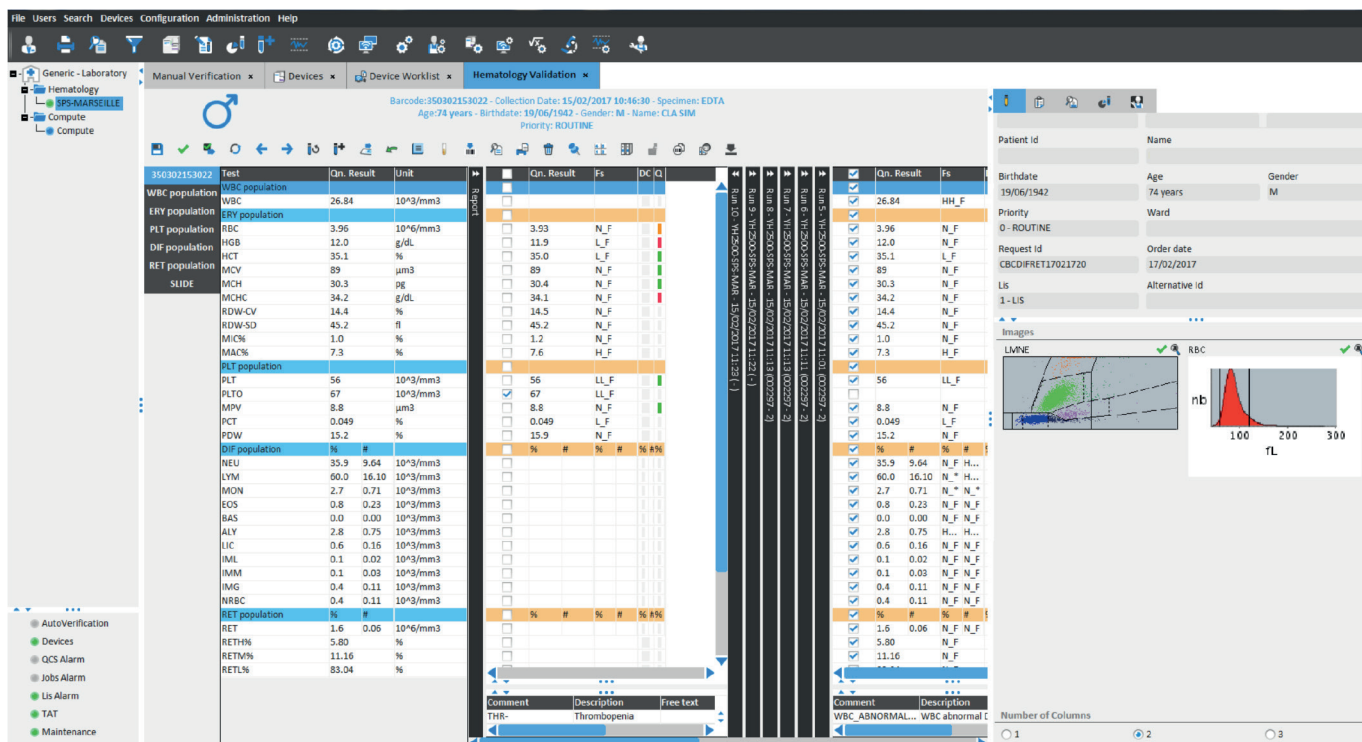
**RBC morphology:**  
Normal morphology.





# Lymphocytosis

Male patient, 74 years old.

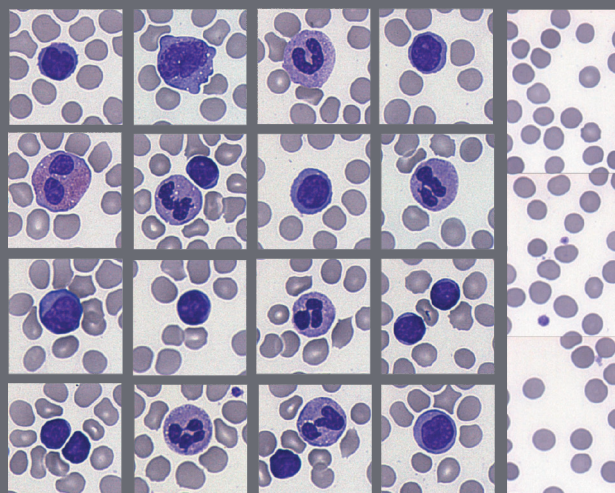


1. On the DIFF scattergram, we observe the important lymphocyte population.
2. On the WBC histogram, we observe the ratio of the lymphocyte population is higher than the granulocyte population.
3. On the LMNE histogram, the peak of the lymphocyte population is confirmed.

## Manual DIFF

NEU% 38.4  
LYM% 60.3  
MON% 0.4  
EOS% 0.9

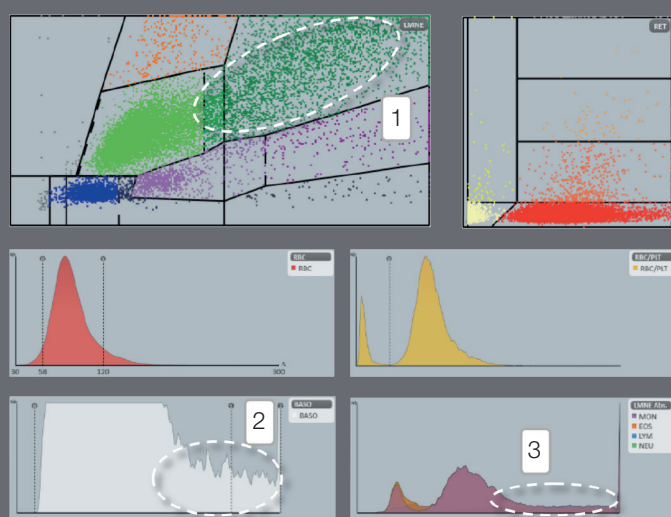
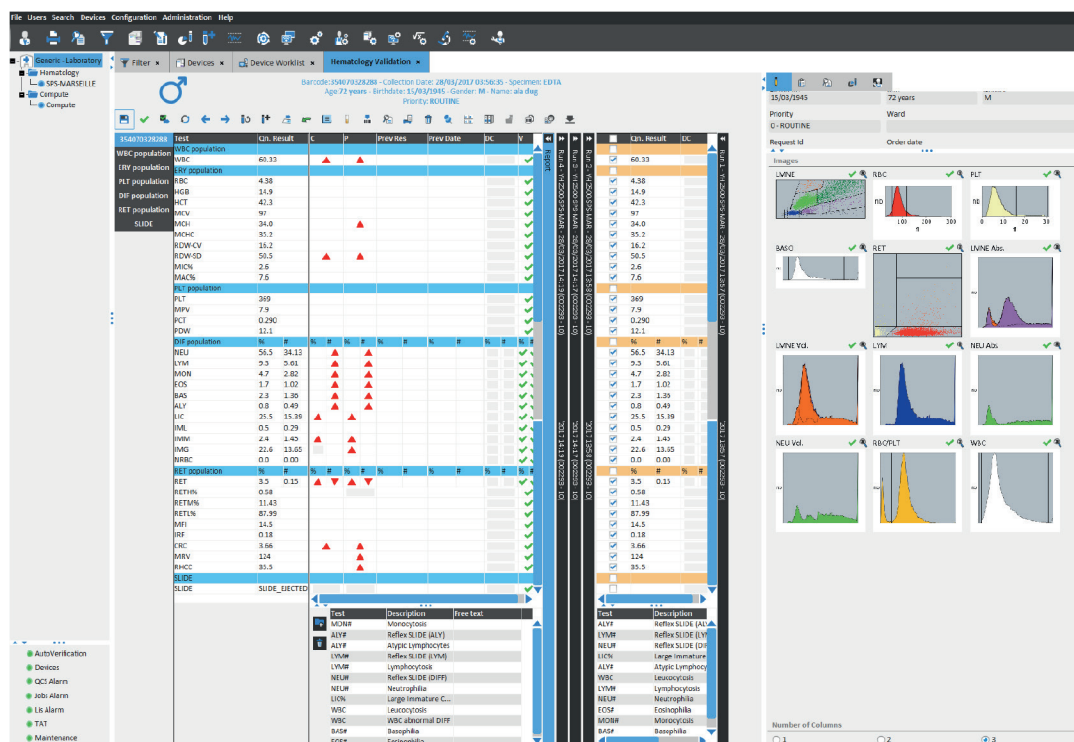
**RBC morphology:**  
Normal morphology.



# Immature granulocytic cells

Male patient, 72 years old.

Out patient medicine unit.  
CML in chemotherapy treatment.



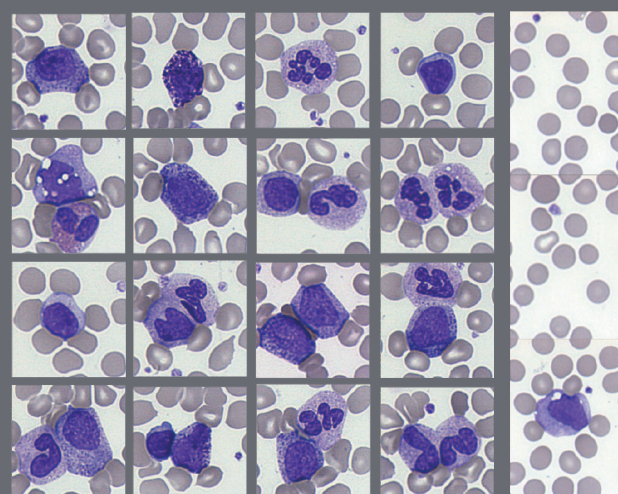
1. On the DIFF scattergram we observe the immature granulocytic population (IMG = 22.6% counted on the Yumizen H2500).
2. On the Baso histogram, we observe the immature population on the right of the curve.
3. On the DIFF absorbance distribution we observe the immature population on the right of the curve.

## Manual DIFF

NEU% 56.0  
LYM% 6.1  
MON% 8.1  
EOS% 1.6  
BAS% 2.8

Meta% 10.1  
Myelo% 15.3

**RBC morphology:**  
*Anisocytosis*

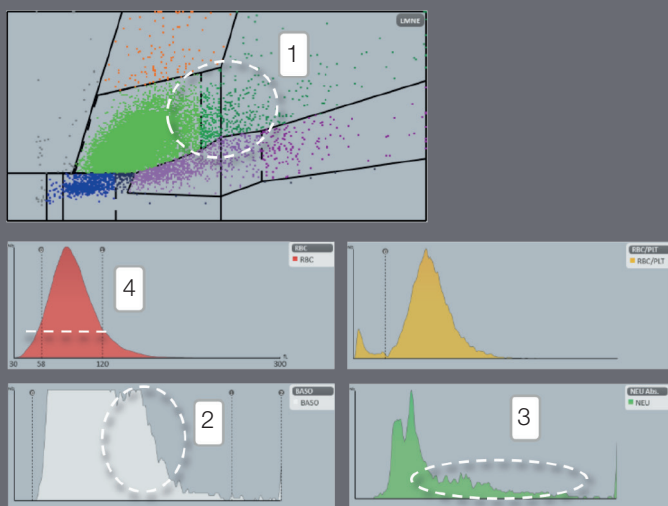
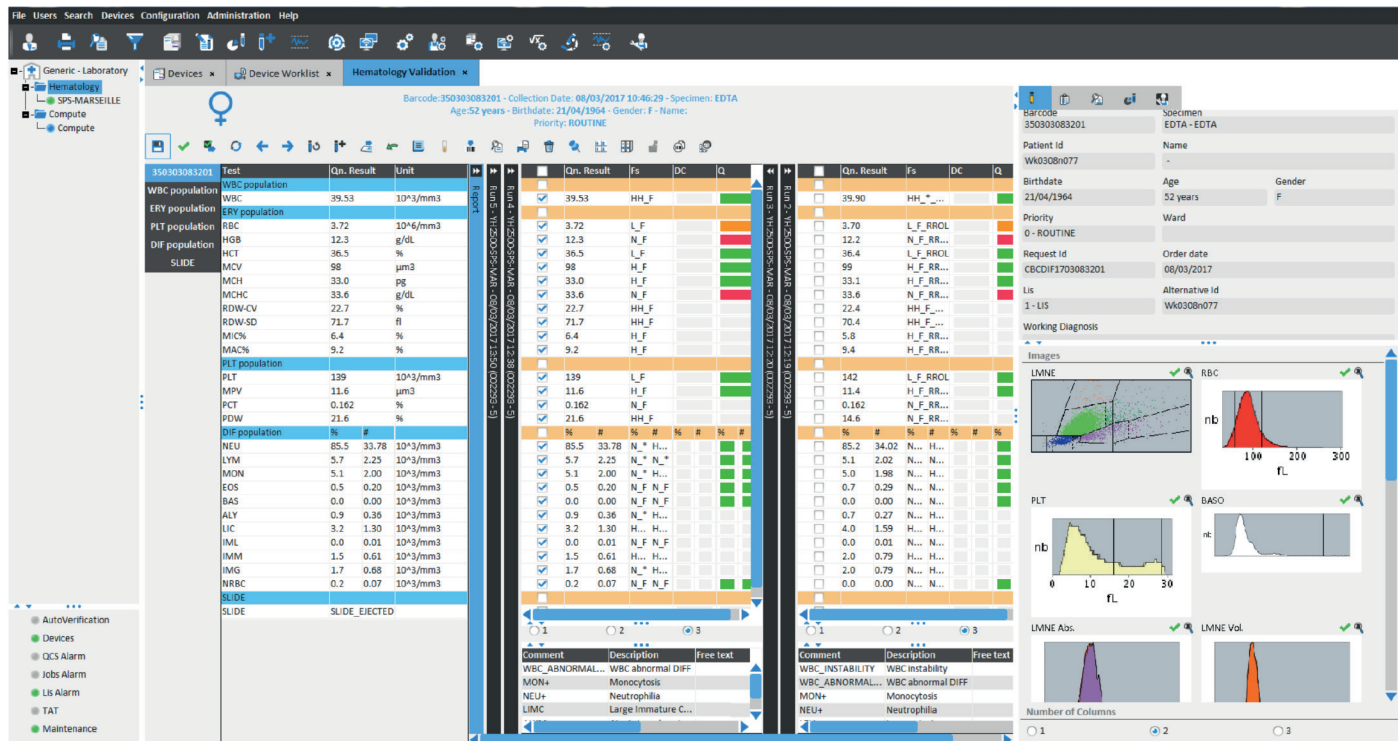




# Immature granulocytic cells

Female patient, 52 years old.

Digestive surgery care unit.

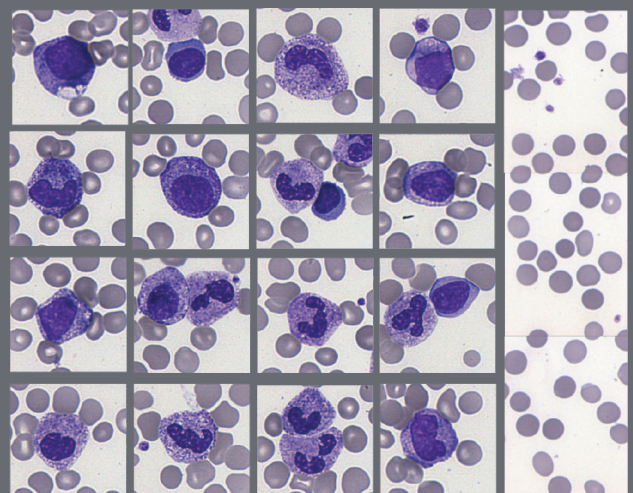


1. On the DIFF scattergram we observe the presence of immature granulocytic cells. The population is essentially located in the bottom of the IMG area which gives information on the degree of cells maturity: more metamyelocytes than myelocytes.
2. On the Baso histogram, and also on the NEU histogram (3), we observe the immature population on the right part of the curve.
4. On the RBC histogram, we observe the large distribution representative to the anisocytosis.

## Manual DIFF

NEU% 86.4  
LYM% 3  
MON% 0.4  
Meta% 8.1  
Myelo% 2.1

**RBC morphology:**  
*Anisocytosis.*





# Immature granulocytic cells

**Female patient, 56 years old.**

Intensive care unit.

Breast and ovarian cancers.

Procalcitonin: 6.9 ng/mL.

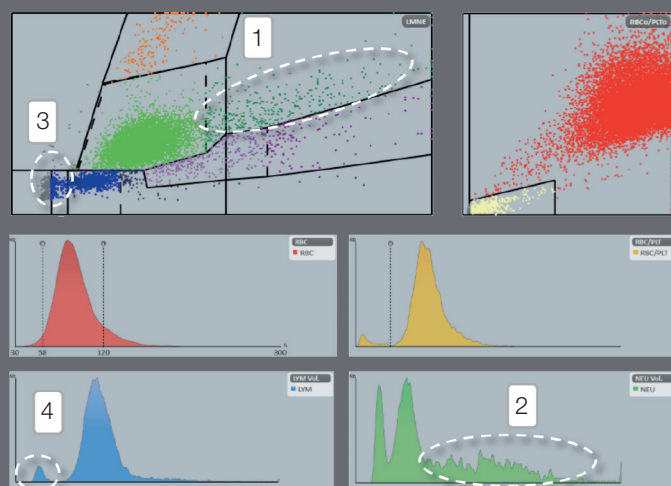
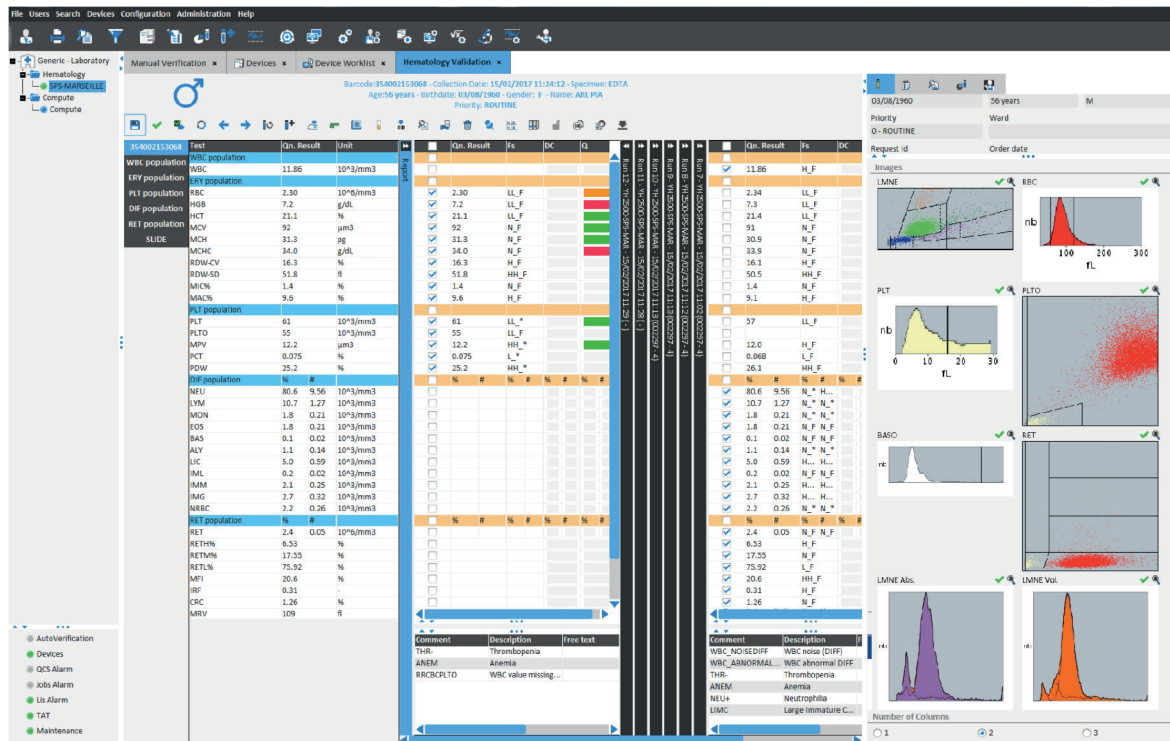
Procalcitonin is a pro-hormone marker of infectious.

Norms: 0 – 0.05 ng/mL.

Low risk of sepsis: 0.05 – 0.5 ng/mL.

Sepsis risk: 0.5 – 2 ng/mL.

Sever sepsis infectious: > 2 ng/mL.



1. On the DIFF scattergram we observe the immature granulocytic population.
2. On the neutrophil distribution histogram, we observe a population corresponding to the immatures cells presence.
3. On the DIFF scattergram we observe the presence of erythroblast population. The number of erythroblast is measured and the population is not included in the WBC counting.
4. On the Lymphocyte distribution histogram, we observe a peak on the left of the Lymphocyte population which correspond to the erythroblast population.

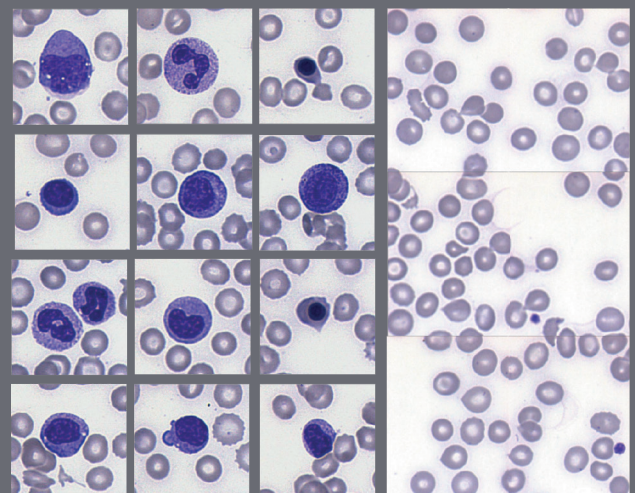
## Manual DIFF

NEU% 84.7  
LYM% 7.4  
MON% 0.5  
EOS% 2.7  
Meta% 2.1

Myelo% 2.6  
ERB% 5.3

## RBC morphology:

Presence a few target cells, anisocytosis.



# Myelodysplastic syndrome with infection

**Male patient, 67 years old.**

Intensive care unit.

Procalcitonin: 37 ng/mL.

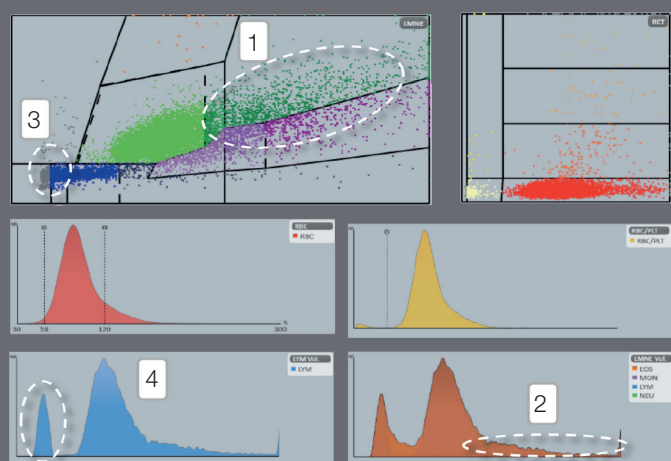
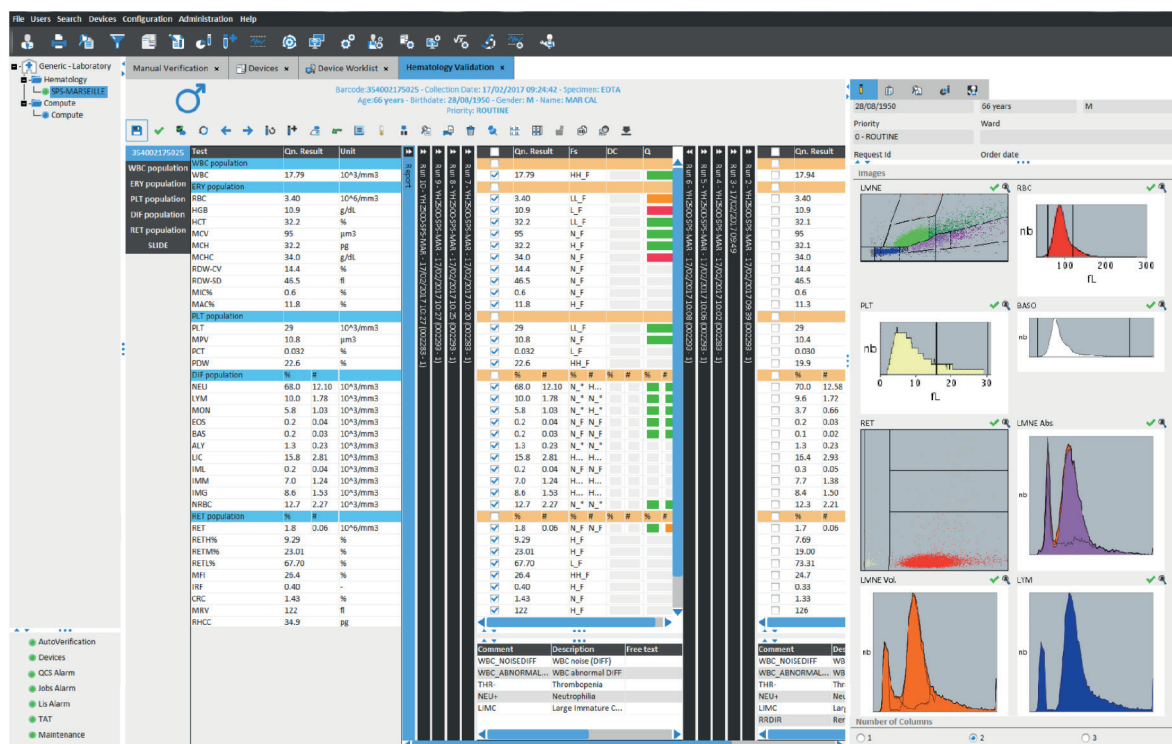
Procalcitonin is a pro-hormone marker of infectious.

Norms: 0 – 0.05 ng/mL.

Low risk of sepsis: 0.05 – 0.5 ng/mL.

Sepsis risk: 0.5 – 2 ng/mL.

Sever sepsis infectious: > 2 ng/mL.



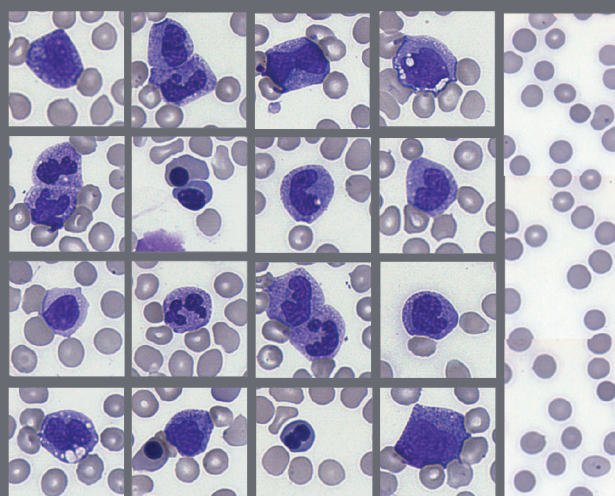
1. On the DIFF scattergram, we observe a population corresponding to the immatures cells presence. Due to the dysmorphies of the cells, the population is situated between the granulocytic and monocytic lines.
2. On the LMNE histogram we observe the immature granulocytic population.
3. On the DIFF scattergram we observe the presence of erythroblast population. The number of erythroblast is measured and the population is not included in the WBC counting.
4. On the Lymphocyte distribution histogram, we observe a peak on the left of the Lymphocyte population which correspond to the erythroblast population.

## Manual DIFF

NEU% 90.7  
LYM% 0.5  
MON% 1.8  
Meta% 5.1

Myelo% 0.9  
Promyelo% 0.5  
Blast% 0.5  
ERB% 16.3

**RBC morphology:**  
Anisocytosis, Jolly bodies.





# RAEB II

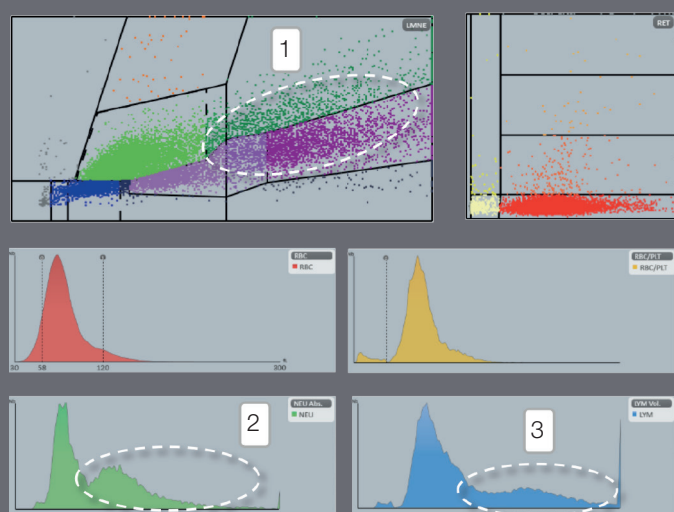
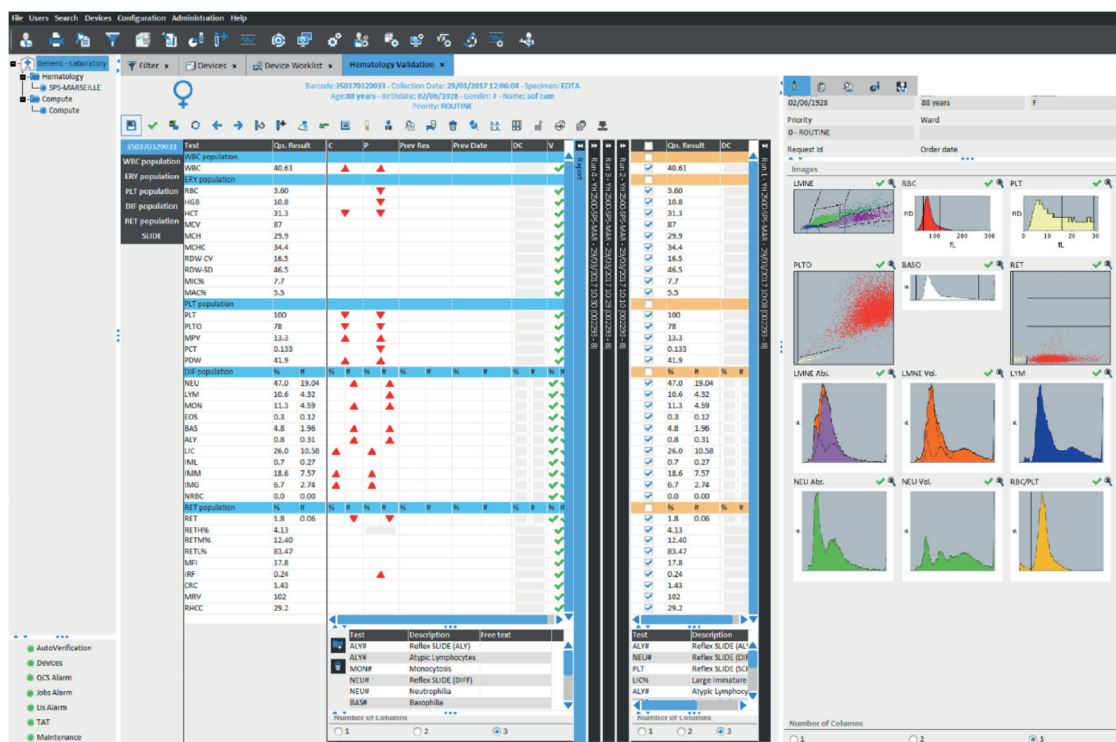
**Female patient, 88 years old.**

Oncology-hematology care unit.

Refractory Anemia with Excess Blast type II.

The RAEB are classified into myelodysplastic syndromes in the FAB classification (or OMS 2016: SMB-EB1).

In the RAEB type II, it is possible to find Auers rods in the blast cells.



1. On the DIFF scattergram, we observe the immature granulocytic line situated between the IMG and IMM. The optical absorbance of degranulated cells is decreased due to morphological abnormalities and the population descends into IMM position.
2. On the NEU histogram, we observe the immature granulocytic population.
3. On the LYM histogram, the immature granulocytic population is also visible.

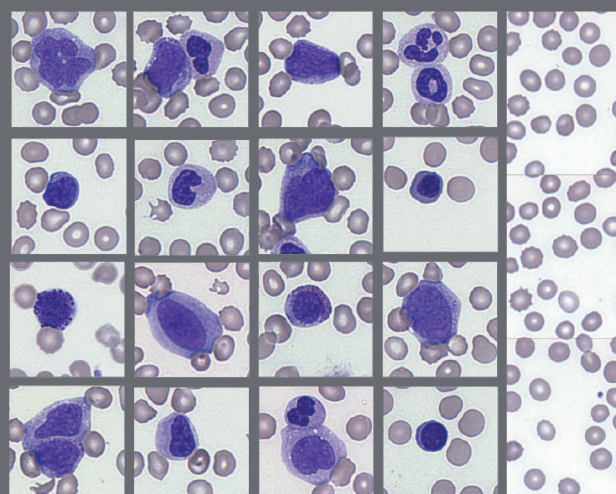
## Manual DIFF

NEU% 56.8  
LYM% 8.6  
MON% 9.9  
EOS% 0.4  
BAS% 0.9

Meta% 10.8  
Myelo% 8.4  
Promyelo% 2.2  
Blast% 2.0  
ERB% 0.9

**RBC morphology:**  
Slight anisocytosis.

**WBC morphology:**  
Cells degranulation of the granulocytic line.

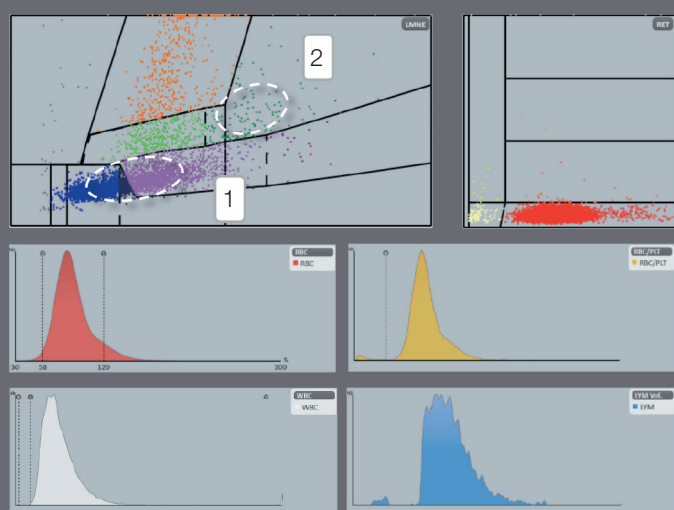




# Acute Myeloid Leukemia M2

Male patient.

AML2 in chemotherapy treatment.



1. On the DIFF scattergram we observe the compact blast population between the lymphocyte, atypical lymphocyte and monocyte areas. The small blasts are situated in the ALY area.
2. On the DIFF scattergram, we observe the small immature granulocytic population in the IMG area.

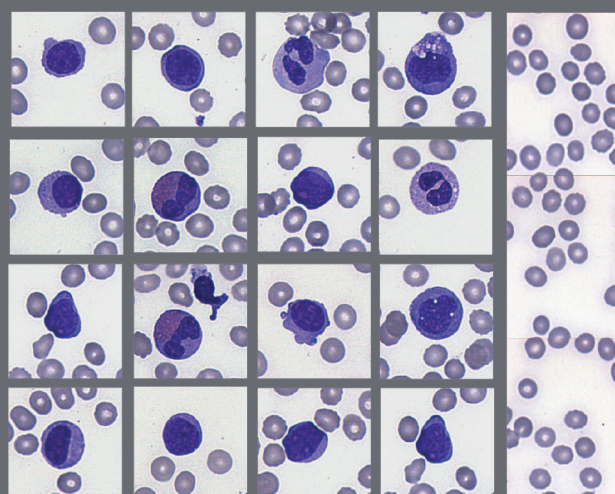
## Manual DIFF

NEU% 4.7  
LYM% 54.8  
MON% 2.4  
EOS% 12.4  
BAS% 0.5

Myelo% 1.9  
Blast% 23.3

## WBC morphology:

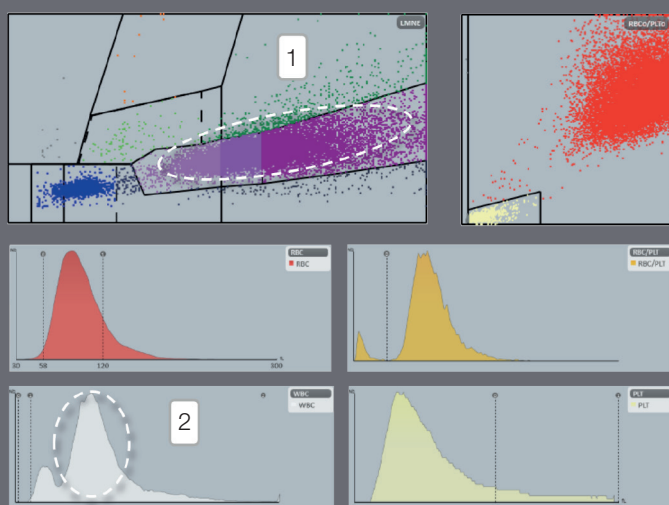
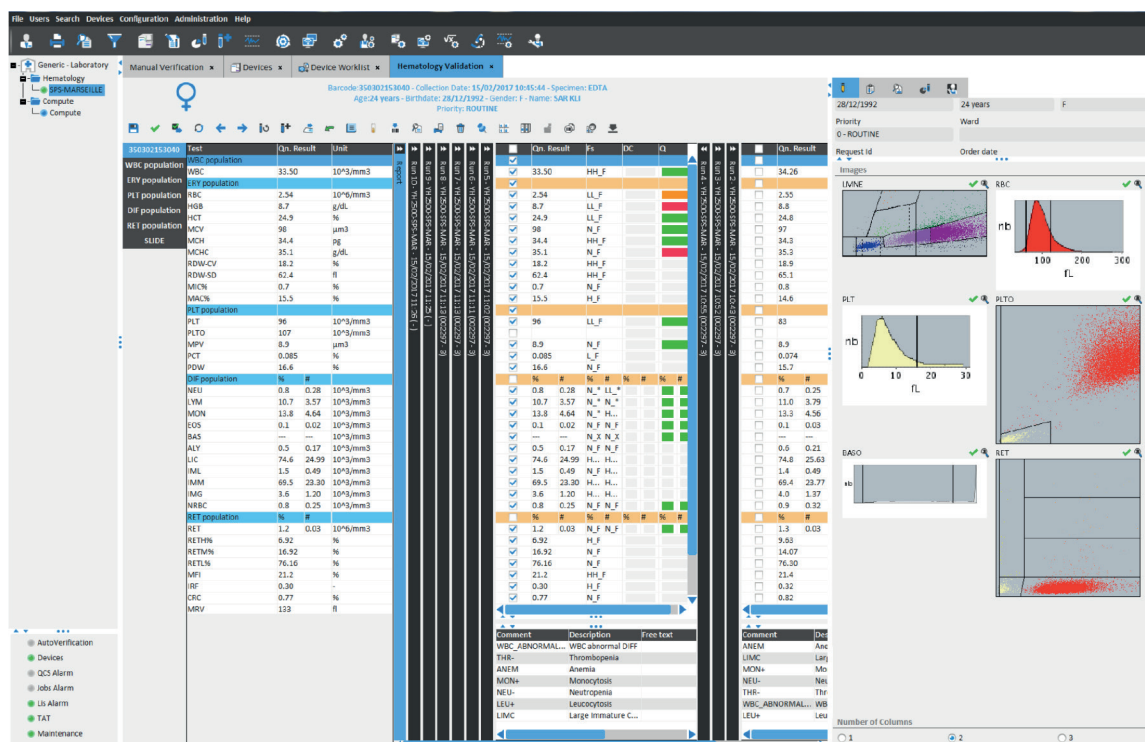
Blasts of small size with nucleolus.  
The small size of the blasts is probably due to the treatment.



# Acute Myeloid Leukemia M5

**Female patient, 24 years old.**

Hematology Intensive care unit.



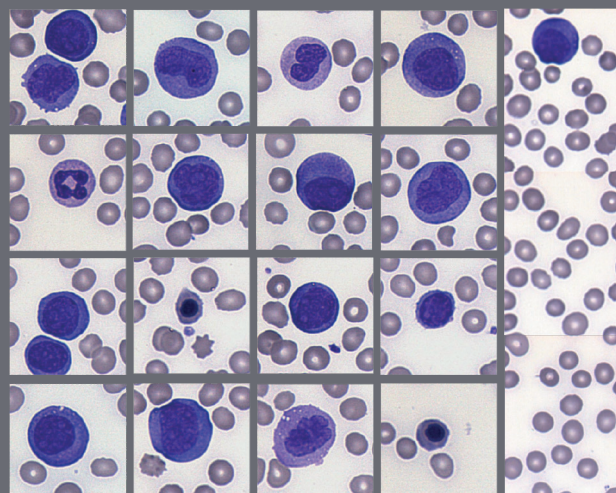
1. On the DIFF scattergram we observe the presence of immature monocytic population. The population is essentially composed of all step of monocytes maturation between the monoblasts, promonocytes and monocytes. The monoid population is perfectly defined in the DIFF scattergram in the dedicated area. We observe also the severe neutropenia.
2. On the WBC histogram, we observe the important ratio of the monocyte cells versus the lymphocyte or granular cells.

## Manual DIFF

NEU% 0.5  
LYM% 21.6  
MON% 4.9  
Blast% 72  
ERB% 2.5

**RBC morphology:**  
*Slight macrocytosis.*

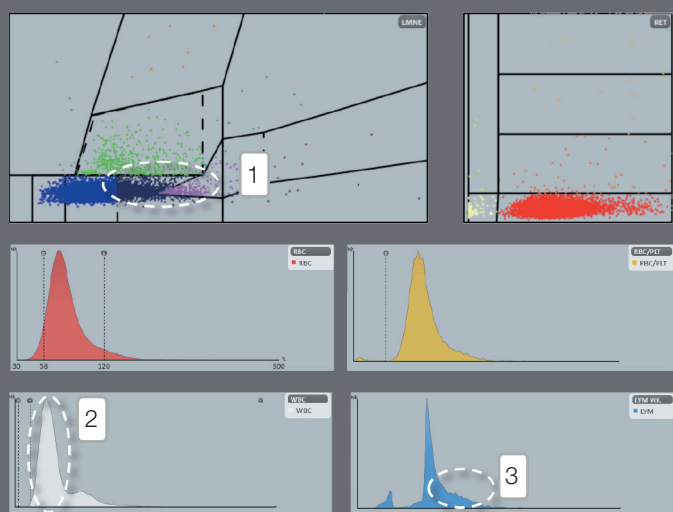
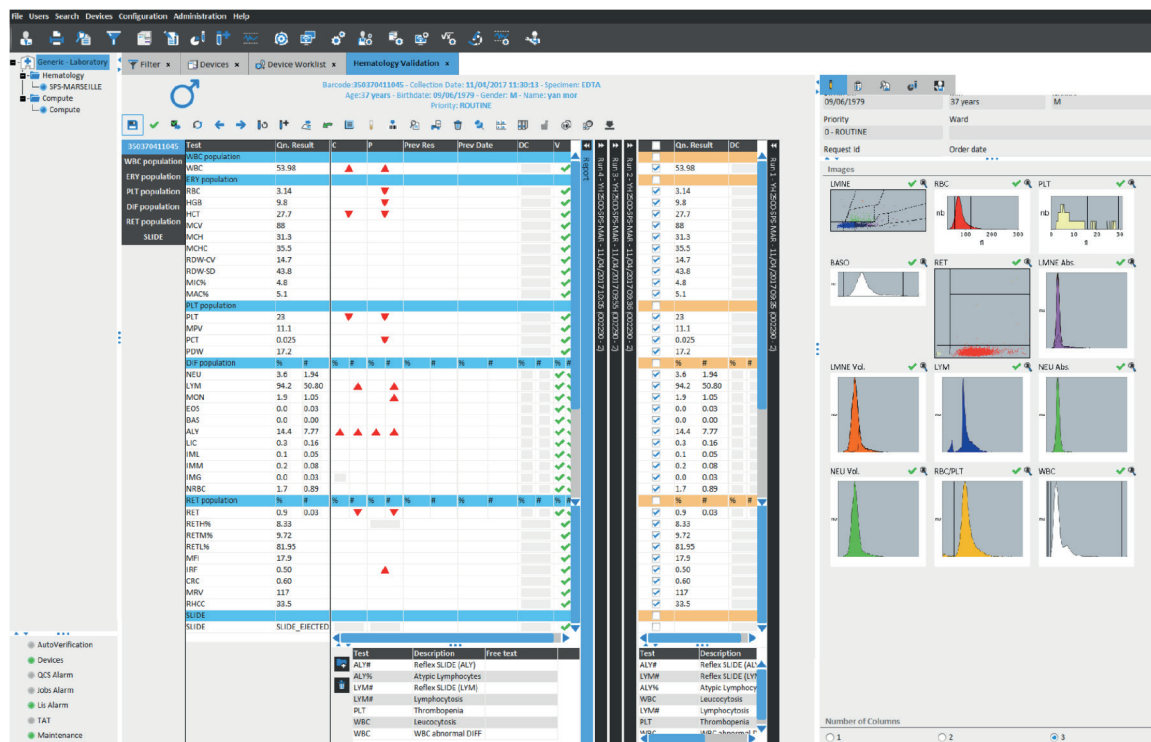
**WBC morphology:**  
All the promonocytes and monoblast forms are classified in the blast population.



# ALL T

Male patient, 38 years old.

Acute Lymphoid Leukemia T.

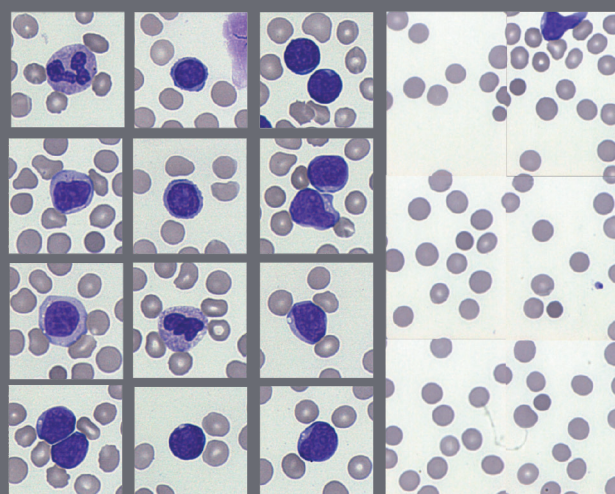


1. On the DIFF scattergram we observe the presence of the lymphoblast population especially in the atypical lymphocyte area.
2. On the WBC histogram, we observe a peak of the lymphocytic population.
3. The histogram of lymphocyte distribution confirm the presence of large atypical lymphocyte population corresponding to the blastic population.

## Manual DIFF

NEU% 1.9  
LYM% 9.6  
Blast% 88.5

**RBC morphology:**  
*Anisocytosis.*



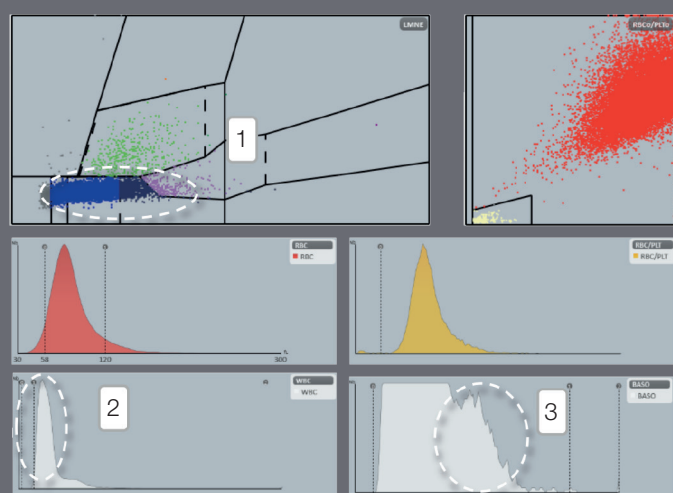
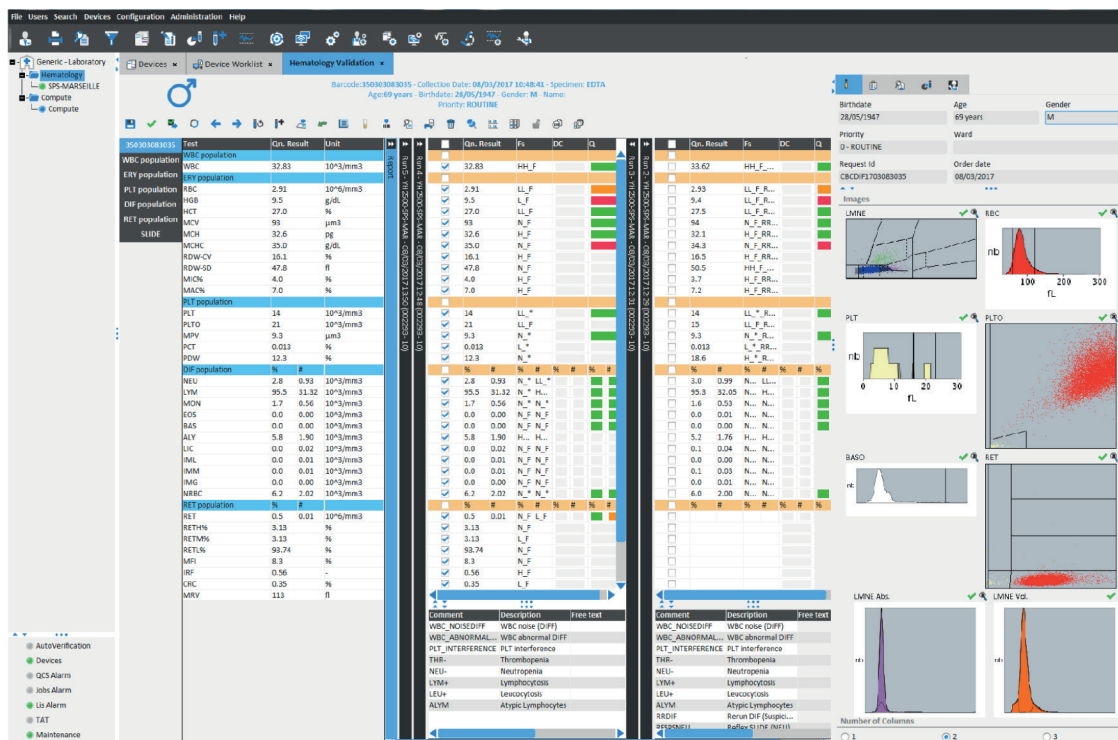


# Chronic Lymphoid Leukemia

**Male patient, 69 years old.**

Cardiovascular Intensive care unit.  
Renal failure and acute cardiac failure with troponin 0.21 µg/L.

The troponin is a marker of muscle injury.  
The troponin is increased in case of myocardial infarction, and also pulmonary embolism, myocardial inflammation, chronic heart failure or end-stage of renal disease.  
Normal range < 0.04 µg/L.



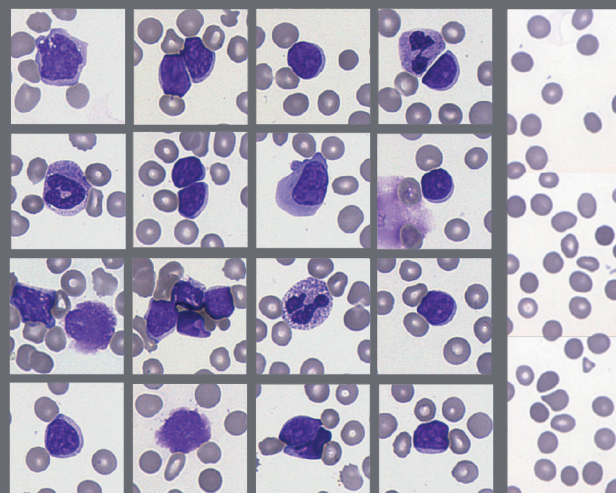
1. On the DIFF scattergram we observe the presence of atypical lymphocytes and immature lymphocytic cells from the CLL.
  2. On the WBC histogram, we observe the ratio of the lymphocyte population is higher than the granulocytic population.
  3. On the Baso histogram, we observe large cells on the right of the curve which correspond to the abnormal forms cells of the CLL.
- Results with smudges cells included in the lymphocyte population:  
NEU% 1.7, LYM% 98.3.

## Manual DIFF

NEU% 2.4  
LYM% 97.6

**RBC morphology:**  
*Anisocytosis, poikilocytosis.*

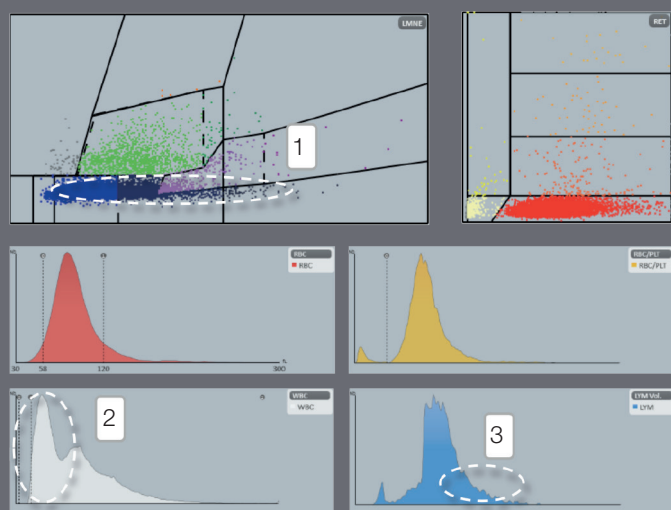
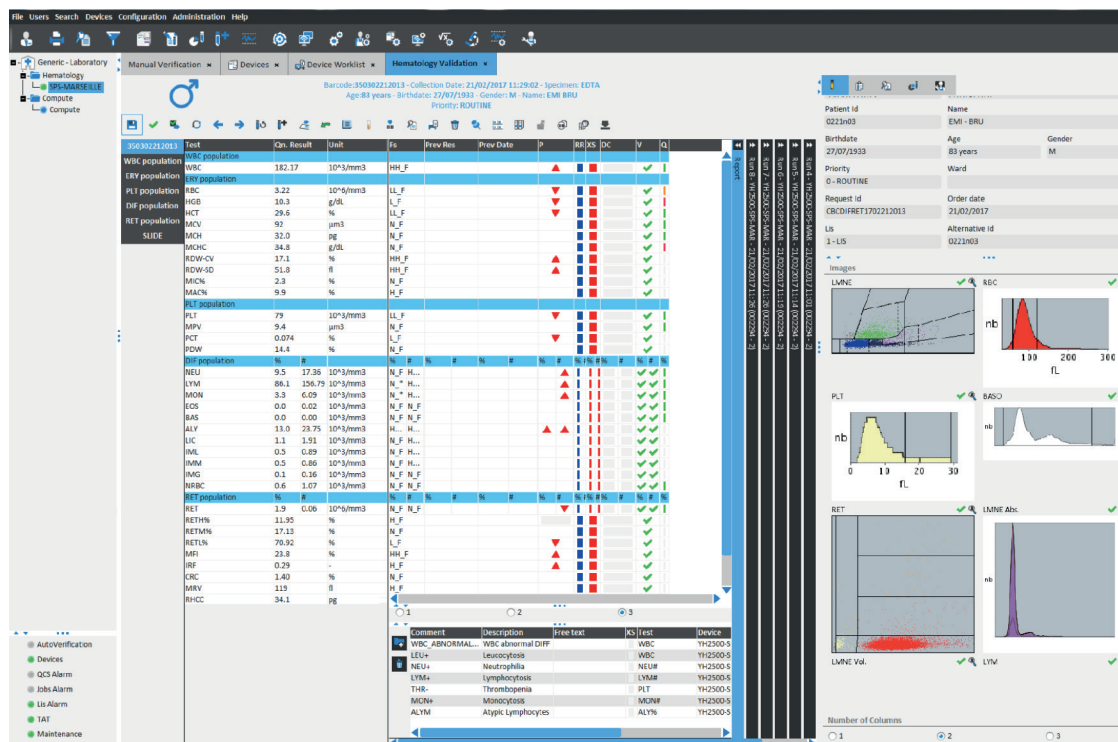
**WBC morphology:**  
*The Gumprecht shadows cells (smudge cells) are not counting in the lymphocyte population.*



# Chronic Lymphoid Leukemia

Male patient, 84 years old.

WBC =  $182.17 \times 10^3/\text{mm}^3$ .



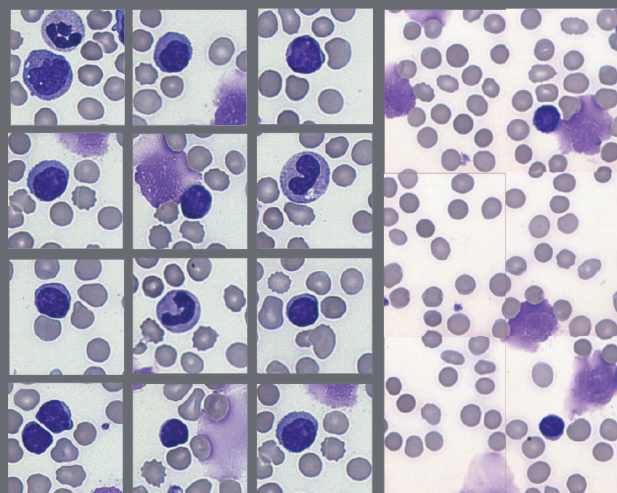
1. On the DIFF scattergram we observe the presence of atypical lymphocytes and immature lymphocytic cells from the CLL.
  2. On the WBC histogram, we observe the ratio of the lymphocyte population is higher than the granulocytic population.
  3. On the Lymphocyte distribution histogram, we observe large cells on the right of the lymphocyte population which correspond to the large cells from the CLL.
- Results with smudges cells included in the lymphocyte population:  
 NEU% 1.1, LYM% 98.7, MON% 0.2.

## Manual DIFF

NEU% 5.7  
 LYM% 93.5  
 MON% 0.8

**RBC morphology:**  
 Few anisocytosis.

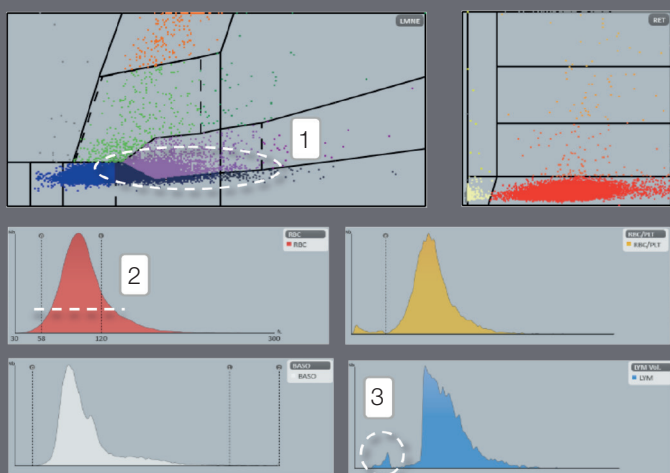
**WBC morphology:**  
 The Gumprecht shadows cells (smudge cells) are not counting in the lymphocyte population.



# CLL with prolymphocytes

**Male patient, 70 years old.**

Hematology department.  
Chronic Lymphoid Leukemia.



1. On the DIFF scattergram we observe the immature lymphocytic population.
2. On the RBC histogram, we observe the large distribution of RBC with the macrocytic population.
3. On the Lymphocyte distribution histogram, we observe a peak on the left of the Lymphocyte population which correspond to the erythroblast population.

Results with smudges cells included in the lymphocyte population:  
NEU% 0.5, LYM% 92.2, MON% 0.7, EOS% 2, Polympho% 4.6, ERB% 1.

## Manual DIFF

NEU% 1.2  
LYM% 80.1  
MON% 1.9  
EOS% 5  
Polympho% 11.8

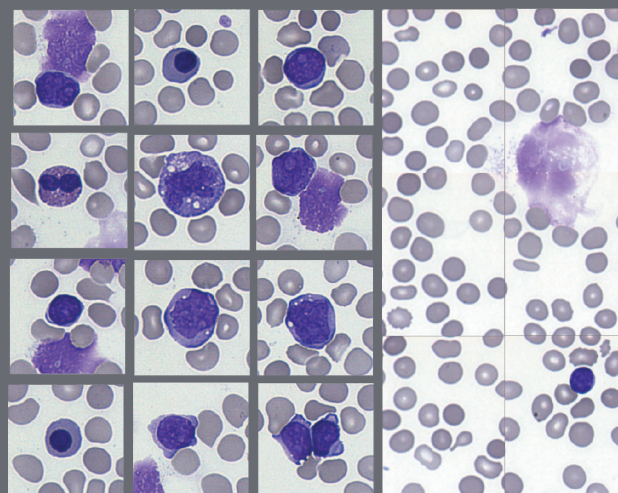
ERB% 2.5

### RBC morphology:

Anisocytosis, macrocytes, poikilocytosis.

### WBC morphology:

The Gumprecht's cells (smudge cells) are not counting in the lymphocyte population.

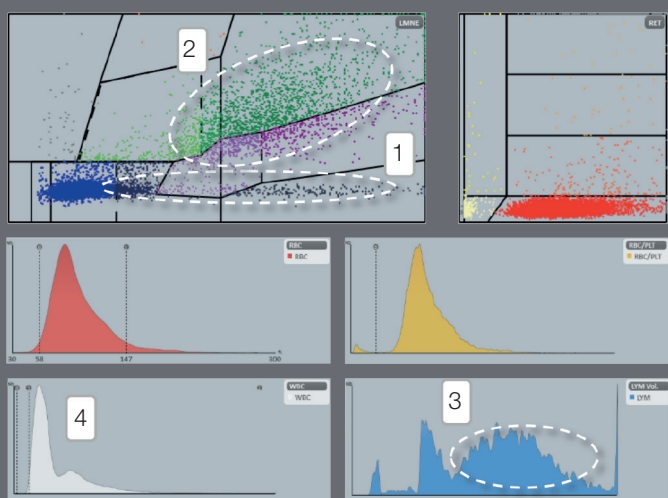
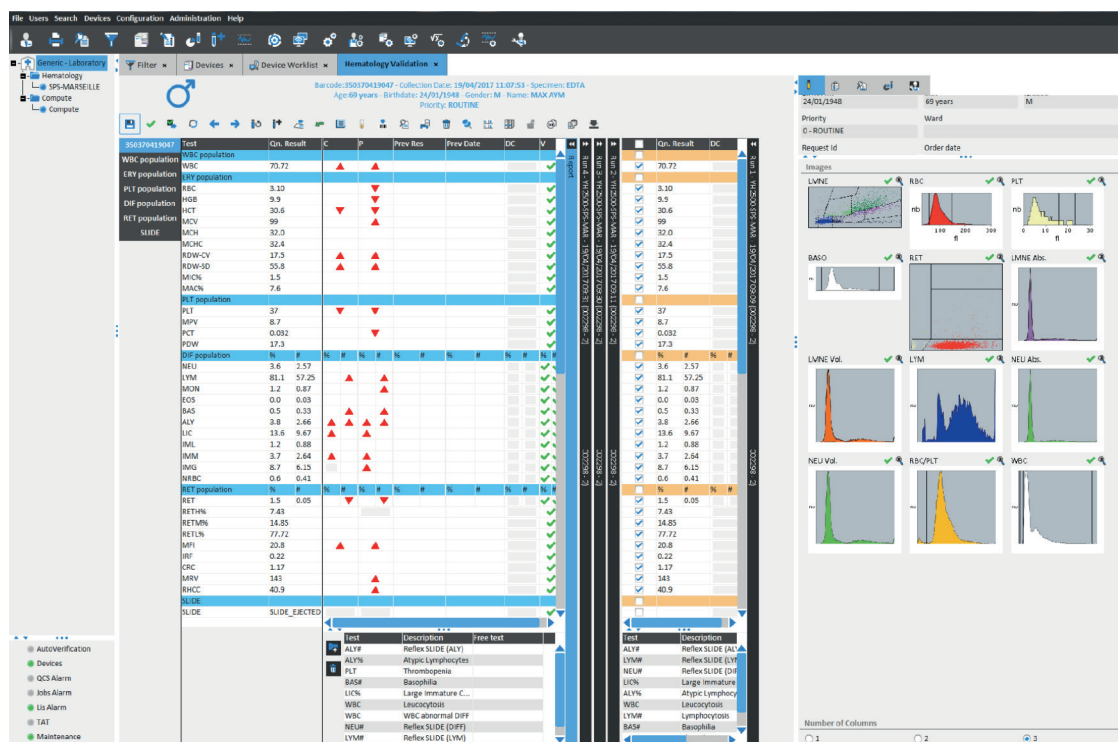




# CLL + AML3

Male patient, 69 years old.

Hematology department.  
Combined CLL and Acute Leukemia  
Myeloid - M3.



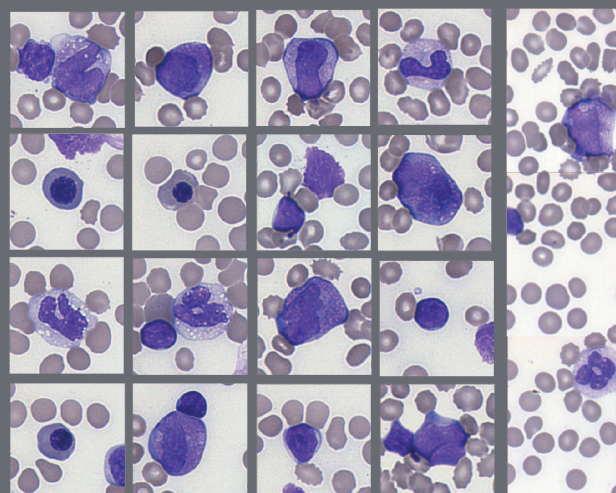
1. On the DIFF scattergram we observe the presence of immature lymphocytic cells from the CLL.
2. On the DIFF scattergram we observe the presence of immature granulocytic cells from the AML3. The position of the population move to the IMM because the cells present morphological abnormalities.
3. On the LYM distribution histogram, we observe a population corresponding to the immatures cells presence from the CLL.
4. On the WBC distribution histogram, we observe the high ratio between the lymphocytes and the IMG populations.

## Manual DIFF

NEU% 0.5  
LYM% 92.7  
MON% 2.7  
Myelo% 4.1  
ERB% 3.2

**RBC morphology:**  
*Anisocytosis.*

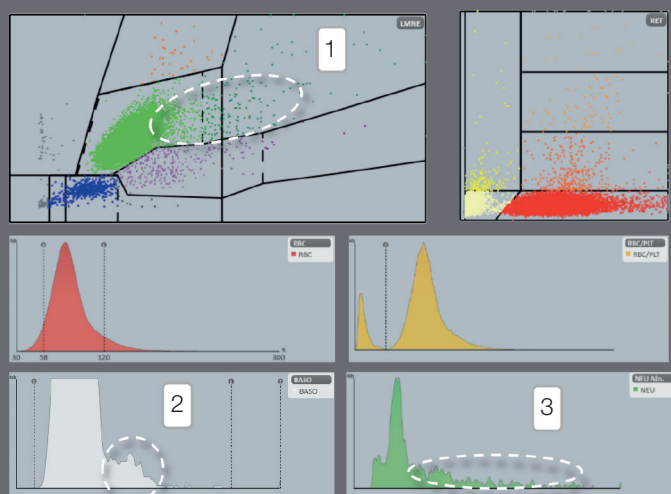
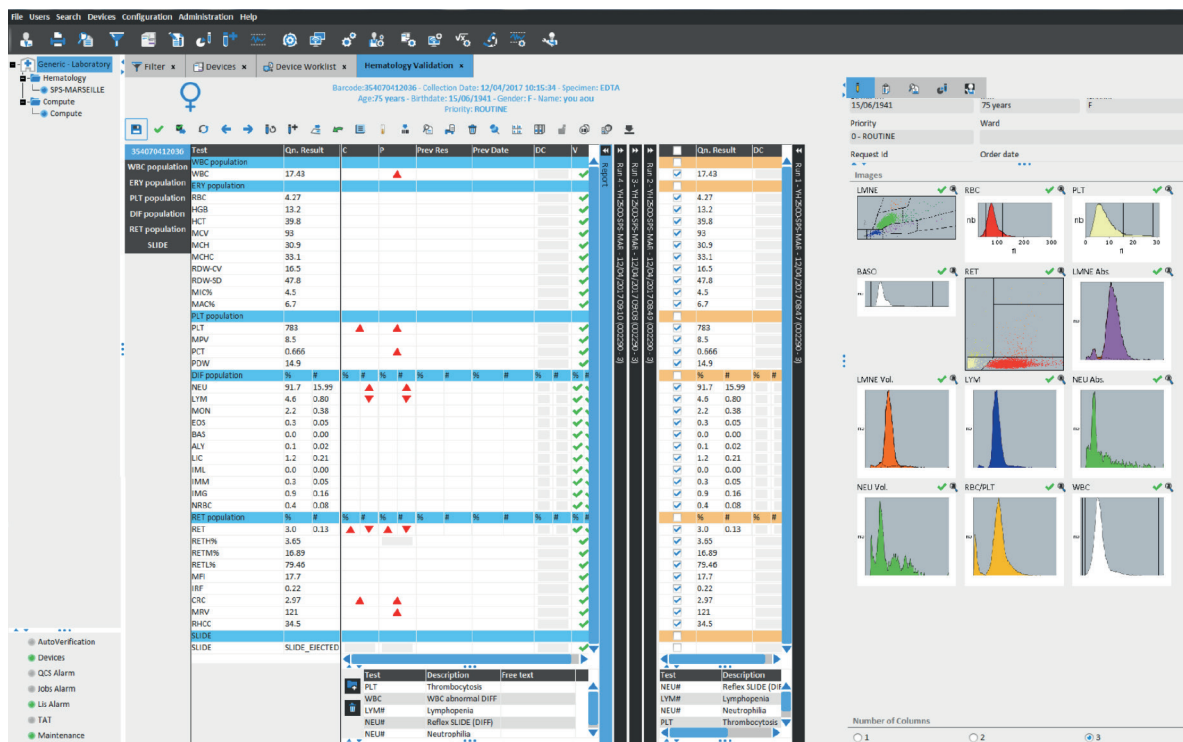
**WBC morphology:**  
*Granulocytic dysmorphia with hyper-granulocytosis and irregular form of the nucleus indented.*



# Hypersegmented neutrophils

Female patient, 75 years old.

It is possible to observe the hypersegmentation of neutrophils in megaloblastic anemias and sometime in myelodysplasias. Individuals who are receiving chemotherapy or have long-term chronic infections may also have hypersegmented neutrophils.



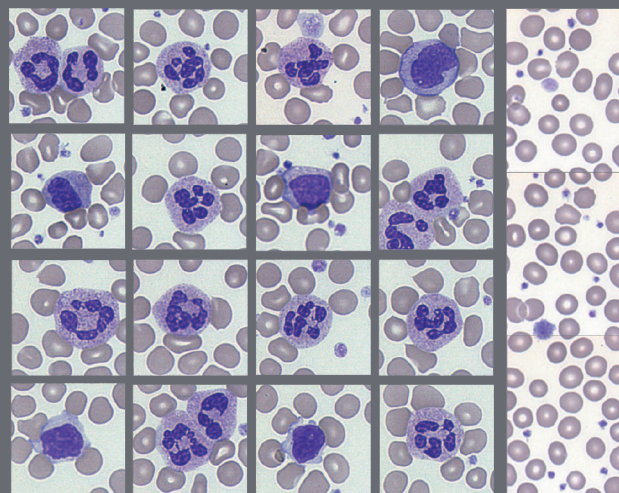
1. On the DIFF scattergram we observe the presence of few immature granulocytic cells. The hypersegmented neutrophils are included in the neutrophil population.
2. On the BASO histogram, we observe also the few immature granulocytic population on the right part of the curve.
3. On the NEU histogram, we observe large cells on the right of the curve.

## Manual DIFF

NEU% 97.5  
LYM% 1.3  
MON% 0.5  
Myelo% 0.9

**RBC morphology:**  
Normal morphology.

**WBC morphology:**  
Hypersegmented neutrophils.





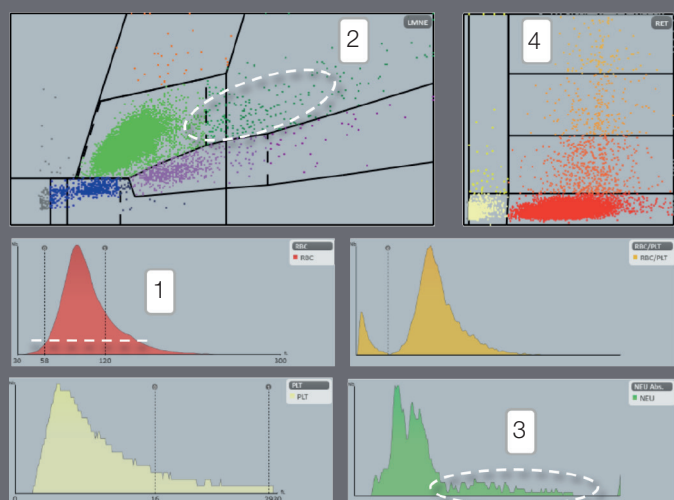
# Vitamin B9 deficiency

## Male patient, 53 years old.

Intensive care unit. Macrocytic,  
normochromic, regenerative anemia.

Speciafoldine treatment. Normal Vitamin B12.

Vitamin B9, or folic acid, has a role in the metabolism. The deficiency in Vit. B9 causes principally a macrocytic (megaloblastic) anemia, but also neural tube defects. Normal range 10 - 45 nmol/L. Vitamin B12, or cobalamin, has also a similar role in the hematopoiesis and neuropathy. Normal range 133 - 675 pmol/L. The Speciafoldine® drugs contains folic acid.



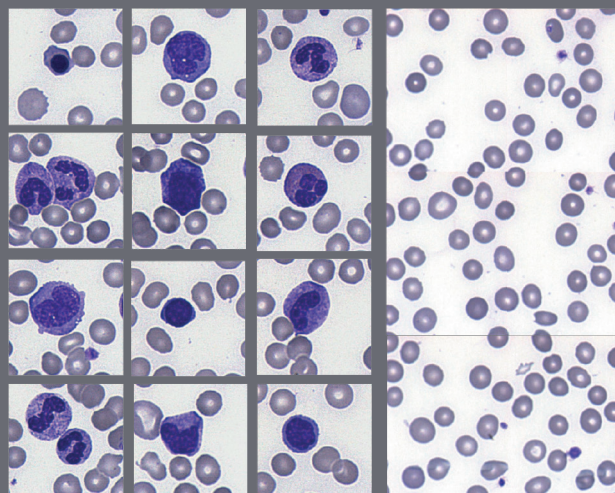
1. On the RBC histogram we observe the anisocytosis with the macrocytic population on the right of the curve.
2. On the DIFF scattergram, we observe the small immature granulocytic population. This population is also visible on the NEU histogram on the right of the curve (3).
3. On the NEU histogram, we observe the small immature granulocytic population on the right of the curve.
4. On the RET histogram, we observe the reticulocyte population with the high regenerative activity: RET H and RET M.

## Manual DIFF

NEU% 93.1  
LYM% 3.2  
MON% 1.8  
EOS% 0.5

Meta% 0.9  
Myelo% 0.5  
ERB% 1

**RBC morphology:**  
*Anisocytosis, macrocytes.*

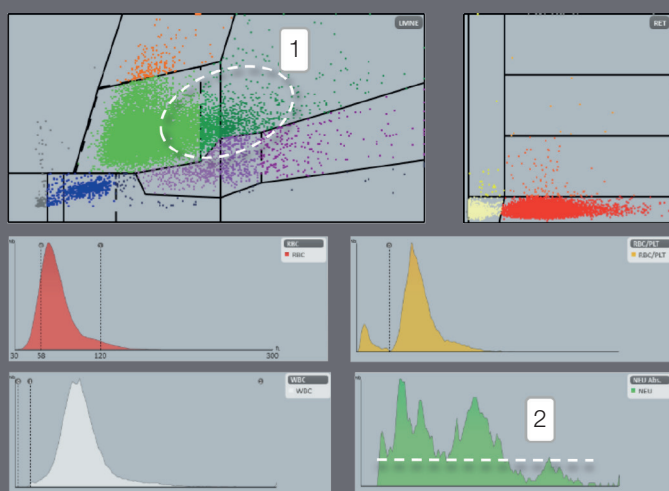
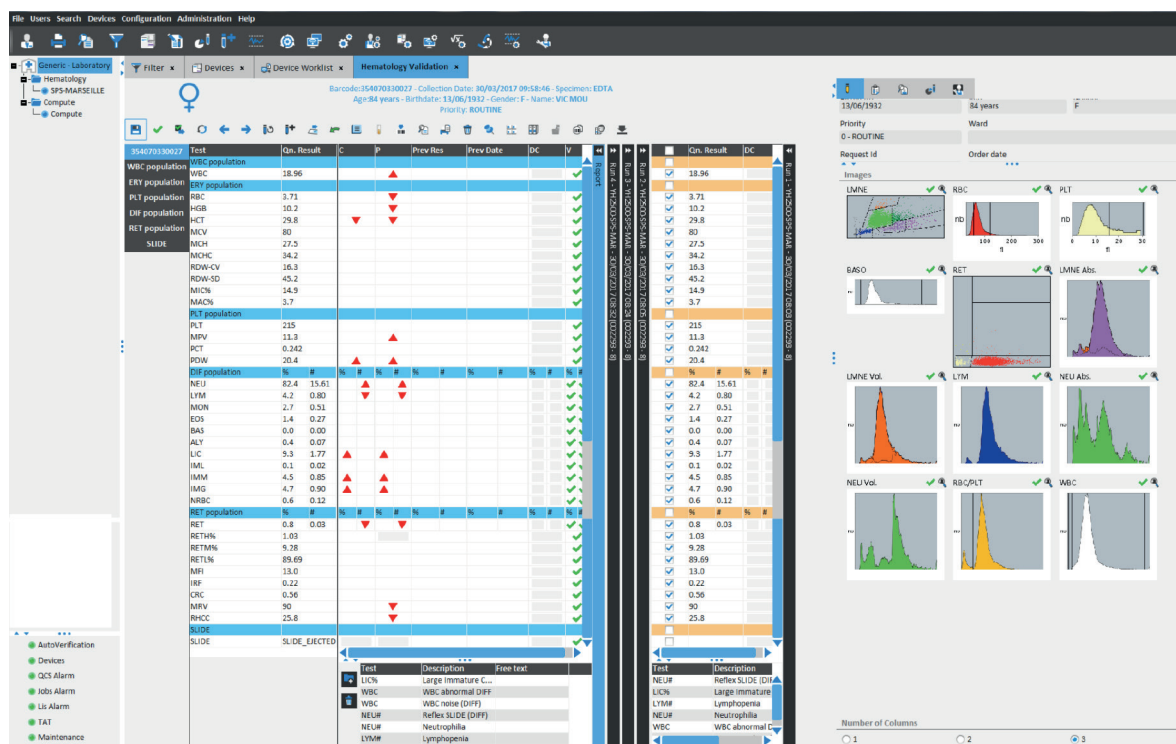




# Vacuolization of the neutrophils

Female patient, 84 years old.

It is possible to observe the vacuolization of neutrophils in association with toxic intake, acute ethyl poisoning, severe sepsis, cryoglobulinemia or after G-CSF/GM-CSF treatments.



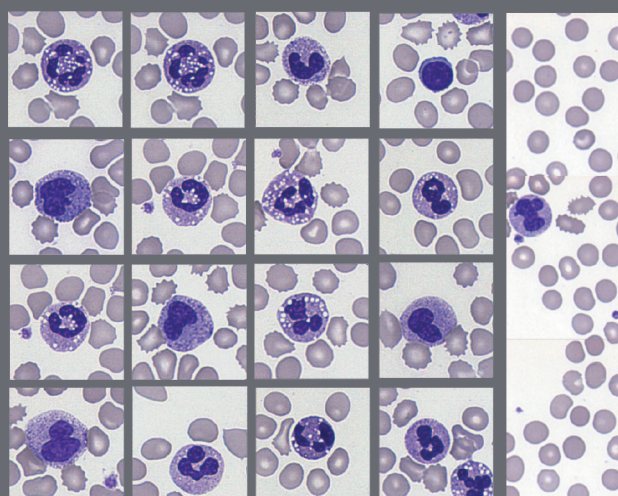
1. On the DIFF scattergram we observe the presence of a specific population between the normal neutrophils and the immature granulocytic cells which contain neutrophils with vacuoles. The sample contain also metamyelocytes population visible in the IMG.
2. On the neutrophil distribution histogram, we observe the different peaks corresponding to the different morphologies of normal neutrophils, vacuolized neutrophils and metamyelocytes.

## Manual DIFF

NEU% 86.5  
LYM% 2.7  
Meta% 10.8

**RBC morphology:**  
Normal morphology.

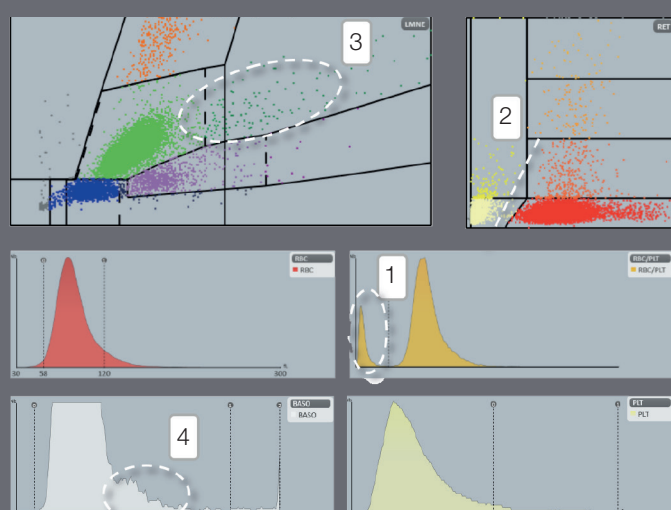
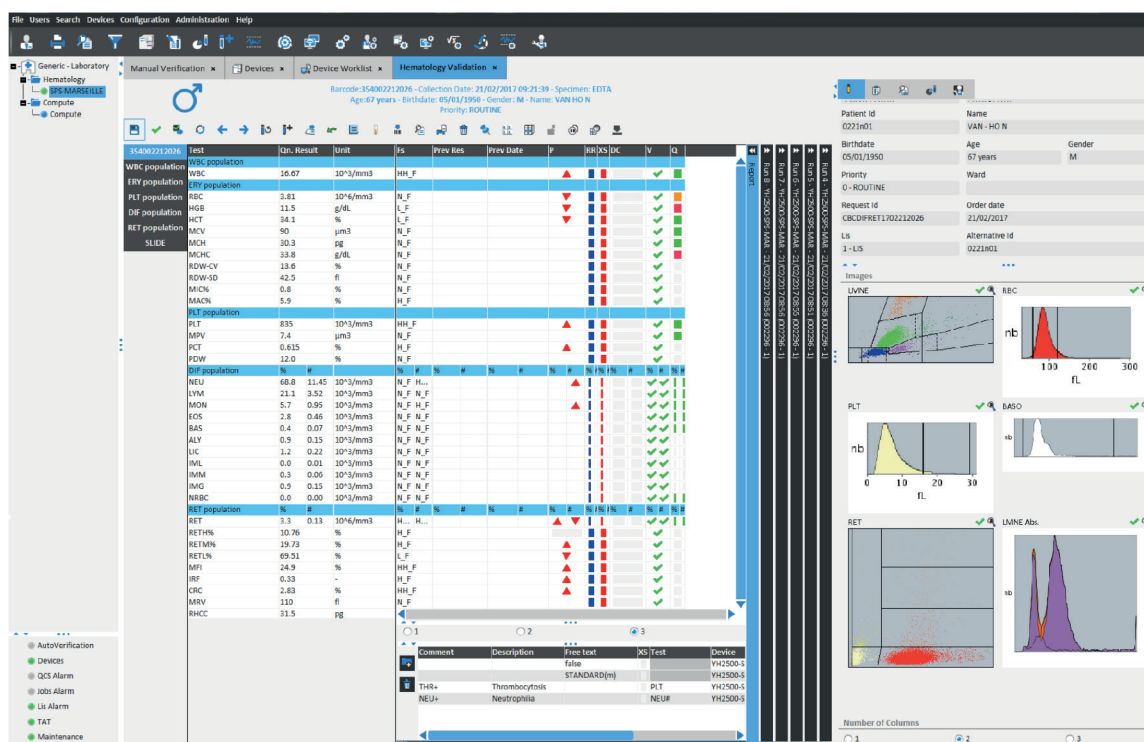
**WBC morphology:**  
Presence of vacuoles in some Neutrophils.



# Thrombocytosis

Male patient, 68 years old.

Intensive care unit.  
Peritoneal infection.



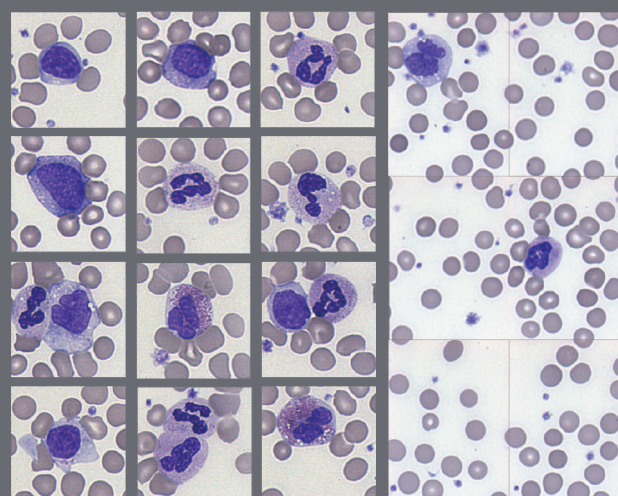
1. On the RBC/PLT histogram, we observe the peak of the platelets and ratio between the platelet and RBC populations. The separation of the both population is large and there is no interferences.
2. On the RET scattergram, we observe the valley between the platelet and RBC populations.
3. On the DIFF scattergram we observe the presence of slight immature granulocytic population.
4. On the Baso histogram we observe the peak of the immature granulocytic population.

## Manual DIFF

NEU% 71.4  
LYM% 19  
MON% 2.8  
EOS% 5.5  
BAS% 0.4

Myelo% 0.9

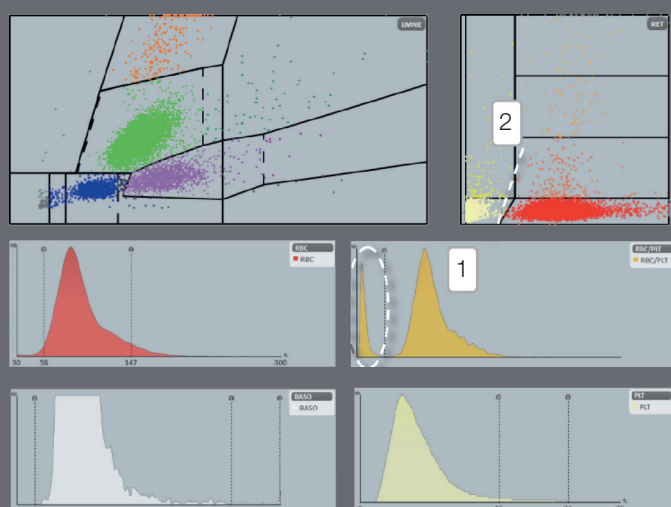
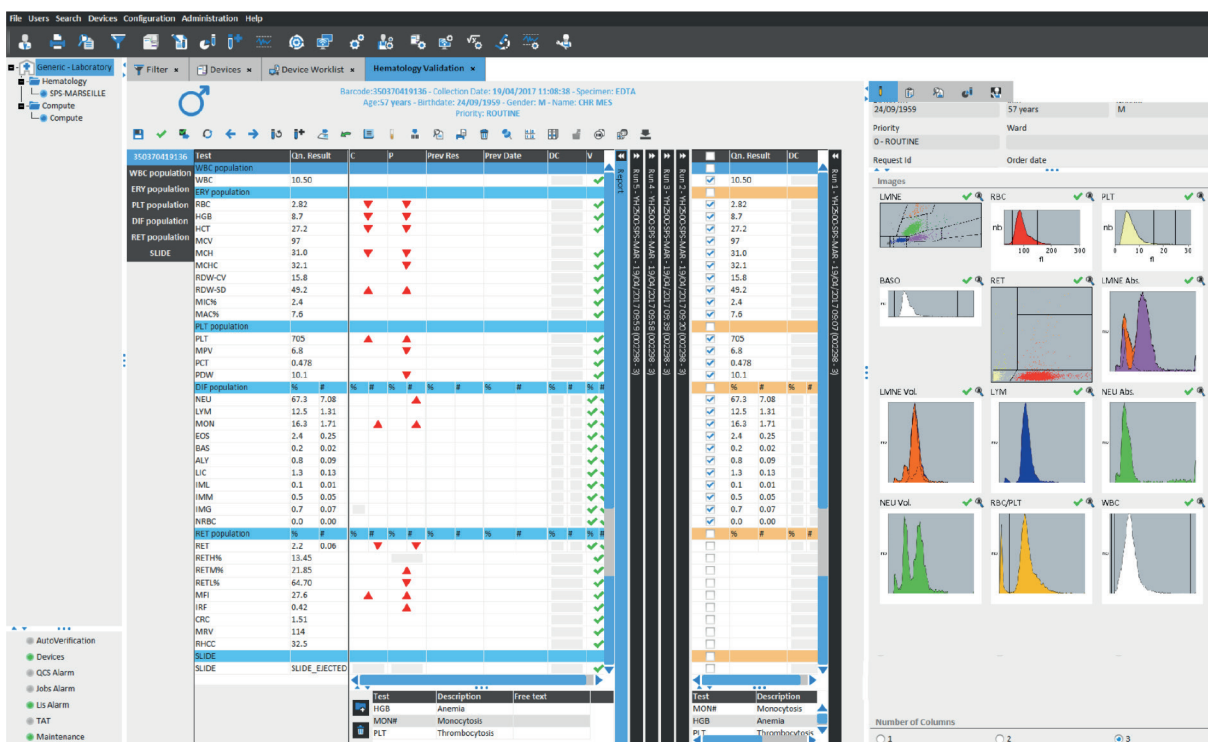
**RBC morphology:**  
Normal morphology.



# Thrombocytosis

Male patient, 57 years old.

Normocytic anemia.

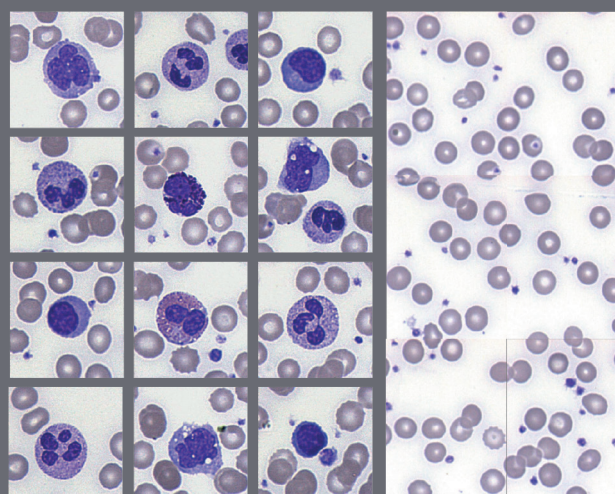


1. On the RBC/PLT histogram, we observe the peak of the platelets and ratio between the platelet and RBC populations. The separation of the both population is large and there is no interferences.
2. On the RET scattergram, we observe the valley between the platelet and RBC populations.

## Manual DIFF

NEU% 79.4  
LYM% 8.5  
MON% 8.5  
EOS% 1.8  
BAS% 1.8

RBC morphology:  
Normal morphology.

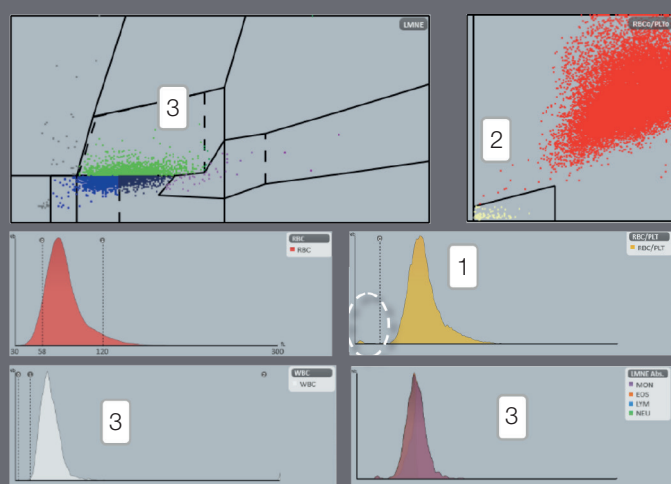
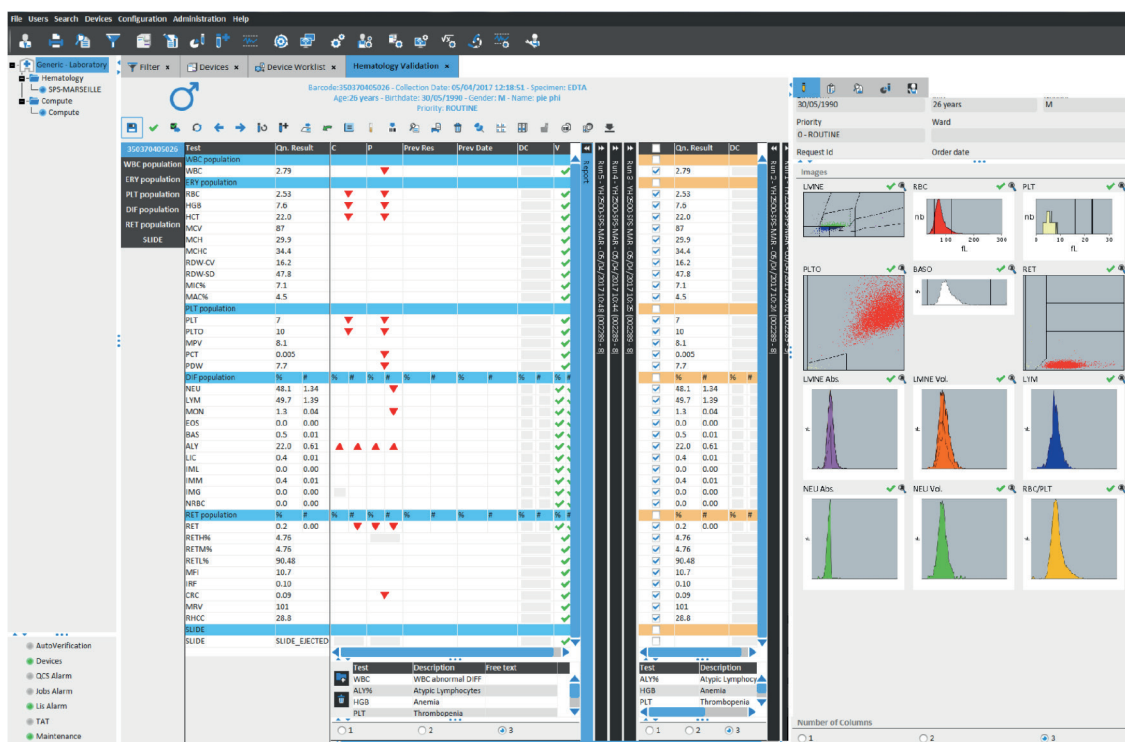




# Thrombocytopenia

Male patient, 26 years old.

ALL in treatment.

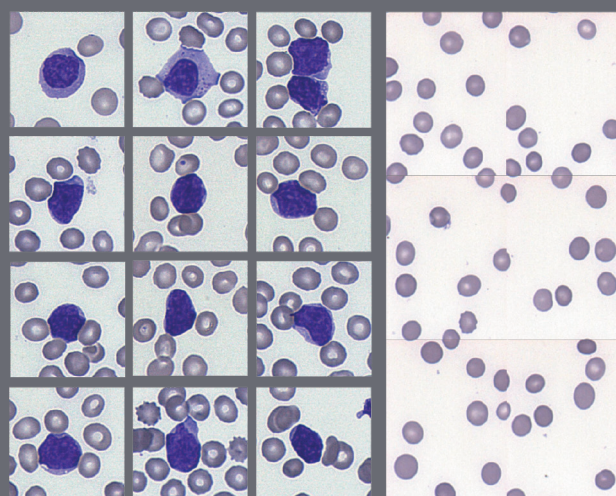


1. On the RBC/PLT histogram, we observe the very small peak of the platelets and ratio between the platelet and RBC populations. Due to the very low value, a PLTo cycle is performed in order to confirm the platelet value.
2. On the PLTo scattergram, we observe the good separation between the platelet and RBC populations and the low value of platelets is confirmed. In addition, the Yumizen H2500 is able to perform a LV (low value cycle) which uses a longer time of counting to give better performances.
3. On the WBC and LMNE scattergrams, we observe the quasi unique lymphoblast population.

## Manual DIFF

LYM% 1.8  
Blast% 98.2

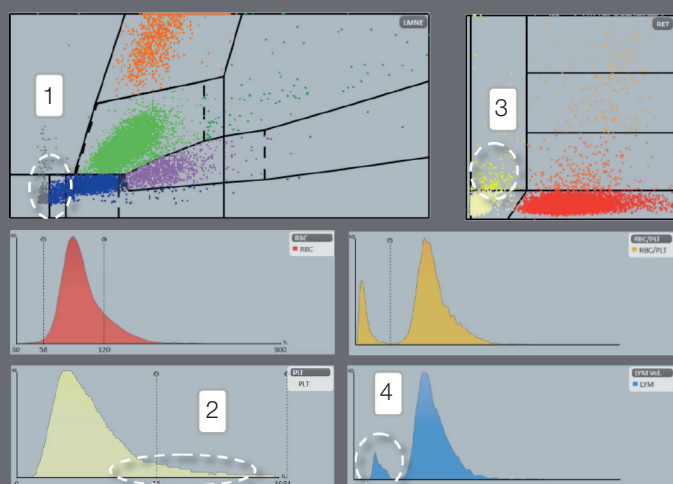
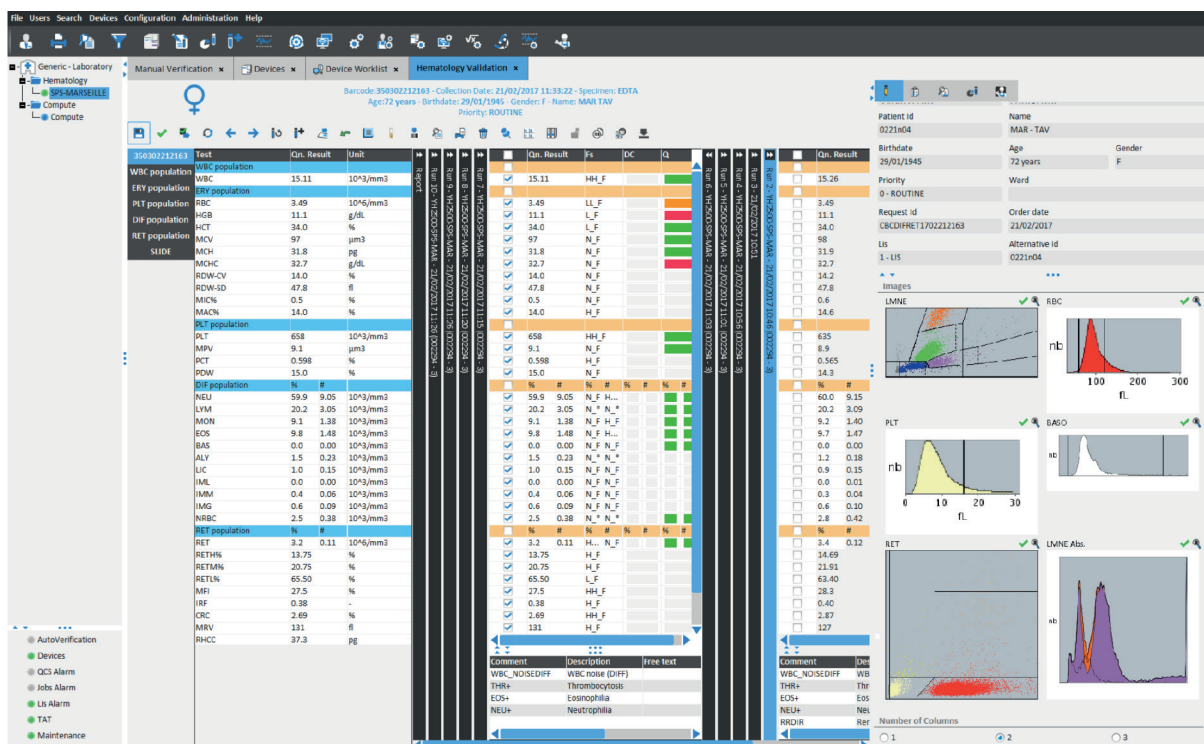
RBC morphology:  
Slight anisocytosis.



# Platelet aggregates

Female patient, 71 years old.

Oncology-surgery care unit.



1. On the DIFF scattergram, we observe the population of the platelets aggregates. The number of elements is measured and not included in the WBC counting.
2. On the PLT histogram, we observe the large platelets.
3. The platelets aggregates are visible in the retic scattergram.
4. On the LYM histogram, we observe a peak on the left of the Lymphocyte population which correspond to the erythroblast population and platelets aggregates. The separation with the lymphocyte population is good which confirm that the WBC value is right corrected.

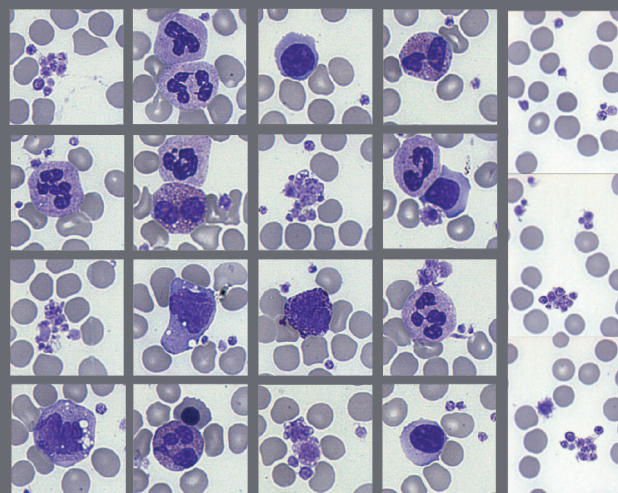
## Manual DIFF

NEU% 70.2  
LYM% 14  
MON% 4.6  
EOS% 10.7  
BAS% 0.5

ERB% 1

**RBC morphology:**  
Slight anisocytosis.

**PLT morphology:**  
Platelets aggregates.











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F. Ferrière

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