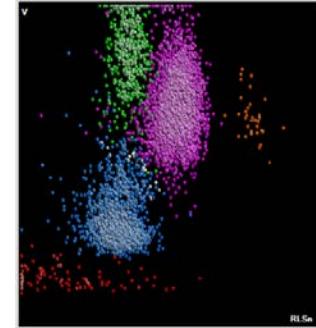
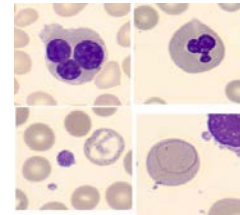
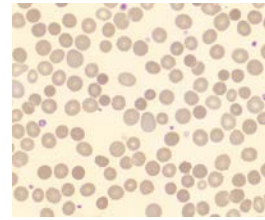
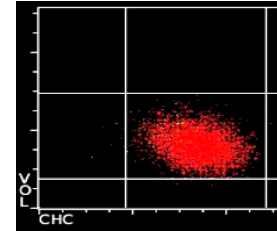
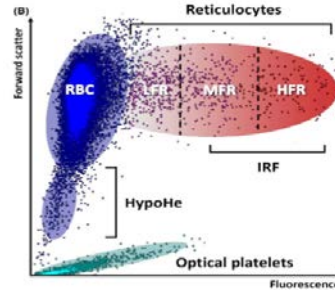


UTILITATS I POSSIBLES APLICACIONS DE LA HEMATIMETRI A EN EL DIAGNÒSTIC INICIAL D'HEMATOLOG

IA



CRISTIAN MORALES INDIANO

Laboratori Clínic Metropolitana Nord (LCMN).

Hospital Universitari Germans Trias i Pujol.

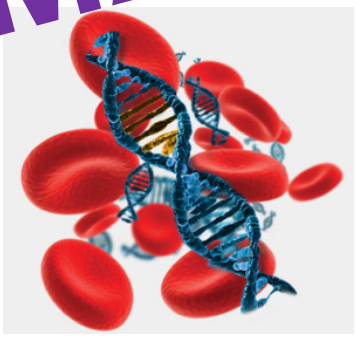
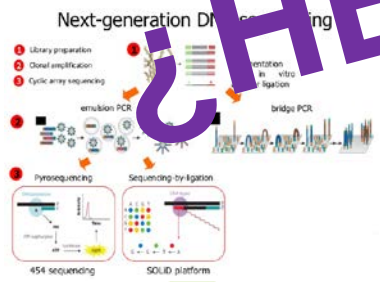
Evolució Tècniques Laboratori

- NGS
- GWAS
- ÓMICAS
- CRISPR
- NETS
- ...

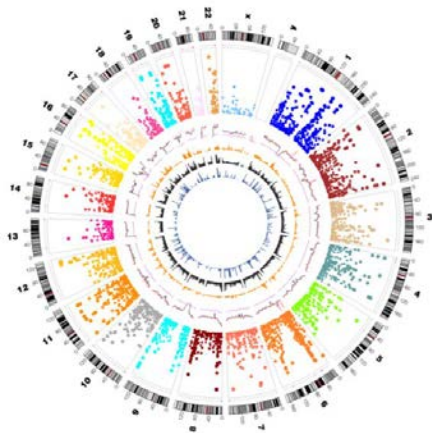


<https://www.fraxa.org/can-crispr-cure-huntington-from>

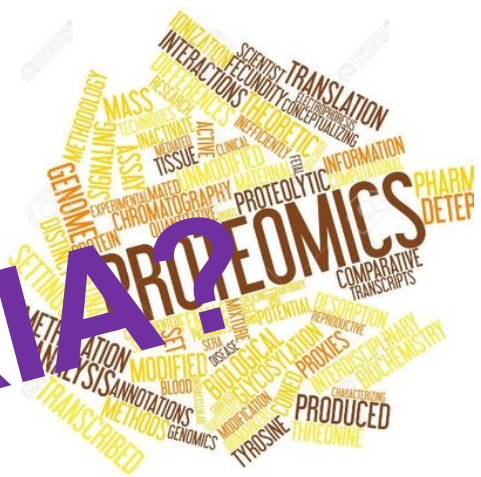
¿HEMATIMETRIA?



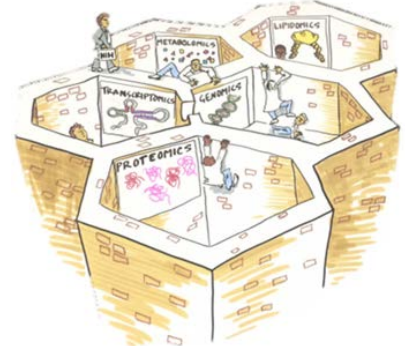
<https://www.biомakers.net/investigacion-y-desarrollo/biopsias-liquidas/>



<http://proteomicnews.blogspot.com/2017/07/fascinating-gwas-proteomics-study.html>



<https://twitter.com/proteomicsstory>



<https://blog.basespace.illumina.com/2014/10/>

<https://www.google.es/search?biw=1366&bih=631&btn=tsch&sa=1&ei=nV2W8mGPMQSGwTymQ74Dwa&q=new-generation+sequencing&oeq=one&pg=J=img-3.0.35.9K%20%20306763.0.3.98599.4.0.0.0.0.106.350.31.4.0.0...1c.1.64.png.0.4.247...0.40Z&neww/E=Emggo=RAE%20v1U.8kY2CM>

Hematimetria?

¿Leu + Hb+ Plq+...
..Diff?



Importància
mètodes
analítics

Noves magnituds
cel·lulars?

Ajudar en
el Dx
clínic?

OBJECTIUS

- Despertar la curiositat envers de les utilitats que pot tenir l'hemograma.

- Consulteu alguna de les "noves magnituds" que pot oferir l'hemograma.

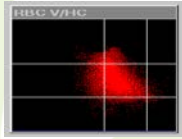


<https://mx.tutor.com/2015/01/13/por-que-la-curiosidad-mejora-el-aprendizaje/>

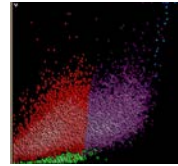
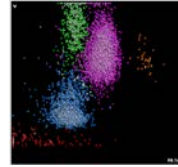
HEMATIMETRIA



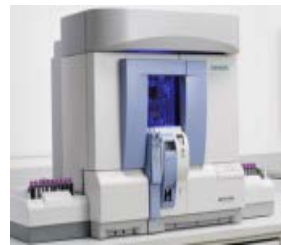
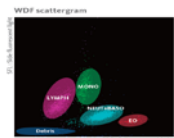
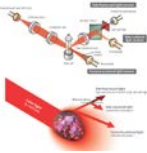
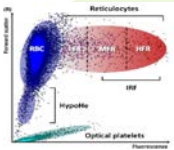
Abbott
CellDyn Sapphire



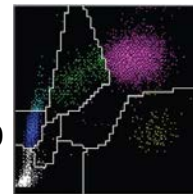
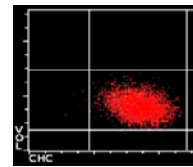
Beckman Coulter
Unicel DxH-series



Sysmex XN-series

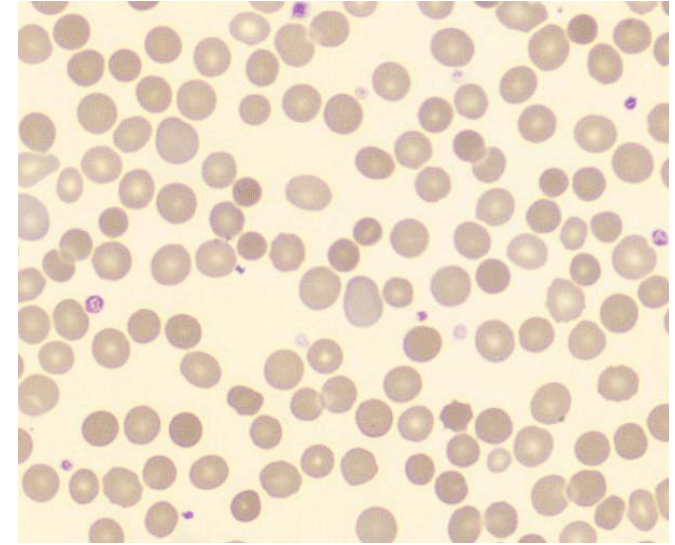
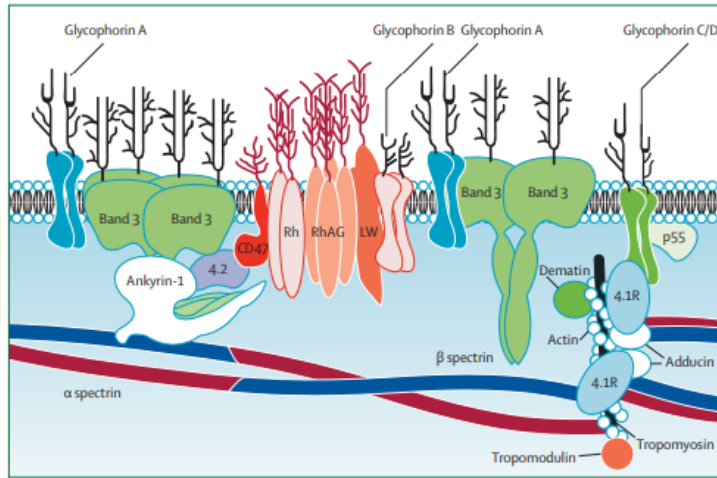


Siemens Advia 2120



PATOLOGIES

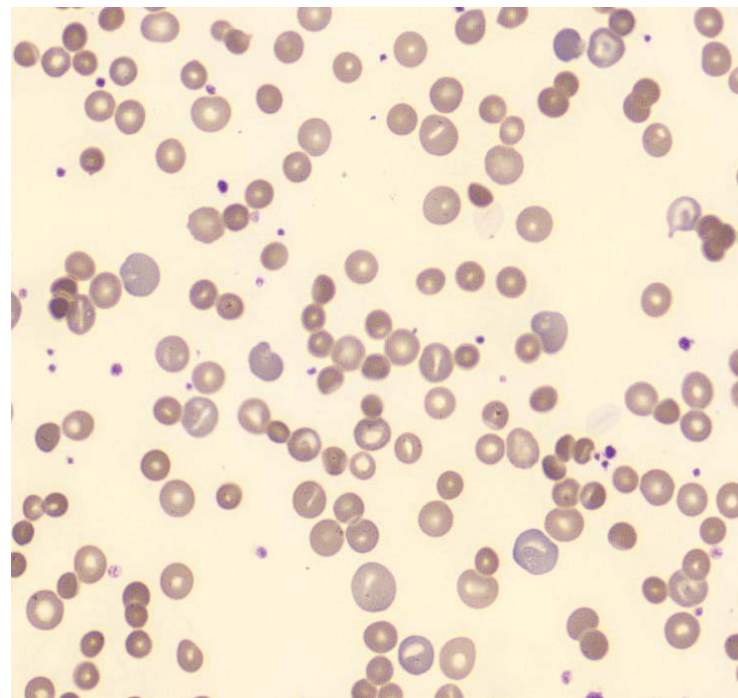
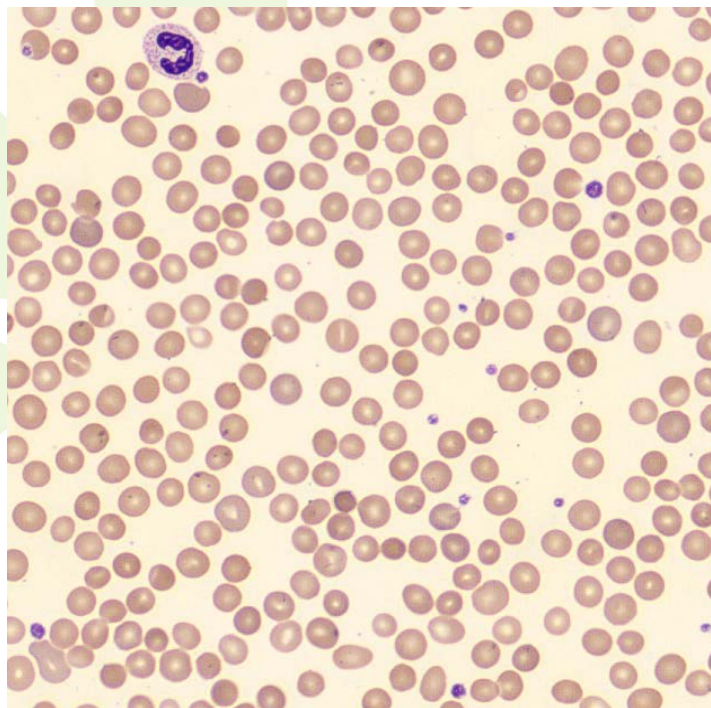
ESFEROCITOSI HEREDITÀRIA



Silverio Perrotta, et al. Lancet 2008; 372: 1411–26

Table 1
HS classification.

| | Minor HS | Moderate HS | Moderate to severe HS | Severe HS |
|---|----------------------------|---|-----------------------|-------------------------------------|
| Hb (g/l) | Normal | > 80 | 60–80 | < 60 |
| Reticulocytes (%) | < 6% | 6–10% | > 10% | > 10% |
| Bilirubin ($\mu\text{mol/l}$) | 17.1–34.2 | > 34.2 | > 34.2–51.3 | > 51.3 |
| Red blood smear | Few spherocytes | Spherocytes | Spherocytes | Microspherocytes and poikilocytosis |
| Osmotic fragility (fresh blood) | Normal or slight increased | Increased | Increased | Increased |
| Osmotic fragility (incubation at 37 °C) | Increased | Increased | Increased | Increased |
| Splenectomy | Rarely | If the capacity level is decreased and depending on certain cases | Necessary > 5 y-old | Necessary > 2–3 y-old |
| Transfusions | 0–1 | 0–2 | > 2 | Regularly |
| SDS-PAGE (protein defect) | Normal | Sp, Ank + Sp, band 3, protein 4.2 | Sp, Ank + Sp, band 3 | Sp, Ank + Sp, band 3 |
| Inheritance | AD | AD, <i>de novo</i> , | AD, <i>de novo</i> | AR |



Reticulòcits Automatització

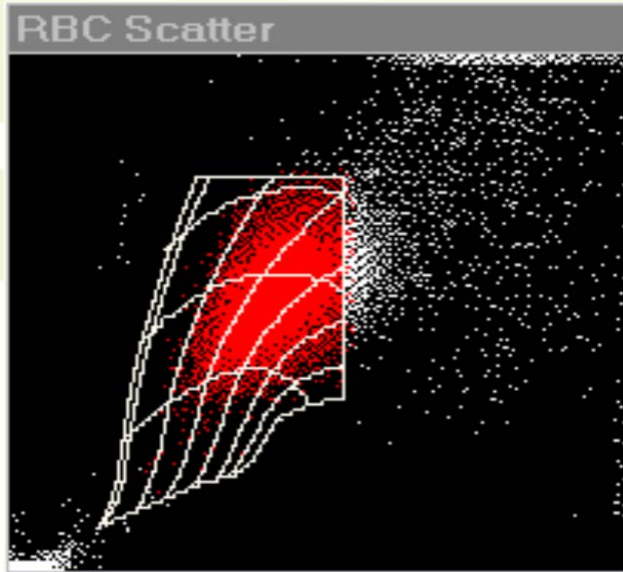
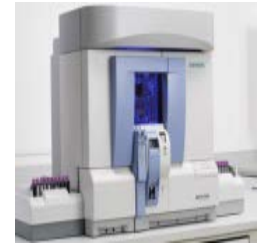
| Companyia | Instruments | Mètode | Colorant | Magnituds |
|------------------------|-------------------------------------|---|--|--|
| Abbott | CELLDYN Ruby CELLDYN Sapphire | Absorbància Fluorescència Dispersió de la luz multiangle | Cianina (Sybr II) | IRF IRF MChR MCVr |
| Beckman Coulter | UniCell DxH LH series | Impedància, citometria fluxe digital en base a VCS | Nuevo azul metileno Nuevo azul metileno | IRF; MRV;HLR;RSf IRF; MRV; MSCV;HLR |
| Horiba | ABX Pentra DX120 | Impedància citometria fluxe fluorescència | Naranja de tiazol | IRF; MRV; RETH RHbC |
| Siemens | ADVIA 120 | Absorbància Scatter òptica | Oxazine 750 | IRF MCVr; CHr |
| Sysmex | XE5000 XN | Fluorescència | Polimetina | IRF RetHe ΔHe |
| Mindray | BC 6800 | Fluorescència | Cianina asimétrica | IRF, H-RET%, M-RET%, L-RET%, RHE, MVR |

Teoría de Mie

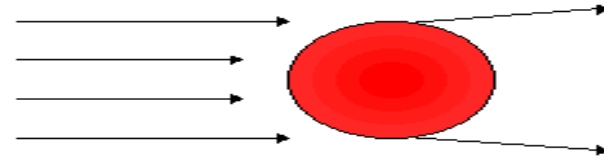
H3 Technicon/Bayer/Siemens

$$\text{CHr} = \text{VC} \times \text{CHC}$$

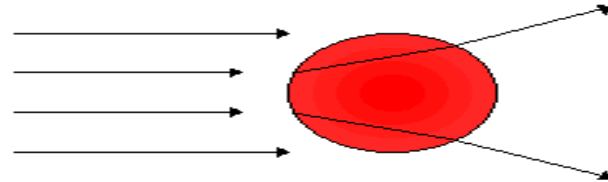
ADVIATM120
HEMATOLOGY SYSTEM



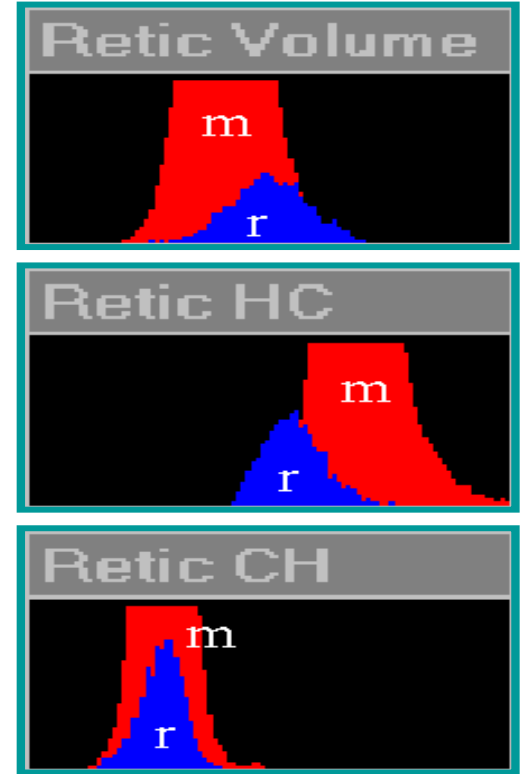
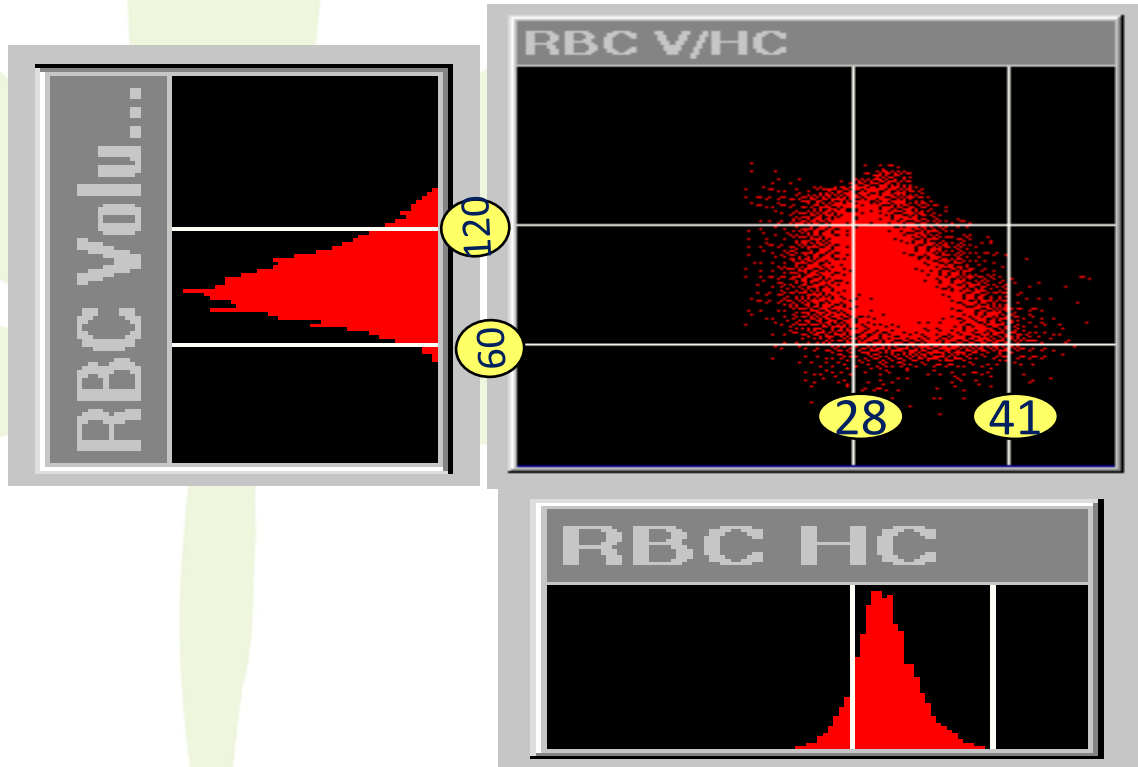
Low angle Dispersion $2^\circ - 3^\circ$
Volume (X axis)



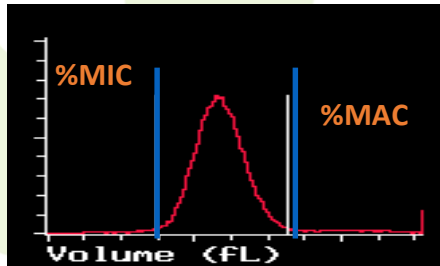
High angle Dispersion $5^\circ - 15^\circ$
Hb concentration (Y axis)



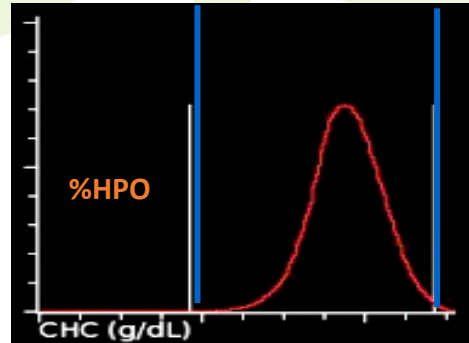
Histogram Red cells: Mie Map



CellDyn Sapphire (ABBOTT)



%MAC



%HPR

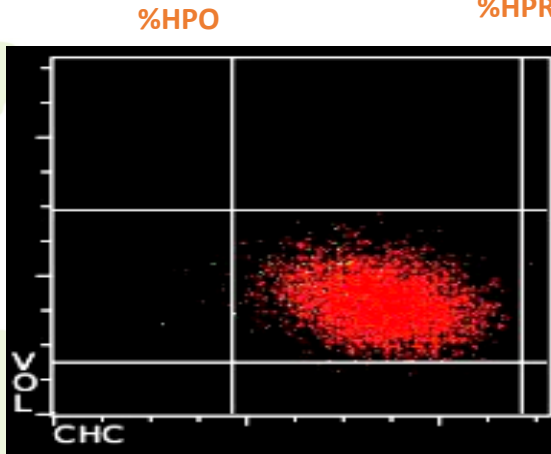


Table 1. Nomenclature of RBC parameters in the two analyzer types

| Parameter (unit) | Definition | Abbott CELL-DYN Sapphire | Siemens Advia |
|--|--|--------------------------|---------------|
| Microcytic RBC (%) | RBC with volume <60 fL | %MIC | MICRO |
| Macrocytic RBC (%) | RBC with volume >120 fL | %MAC | MACRO |
| Hypochromic RBC (%) | RBC with cellular Hgb concentration <28 g/dL | %HPO | HYPO |
| Hyperchromic RBC (%) | RBC with cellular Hgb concentration >41 g/dL | %HPR | HYPER |
| Hgb concentration distribution width (%) | Width of cellular Hgb concentration distribution | HDW | HC VAR |
| Reticulocyte MCV (fL) | Mean cellular volume of reticulocytes | MCVr | MCVr |
| Reticulocyte MCH (pg) | Mean cellular Hgb content of reticulocytes | MCHr | CHr™ |
| Reticulocyte MCHC (g/dL) | Mean cellular Hgb concentration of reticulocytes | CHCr | CHCMr |



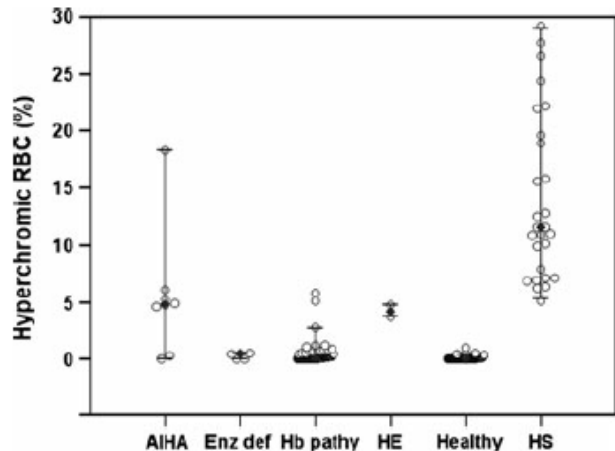
Screening and confirmation of hereditary spherocytosis in children using a CELL-DYN Sapphire haematology analyser

S. ROONEY*, J. J. M. L. HOFFMANN†, O. M. CORMACK*, C. MCMAHON*

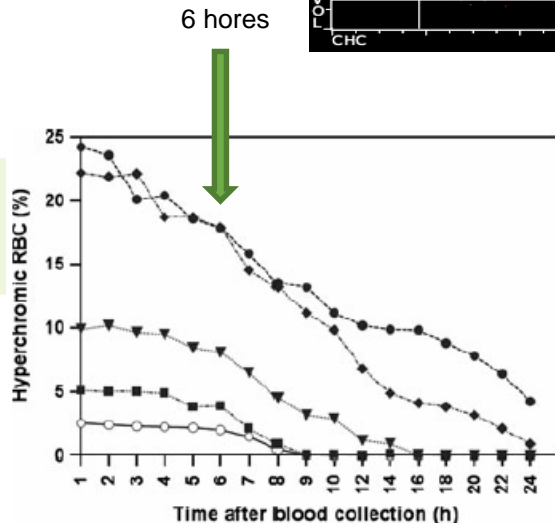
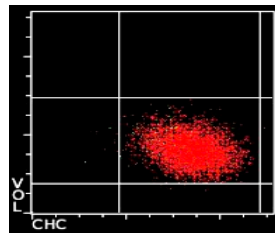
2014 Int. Jnl. Lab. Hem.

-740 patients pediàtrics

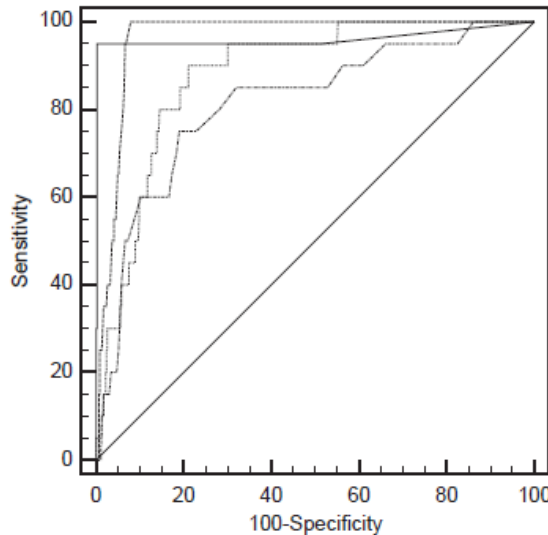
- 32 HS, 8 AHAI, 2 EH, 6 EZ, 114 Hbp, ...
- 272 Sanos



AIHA group had significantly lower HPR than in HS (median 4.9% compared with 11.5%; $P = 0.0006$ by Mann–Whitney U-test)

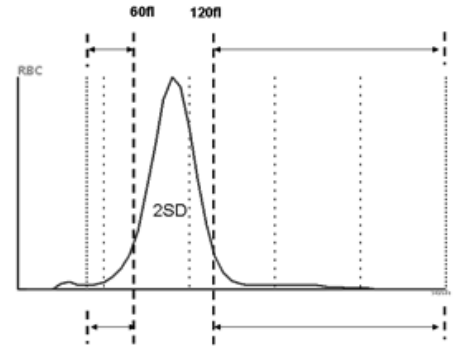
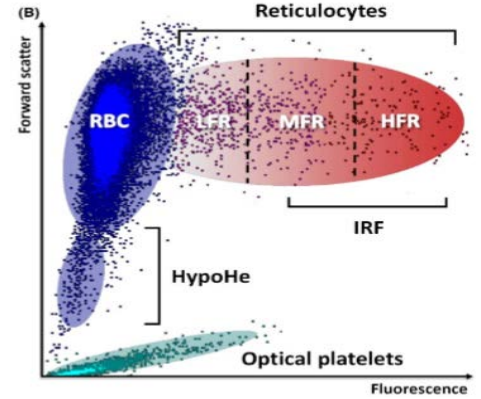
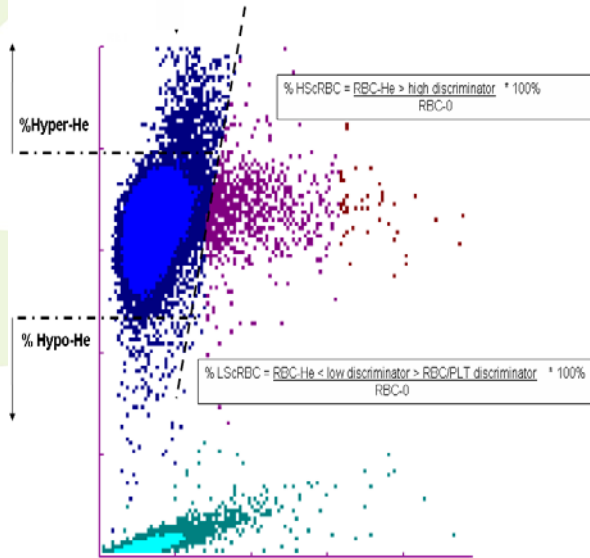
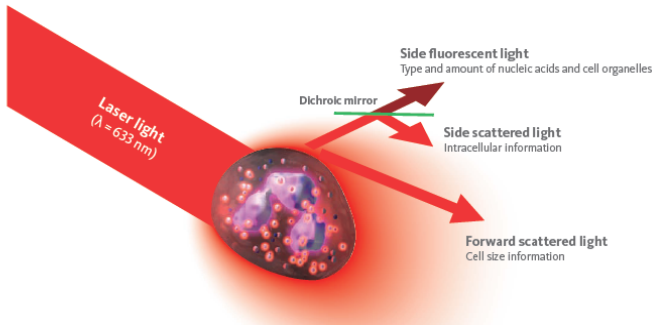
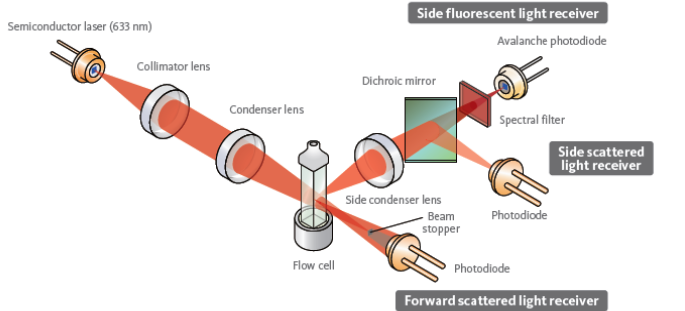


HPR (4.9 %): SENS: 96.4% ESP: 99.1%



| CPD | AUC | IC (95%) | P |
|--------------------------------|-------|-------------|--------|
| HPR (4.9 %) | 0.972 | 0.957 0.983 | <0.001 |
| BIL (13uM) | 0.964 | 0.943 0.977 | <0.001 |
| RET # (130x10 ⁹ /L) | 0.879 | 0.854 0.902 | <0.001 |
| MCHC (34.8 g/dL) | 0.753 | 0.721 0.784 | <0.001 |

Sysmex (XE/XN)



$$\text{MicroR\%} = \frac{\text{cells} < 60 \text{ fl} > \text{LD}}{\text{RBC}} * 100$$

$$\text{MacroR\%} = \frac{\text{cells} > 120 \text{ fl} < \text{HD}}{\text{RBC}} * 100$$

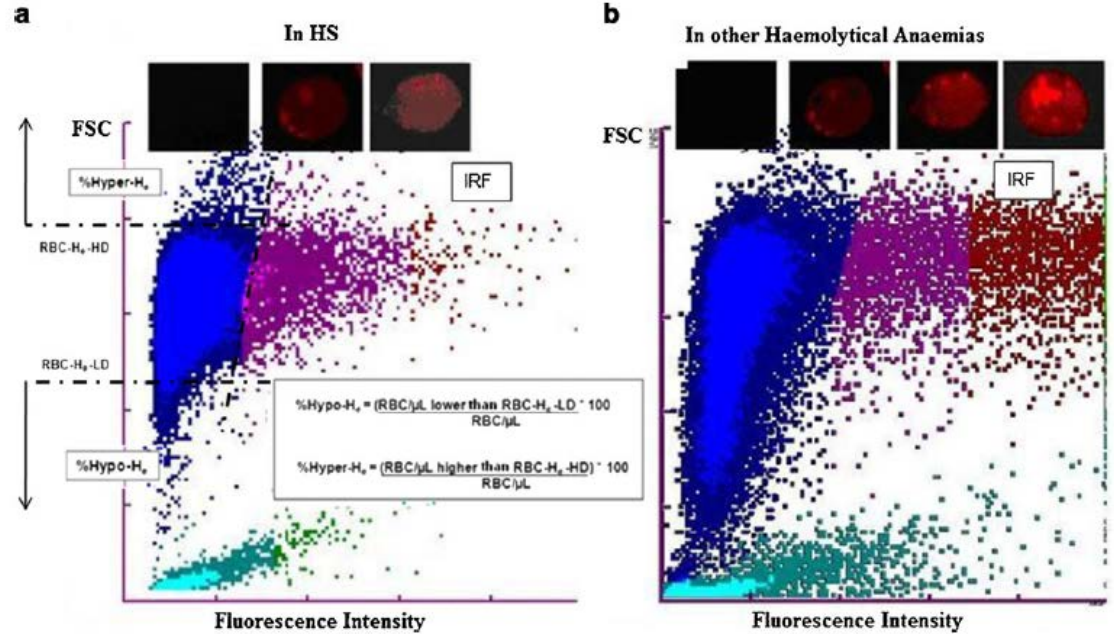
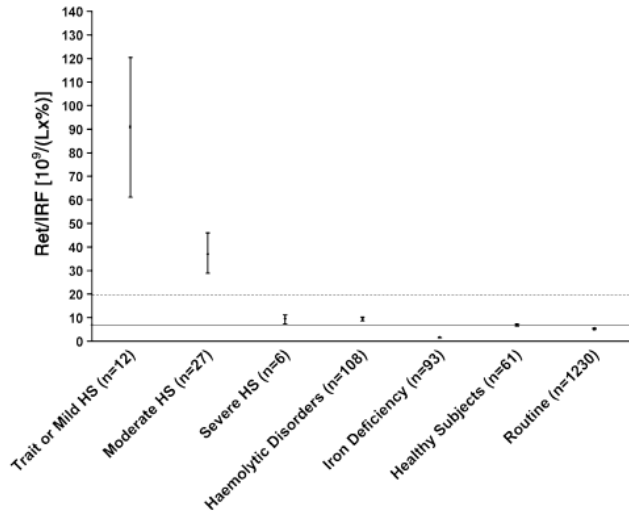
Additional erythrocytic and reticulocytic parameters helpful for diagnosis of hereditary spherocytosis: results of a multicentre study

François Mullier · Elodie Lainey · Odile Fenneteau · Lydie Da Costa ·
 Françoise Schillinger · Nicolas Bailly · Yvan Cornet · Christian Chatelain ·
 Jean-Michel Dogne · Bernard Chatelain

Ann Hematol (2011) 90:759–768



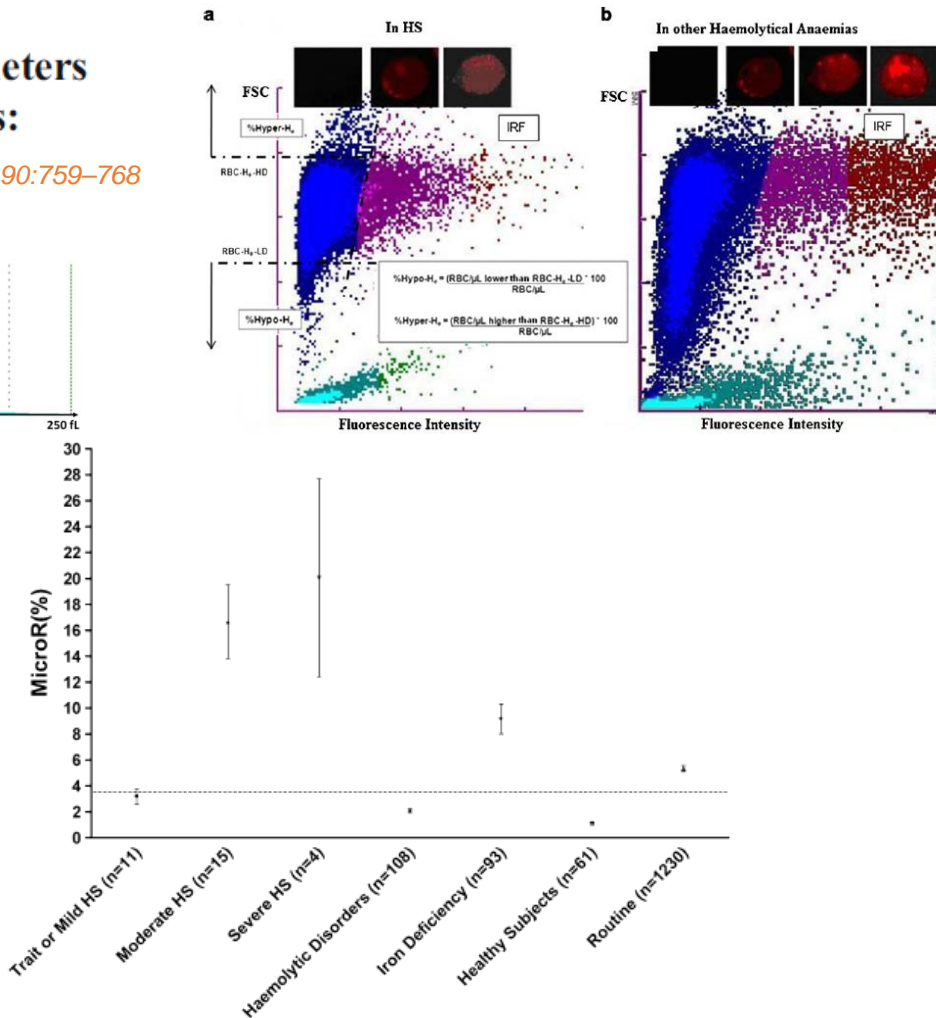
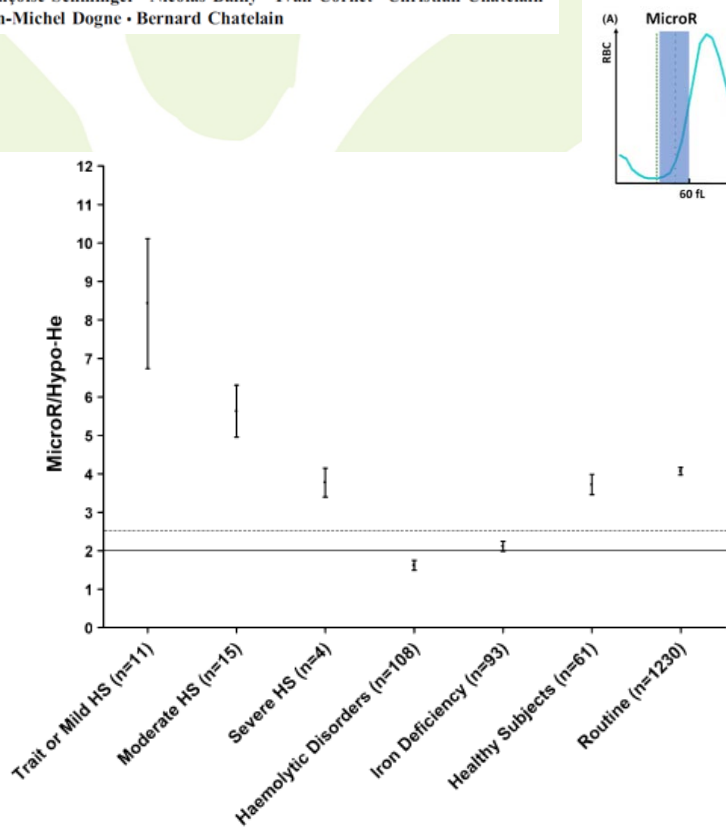
- 45 EH,
- 108 Altres: ABO incomp (4), PTT (4), SUH (3), Drep (3),...
- 61 Grup control/1230 mostres rutina



Additional erythrocytic and reticulocytic parameters helpful for diagnosis of hereditary spherocytosis: results of a multicentre study

François Mullier · Elodie Lainey · Odile Fenneteau · Lydie Da Costa ·
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Additional erythrocytic and reticulocytic parameters helpful for diagnosis of hereditary spherocytosis: results of a multicentre study

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Françoise Schillinger · Nicolas Bailly · Yvan Cornet · Christian Chatelain ·
Jean-Michel Dogne · Bernard Chatelain

Ann Hematol (2011) 90:759–768

Table 2 Hereditary spherocytosis diagnostic tool

| Rule | Parameters |
|--------|---|
| Rule 1 | Precondition Ret $\geq 80,000/\mu\text{l}$ and Ret/IRF > 7.7 |
| Rule 2 | Severity Trait or mild HS Hb > 12 g/dl Moderate HS 8 g/dl \geq Hb ≤ 12 g/dl Severe HS Hb < 8 g/dl Ret/IRF ≥ 19 MicroR $\geq 3.5\%$ and MicroR/Hypo-He ≥ 2.5 MicroR $\geq 3.5\%$ and MicroR/Hypo-He ≥ 2 |

Ret reticulocytes (μl), IRF immature reticulocytes fraction (%), HS hereditary spherocytosis, Hb haemoglobin, MicroR microcytic erythrocytes (%), Hypo-He hypochromic erythrocytes (%)

Table 3 Efficiency of the HS diagnostic tool and comparison with single parameters and existing rules

| Parameter | AUC (95% CI) | Cut-off | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) |
|-------------------------|---------------------|----------|-----------------|-----------------|---------|---------|
| MCHC (g/dl) | 0.735 (0.711–0.758) | 34.7 | 73.3 | 72.6 | 5.1 | 99.3 |
| MicroR (%) | 0.744 (0.721–0.766) | 7.8 | 56.7 | 84.8 | 7.0 | 99.0 |
| RDW-CV (%) | 0.684 (0.659–0.708) | 18.1 | 55.2 | 80.6 | 5.6 | 98.9 |
| MCHC and RDW-CV | 0.678 (0.653–0.702) | Positive | 37.9 | 97.6 | 24.4 | 98.7 |
| Hyper-He (%) | 0.750 (0.726–0.772) | 0.5 | 55.2 | 82.1 | 6.0 | 98.9 |
| MCHC and Hyper-He | 0.714 (0.690–0.738) | Positive | 44.8 | 98.1 | 32.5 | 98.8 |
| RDW-CV and Hyper-He | 0.642 (0.617–0.667) | Positive | 34.5 | 94.0 | 10.6 | 98.6 |
| MicroR/Hypo-He ratio | 0.743 (0.720–0.764) | 4.0 | 76.7 | 65.6 | 4.3 | 99.3 |
| Ret ($10^9/\text{L}$) | 0.938 (0.925–0.950) | 103.5 | 93.3 | 83.6 | 10.3 | 99.8 |
| Ret/IRF ratio | 0.976 (0.967–0.983) | 9.7 | 96.7 | 89.6 | 15.9 | 99.9 |
| HS diagnostic tool | 0.997 (0.992–0.999) | Positive | 100.0 | 99.3 | 75.0 | 100.0 |

AUC area under the curve, 95% CI 95% confidence interval, PPV predictive positive value, NPV negative predictive value, MCHC mean corpuscular haemoglobin concentration (g/dl), MicroR microcytic erythrocytes (%), RDW-CV (%) red blood cells distribution width–coefficient of variation, Hyper-He hyperchromic erythrocytes (%), Hypo-He hypochromic erythrocytes (%), MicroR/Hypo-He microcytic erythrocytes/hypochromic erythrocytes, Ret/IRF reticulocytes/immature reticulocytes fraction [$10^9/(\text{L}\times\%)$], HS hereditary spherocytosis

Evaluation of a hereditary spherocytosis screening algorithm by automated blood count using reticulocytes and erythrocytic parameters on the Sysmex XN-series

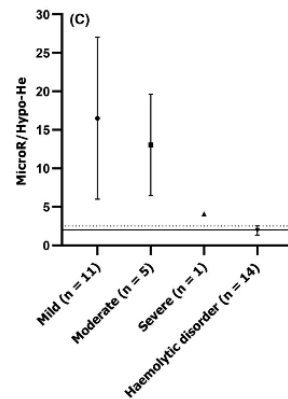
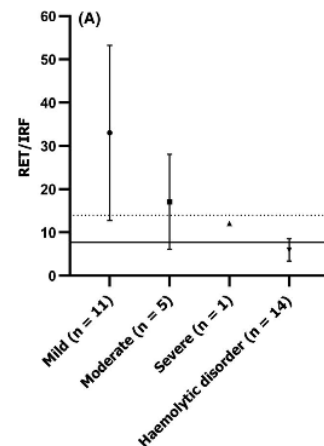
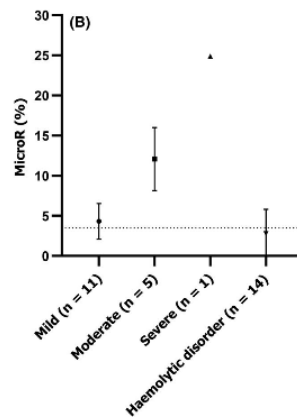
Int J Lab Hematol. 2019 Nov 22. doi: 10.1111/ijlh.13125



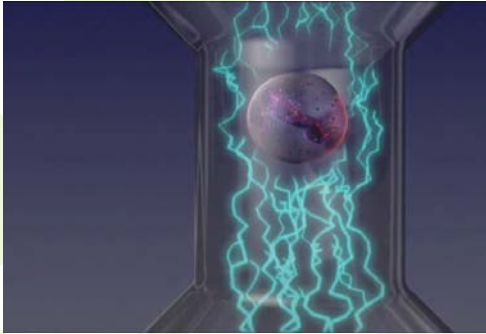
Jean-Yves Sottiaux¹
 Julien Favresse¹
 Charles Chevalier²
 Bernard Chatelain¹
 Hugues Jacqmin¹
 François Mullier¹

| Rule | Parameters | | |
|--------------|---|--|--|
| Rule 1 | | | |
| Precondition | RET \geq 80 000/ μ L and Ret/IRF >7.7 | | |
| Rule 2 | | | |
| Severity | Trait or mild HS (Hb >12g/dL) | Moderate HS (8g/dL \geq Hb \leq 12g/dL) | Severe HS (Hb <8g/dL) |
| | RET/IRF \geq 14 | MicroR \geq 3.5% and MicroR/Hypo-He \geq 2.5 | MicroR \geq 3.5% and MicroR/Hypo-He \geq 2 |

Abbreviations: Hb, haemoglobin (g/dL); Hypo-He, hypohaemoglobinized (%); IRF, immature reticulocyte fraction (%); MicroR, microcytic erythrocytes (%); MicroR/Hypo-He, microcytic erythrocytes/hypohaemoglobinized; RET, reticulocytes (/ μ L); RET/IRF, reticulocyte/immature reticulocyte fraction.



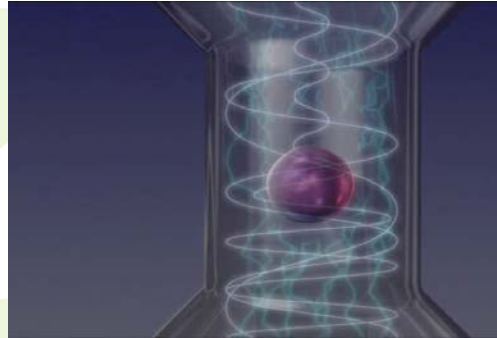
BECKMAN COULTER. Automated Intelligent Morphology (VCSn)



V = Volumen

Principio Coulter

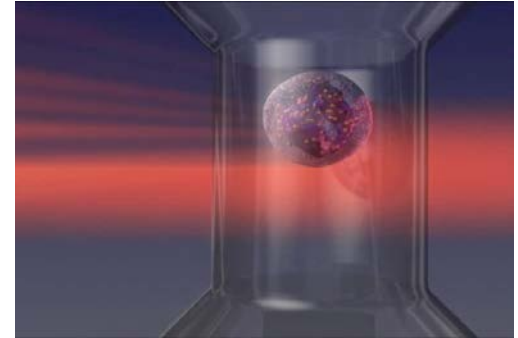
Tamaño



C = Conductividad

Sondeo electromagnético de alta frecuencia

Núcleo/Citoplasma
Estructura de la cromatina



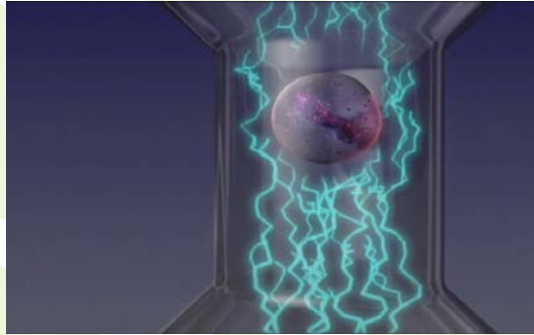
Sn = Scatter

Dispersión de luz de láser
(5 ángulos)

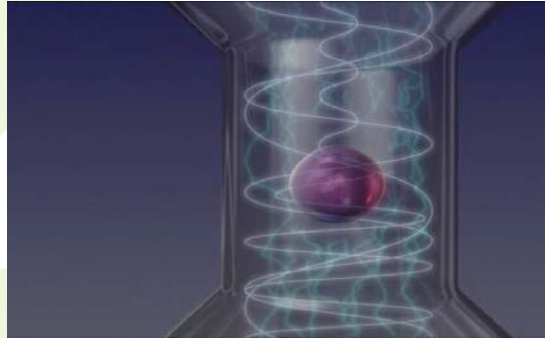
Segmentación del núcleo
Granularidad
Tamaño

Automated Intelligent Morphology

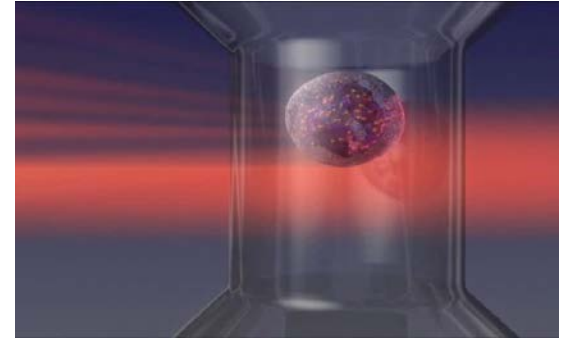
V = Volumen



C = Conductividad



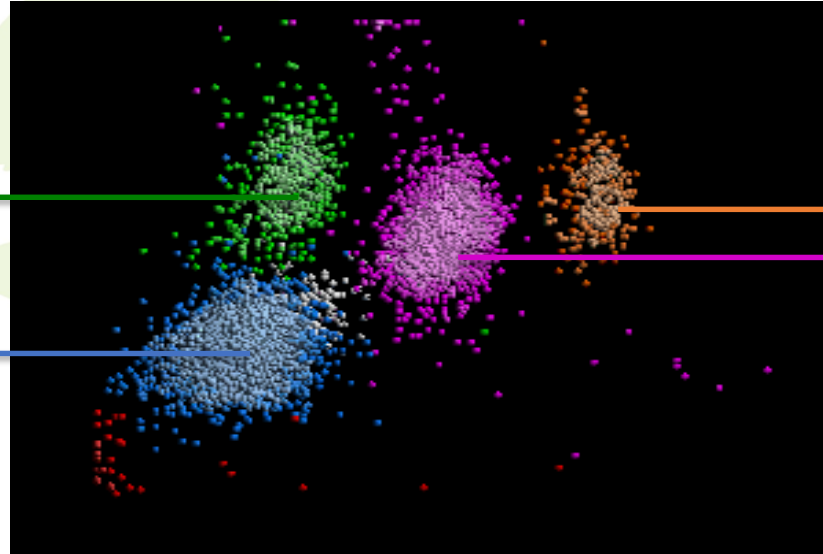
Sn = Scatter



X-MEN

CELL POPULATION DATA

- NEUTRÓFILOS.
- LINFOCITOS.
- MONOCITOS.
- EOSINÓFILOS.
- BASÓFILOS.
- NO LEUCOCITOS.



X+SD

X+SD

X+SD

X+SD

NÚMEROS

The GEN.S: a fortuitous finding of a routine screening test for hereditary spherocytosis.

Chiron M, Cynober T, Mielot F, Tchernia G, Croisille L

Hematol Cell Ther. 1999 Jun;41(3):113-6.



Beckman Coulter GEN-S

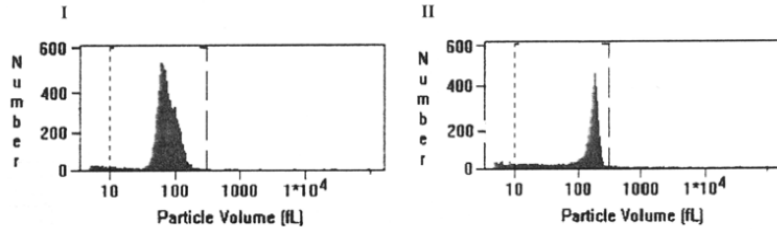


Fig. 2. Multisizer® assay control sample. I. First step blood sample with new methylene blue at 41°; C. II. Second step blood sample with new methylene blue and reagent B at 41°; C a red cell spherization is induced

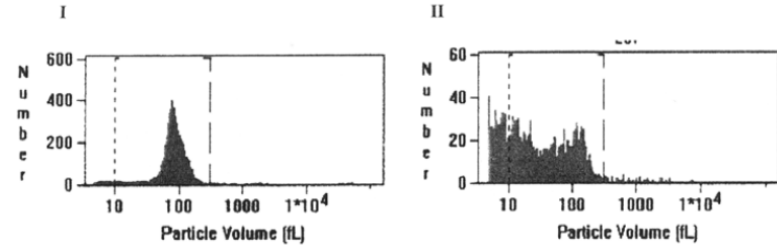


Fig. 3. Multisizer® assay HS sample. I. First step blood sample with new methylene blue at 41°; C. II. Second step blood sample with new methylene blue and reagent B at 41°; C a red cell fragmentation is induced

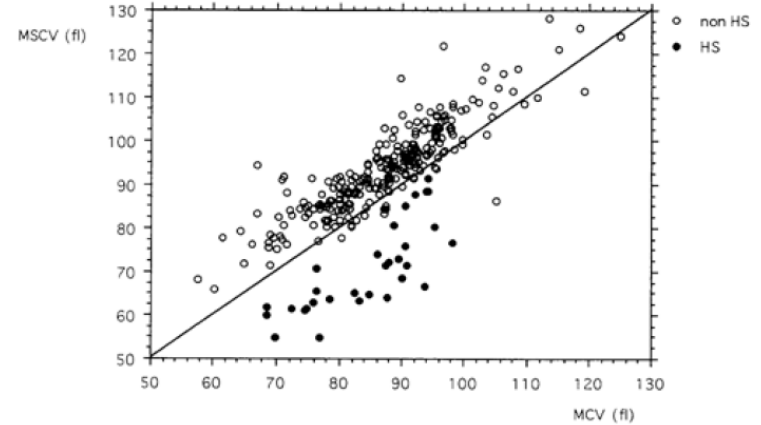


Fig. 1. Direct correlation between MCV and MSCV in 286 samples. Plots reveal a significant sub-population under the line defined by $MSCV = MCV$

MCV-MSCV > 0
SEN: 100%
ESP: 93,3%

CONCLUSION: MSCV < MCV is highly indicative of HS and probably of acquired immune spherocytosis, which must both be confirmed by other methods.

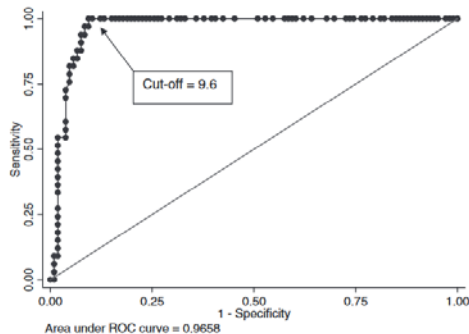
Evaluation of mean spherred corpuscular volume for predicting hereditary spherocytosis

Int. Jnl. Lab. Hem. 2010, 32, 519–523

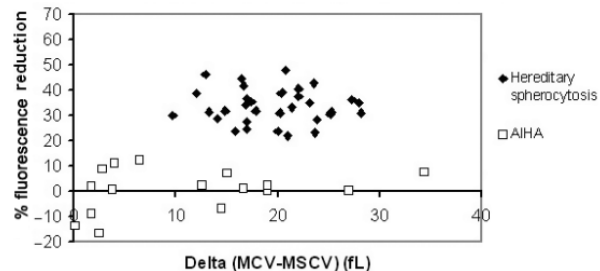
J. BROSÉUS, B. VISOMBLAIN, J. GUY, M. MAYNADIÉ, F. GIRODON

Study of 415 samples:

- 33 cases of HS,
- 16 cases of AIHA
- 366 cases of healthy controls



MCV-MSCV > 9.6
SEN: 100%
ESP: 90,6%



Comparison and evaluation of three screening tests of hereditary spherocytosis in Chinese patients

Yi-feng Tao · Zeng-fu Deng · Lin Liao · Yu-ling Qiu · Wen-qiang Chen · Fa-quan Lin

Ann Hematol (2015) 94:747–751

Study of 237 samples:

- 56 HS,
- 86 thalassemia
- 95 healthy controls

MCV-MSCV > 0
SEN: 89.3%
ESP: 96.1%

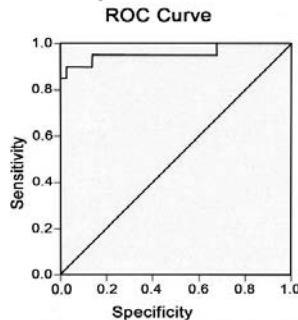


Fig. 1 The ROC curve of comparing MSCV to MCV to diagnose HS

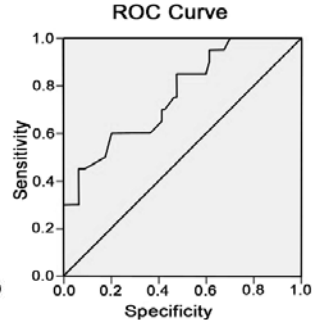


Fig. 2 The ROC curve of diagnosing HS using MCHC

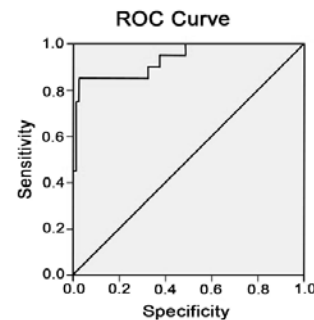



Fig. 3 The ROC curve of flow cytometric osmotic fragility test for HS

Blood cell parameters for screening and diagnosis of hereditary spherocytosis

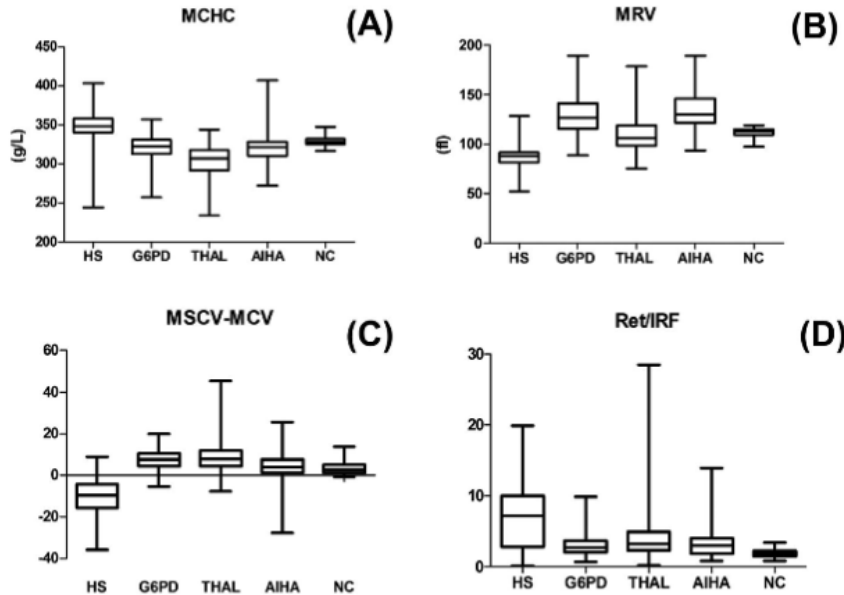
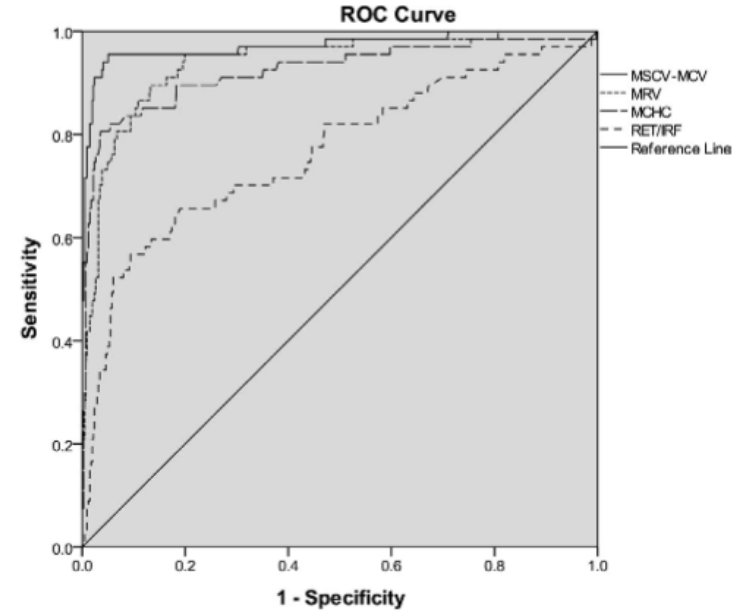
Lin Liao¹ | Yuchan Xu¹ | Hongying Wei² | Yuling Qiu³ | Wenqiang Chen³ |
 Jian Huang¹ | Yifeng Tao⁴ | Xuelian Deng¹ | Zengfu Deng¹ | Hui Tao¹ | Faquan Lin¹ 

J Clin Lab Anal. 2019;33:e22844

Descriptive study of 482 samples:

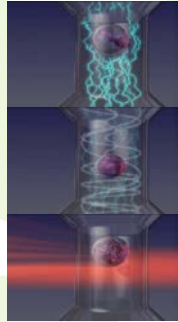
- 67 cases of HS,
- 59 cases of G6PD deficiency,
- 57 cases of AIHA,
- 99 cases of thalassemia
- 100 cases of healthy controls

MSCV-MCV < 0.6
SEN: 95.5%
ESP: 94.9%



| MAGNITUD (Punt de tall) | AUC | IC (95%) | | SENS | ESP |
|-------------------------|------|----------|-------|------|------|
| MSCV-MCV (0.6) | 0.97 | 0.95 | 0.100 | 95.5 | 94.4 |
| MRV (96.1 fL) | 0.94 | 0.91 | 0.97 | 86.6 | 89.2 |
| MCHC (33.5) | 0.92 | 0.88 | 0.97 | 82.1 | 94.5 |
| RET/IRF (4.5) | 0.77 | 0.70 | 0.84 | 65.7 | 81 |

CPD SERIE ROJA

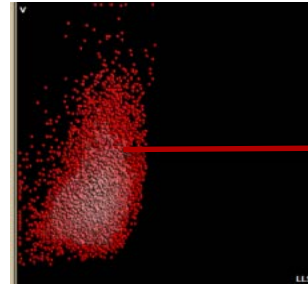
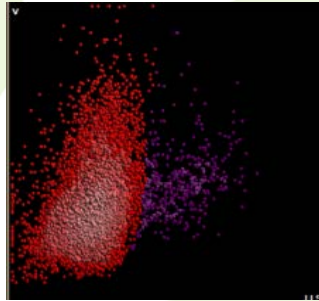


V

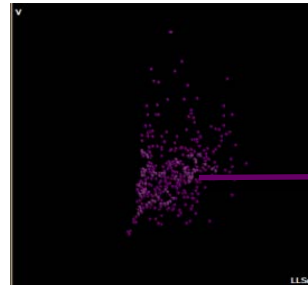
C

Sn

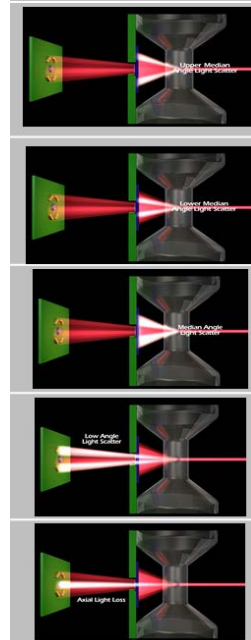
Canal Reticulocitos



X+SD

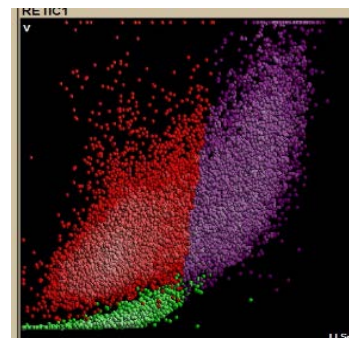
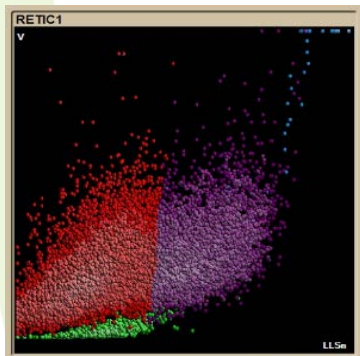
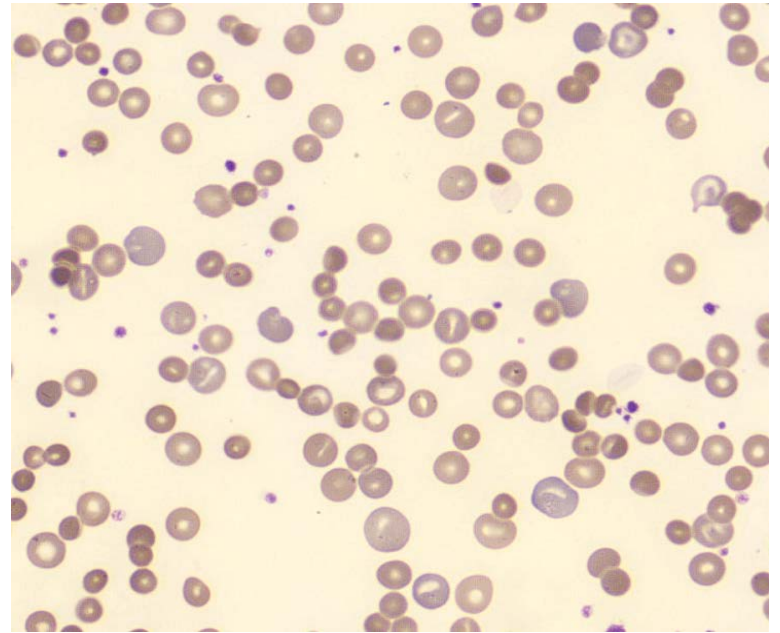
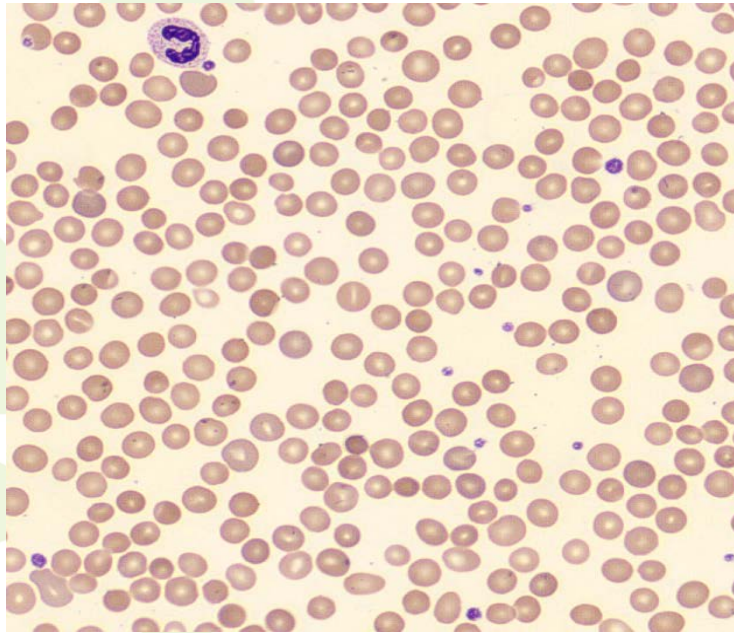


X+SD



| Instrumentos | Colorant | Parametres |
|--------------|---------------------|--------------------|
| UniCell DxH | Nuevo azul metileno | IRF; MRV;HLR;RSF |
| LH series | Nuevo azul metileno | IRF; MRV; MSCV;HLR |

| | RETIC | | NO RETIC | |
|-------|-------|-------|----------|-------|
| | Media | DE | Media | DE |
| V | 51 | 14.21 | 39 | 11.65 |
| C | 75 | 22.84 | 74 | 23.55 |
| DLAM | 130 | 22.29 | 59 | 14.04 |
| DLAMS | 135 | 21.36 | 64 | 13.87 |
| DLAMI | 121 | 25.40 | 49 | 15.44 |
| LALS | 112 | 29.14 | 63 | 19.69 |
| AL2 | 136 | 25.59 | 102 | 13.60 |



DxH-800

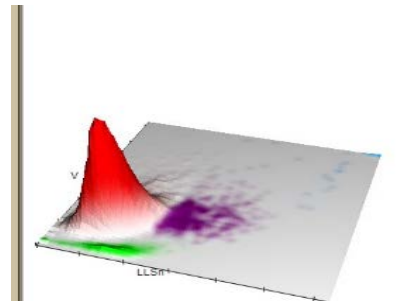
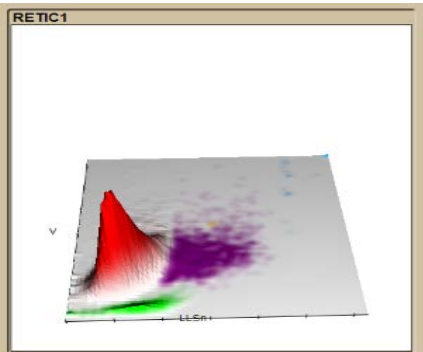
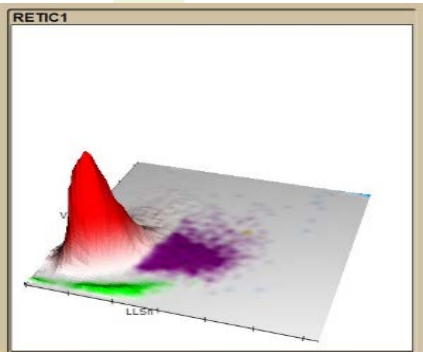
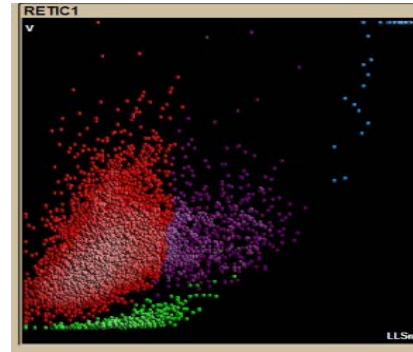
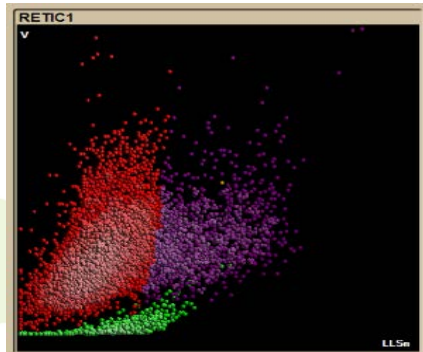
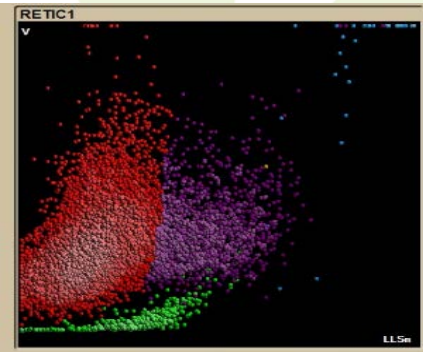
| | |
|------|---|
| RETp | <input type="text" value="10.22"/> |
| RET | <input type="text" value="366"/> <input type="text" value="40 - 85"/> |
| VRM | <input type="text" value="93.8"/> |
| FRI | <input type="text" value="0.57"/> |

DxH-800

| | |
|------|---|
| RETp | <input type="text" value="5.31"/> |
| RET | <input type="text" value="280"/> <input type="text" value="40 - 85"/> |
| VRM | <input type="text" value="90.2"/> |
| FRI | <input type="text" value="0.46"/> |

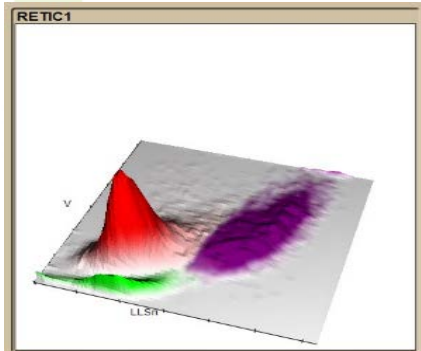
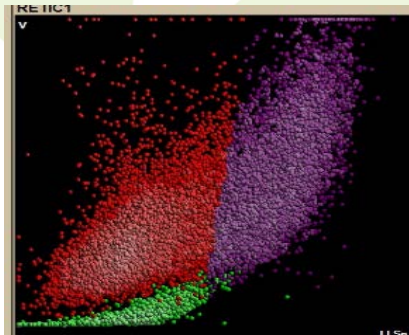
DxH-800

| | |
|------|---|
| RETp | <input type="text" value="6.45"/> |
| RET | <input type="text" value="204"/> <input type="text" value="40 - 85"/> |
| VRM | <input type="text" value="99.0"/> |
| FRI | <input type="text" value="0.56"/> |



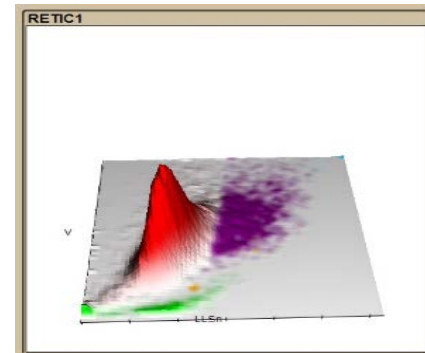
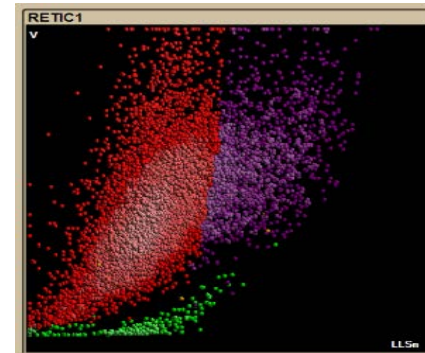
DxH-800

RETp
RET
VRM
FRI



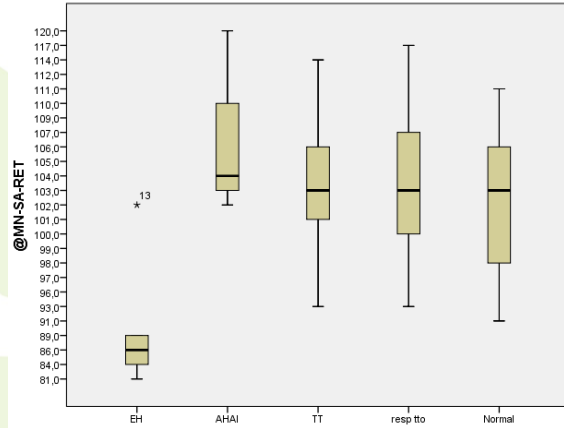
DxH-800

RETp
RET
VRM
FRI

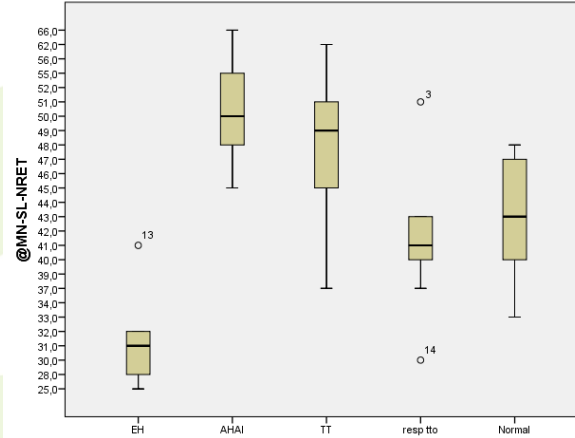


- 57 pacientes (5 EH, 3 AHAI, 20 Talasemias, 9 Respuesta tto, 20 Normales).

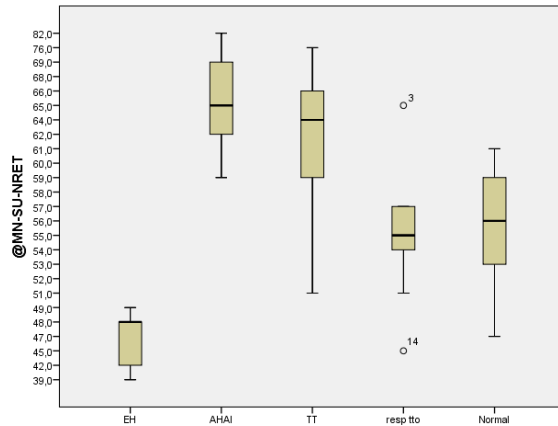
Media-SA-Ret



Media-SL-NoRet



Media-SU-NoRet



Media-SM-NoRet

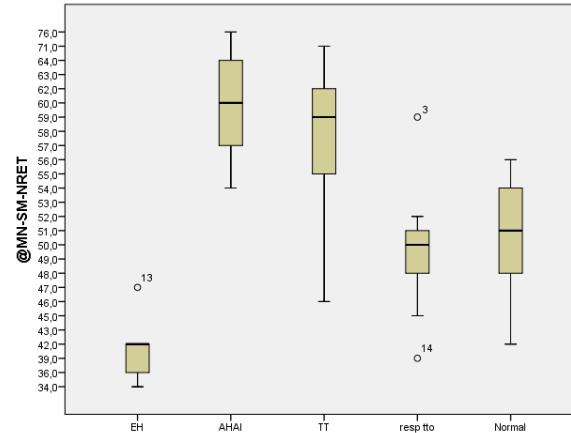


Tabla 2. AUC para los CPD estudiados y la fórmula descrita.

| Fórmula | AUC | IC 95% | p |
|------------|-------|-------------|--------|
| M-SA-RET | 0.922 | 0.777-1.000 | <0.001 |
| M-SM-NoRET | 0.969 | 0.916-1.000 | <0.001 |
| M-SU-NoRET | 0.981 | 0.940-1.000 | <0.001 |
| M-SL-NoRET | 0.950 | 0.871-1.000 | <0.001 |

M-SA-RET: media del ángulo axial (5°) de los reticulocitos. **M-SM-NoRET:** media del ángulo medio de los eritrocitos (9-43°). **M-SU-NoRET:** media del ángulo alto (20-43°) de los eritrocitos. **M-SL-NoRET:** media del ángulo bajo (9-19°) de los eritrocitos.

20-43°

CUT-OFF: 46.5

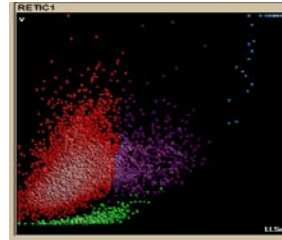
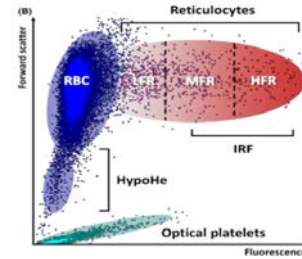
SEN: 96.9%

ESP: 100%

ESFEROCITOSI HEREDITÀRIA

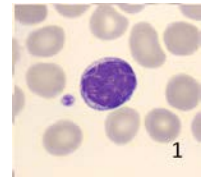
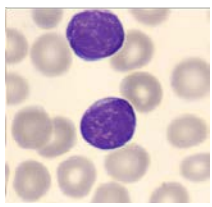
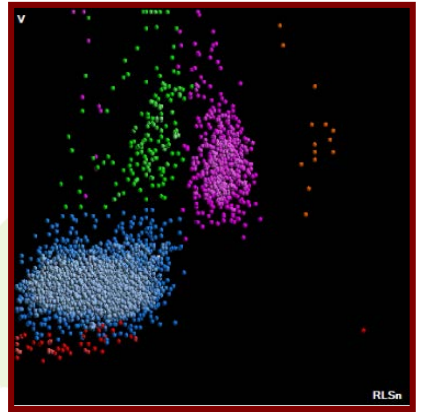
- **Anèmia hemolítica** que es caracteriza per:

- Reticulocitosis (**RET#**, **RET%**) amb una disminució **IRF**.
- Presència d'**esferòcits** que es poden detectar/quantificar mitjançant les magnituds: **%HPR**, **%MicR**, **%MicR/%Hypo-He**, **MSCV** o **MCV-MSCV**, ...
- La alteració a la membrana, fa que tant els **hematies** com els **reticulòcits** presenten unes **característiques cel·lulars/poblacionals pròpies**: **M-SA-RET**, **M-SM-RET**, **M-SU-RET**, **M-SA-NRET**, **M-SM-NRET**, **M-SU-NRET**,...

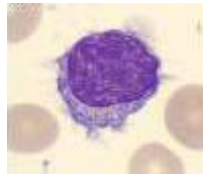
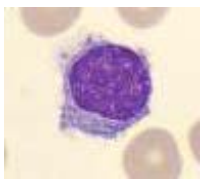
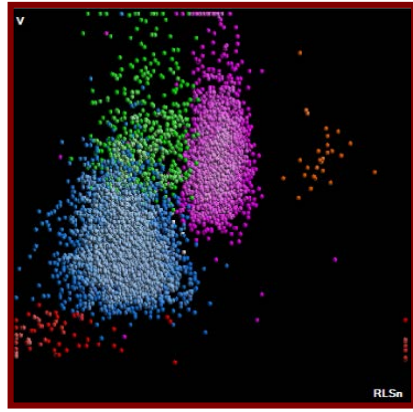


LIMFOCITOSI

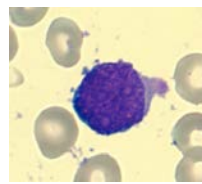
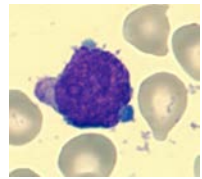
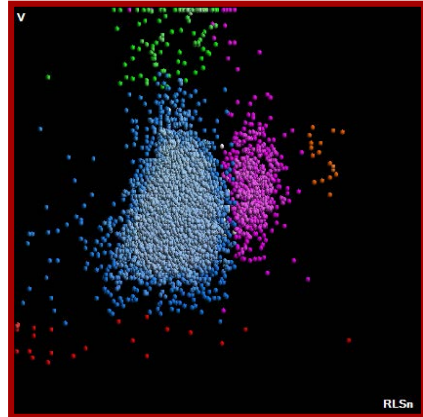
Limfòcits: $7.4 \times 10^9/L$



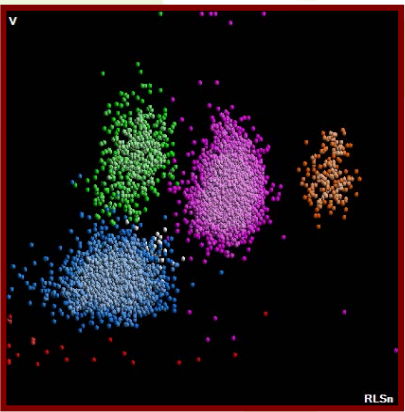
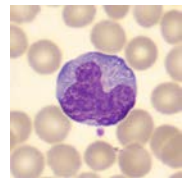
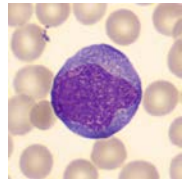
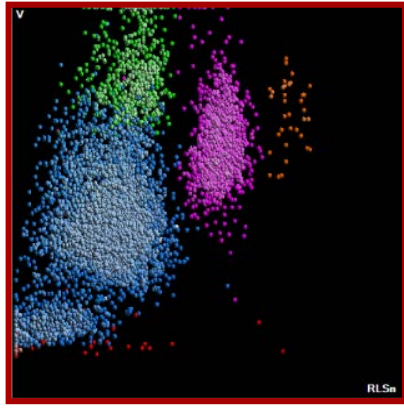
Limfòcits: $5.1 \times 10^9/L$



Limfòcits: $14.4 \times 10^9/L$



Limfòcits: $6.5 \times 10^9/L$



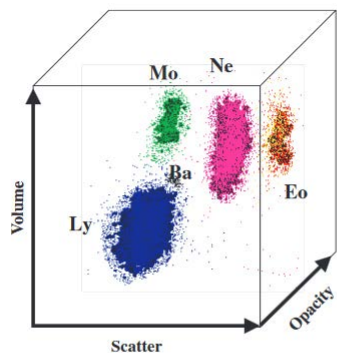
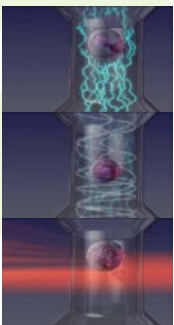
M. SILVA*,
 C. FOURCADE†,
 C. FARTOUKH‡,
 B. LENORMAND*,
 G. BUCHONNET*,
 M. P. CALLAT*,
 C. LECLERC§,
 J. P. BASUYAU¶,
 M. VASSE*

Lymphocyte volume and conductivity indices of the haematology analyser Coulter® GEN.S™ in lymphoproliferative disorders and viral diseases

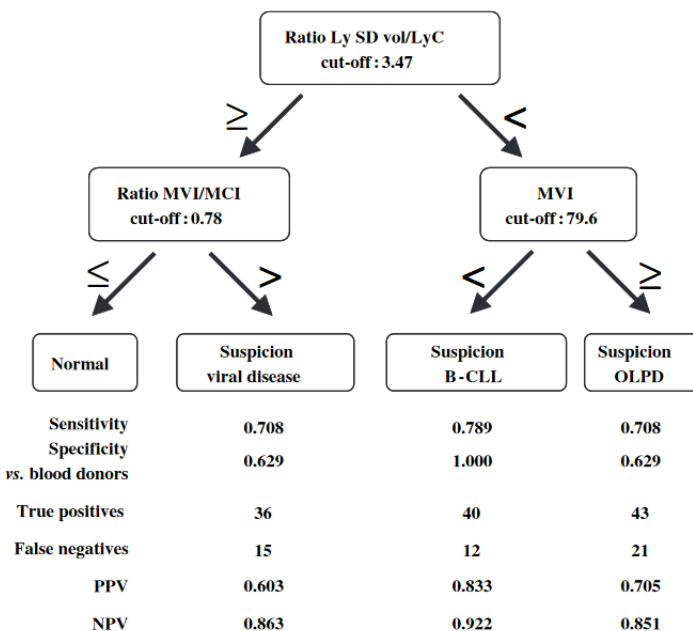
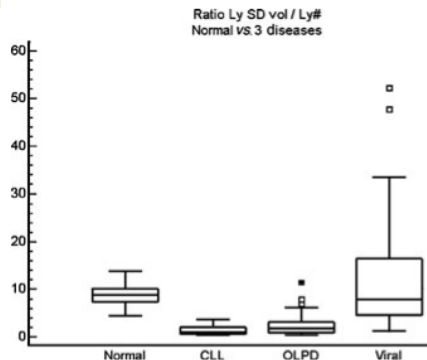
Clin. Lab. Haem. 2006, 28,1-8



Beckman Coulter GEN-S



| | NE | | LY | | MO | | EO | |
|---|------|-------|------|-------|------|-------|------|-------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| V | 169 | 49.92 | 82 | 25.42 | 184 | 26.63 | 161 | 28.86 |
| C | 147 | 17.86 | 130 | 31.82 | 130 | 9.74 | 143 | 9.48 |
| S | 128 | 17.81 | 69 | 22.53 | 92 | 11.40 | 193 | 7.88 |



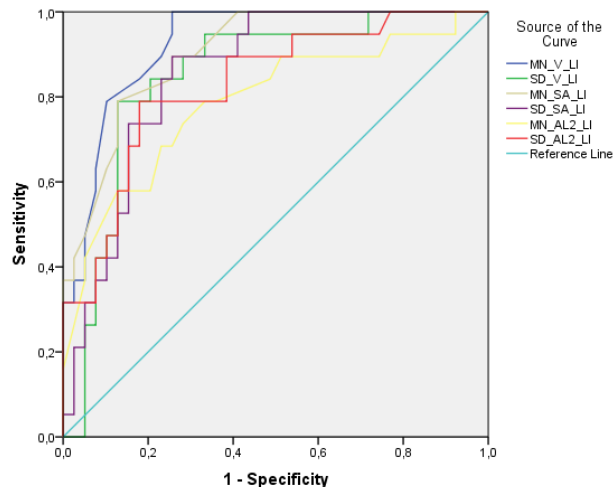
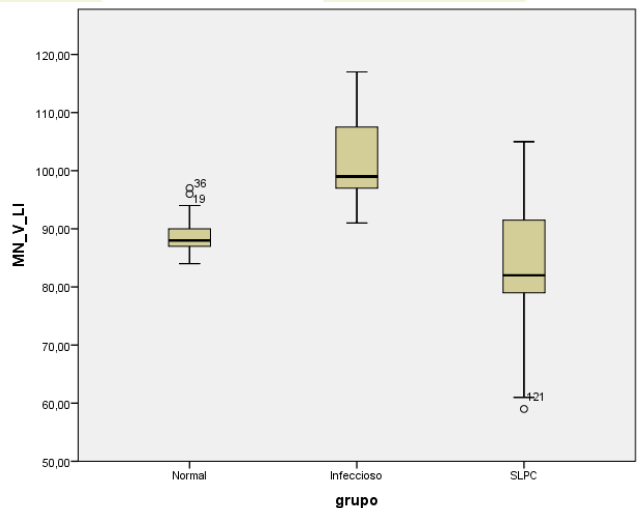
Utilidad de los Cell Population Data en el diagnóstico diferencial de las linfocitosis.

X.Nieto, et al.

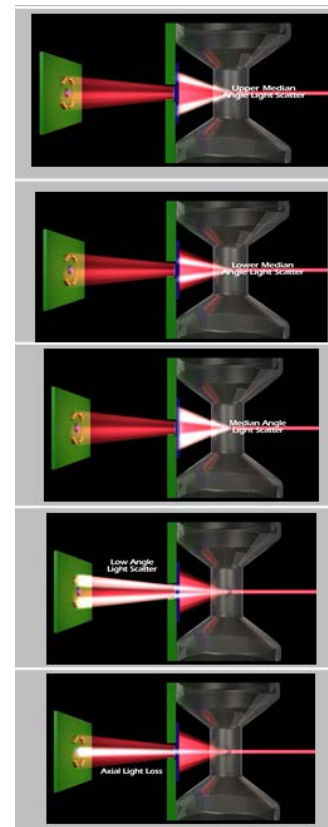
LIX Congreso Nacional de la Sociedad Española de Hematología y Hemoterapia, Málaga, 26-28 Octubre. Abstract book PC-133

122 patients:

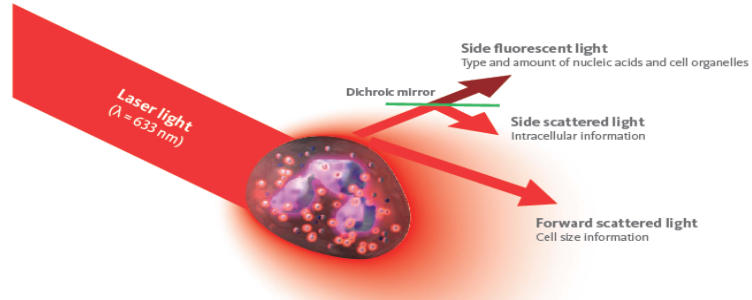
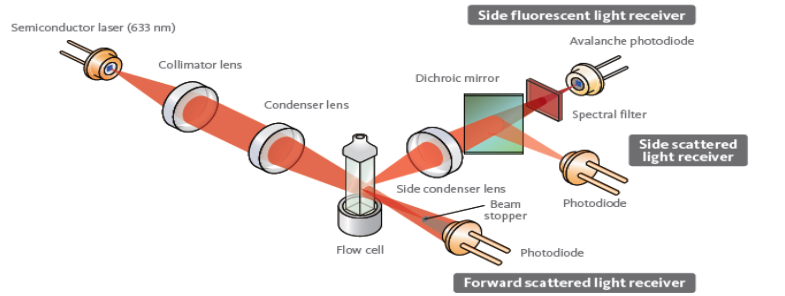
- 63 controls
- 59 Linfocitosis (41 LLC i 18 MNS)



MV-Li: 0,924. Sens: 89,5%, Esp: 76,9%
MSA-Li: 0.904. Sens: 89,5%, Esp: 74.4%

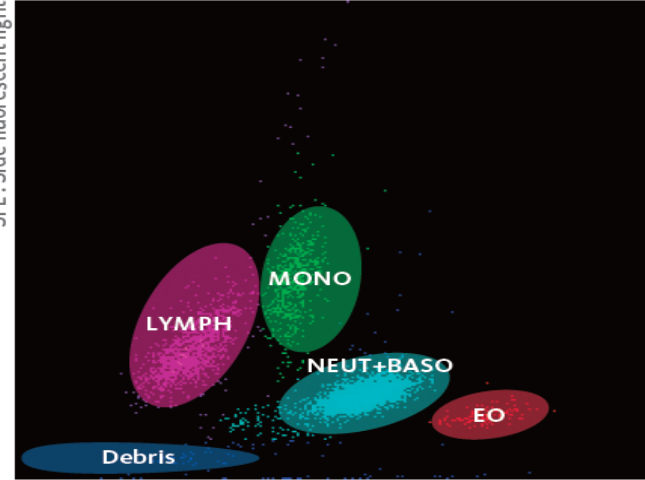


Sysmex-XN



WDF scattergram

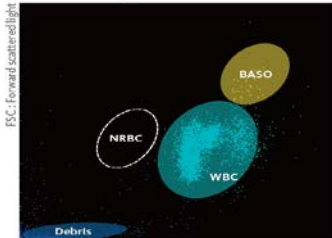
SFL : Side fluorescent light



SSC : Side scattered light

WNR scattergram

FSC: Forward scattered light



SFL : Side fluorescent light

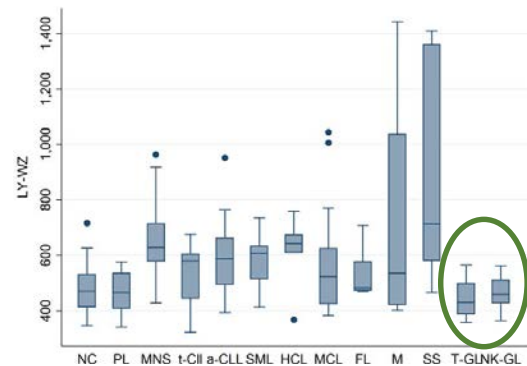
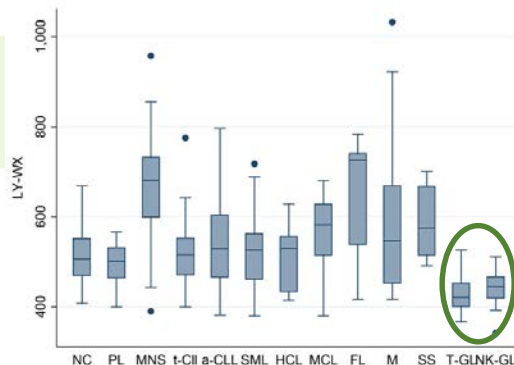
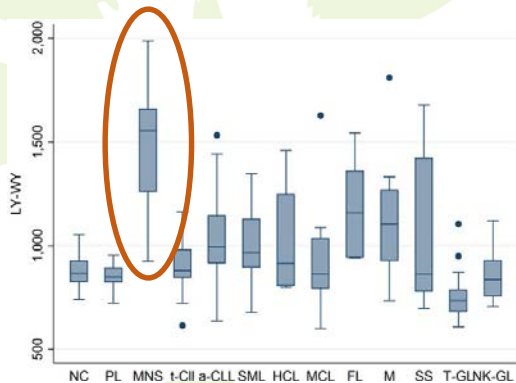
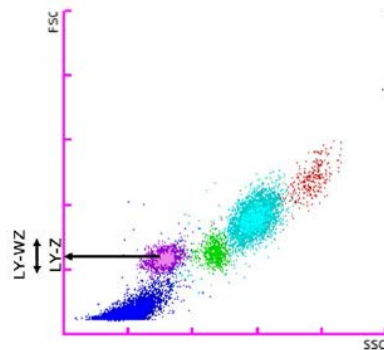
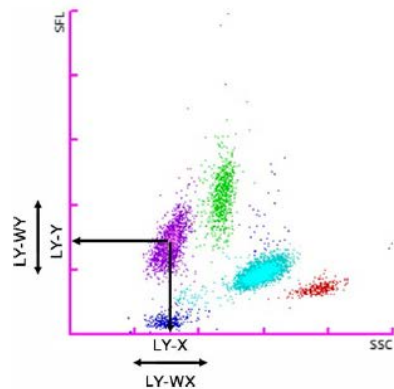
Usefulness of the lymphocyte positional parameters in the Sysmex XN haematology analyser in lymphoproliferative disorders and mononucleosis syndrome

J. R. Furundarena | A. Uranga | M. R. Sainz | C. González | N. Uresandi | N. Argoitia | M. Araiz

Int J Lab Hem. 2018;40:41–48.

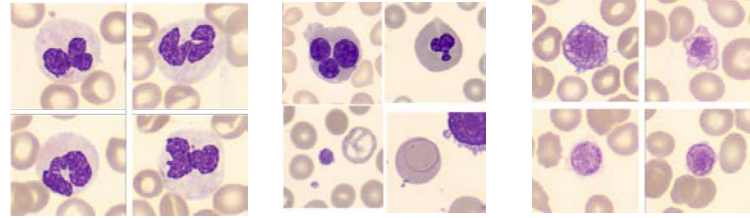
301 patients:

- 42 controls
- 23 LP, 22 MNS
- 162 SLPC
- 40 T-GL, 12 NK-GLs



- **LY-WX+LY-WY <1230**: SE of 67.5%, an SP of 98.2%, a PPV of 87.1% and an NPV of 94.3%.
- **Score Teixidó**: SE of 63.6%, an SP of 97.5%, a PPV of 70.0% and an NPV of 96.7%.
- **38.5% of all cases, the analyser did not generate any morphologic flag.**
- **Abnormal results in lymphocyte positional parameters were useful to detect 72.5% of these samples.**

SÍNDROMES MIELODISPLÀSIQUES



- Les síndromes **mielodisplàsiques (SMD)** són un grup d'hemopaties caracteritzades per la presència d'**una o varies citopènies i displàsia** en **sang perifèrica**.
- A part de les SMD, existeixen moltes altres **condicions patològiques** que cursen amb **citopènies i displàsia**.
- La identificació dels signes i grau de displàsia és **subjectiva i complexe**, amb **variacions importants** interobservador.

Robin Boutault,¹ Pierre Peterlin,² Marouane Boubaya,³ Katja Sockel,^{4,5} Patrice Chevallier,² Alice Garnier,² Thierry Guillaume,⁷ Amandine Le Bourgeois,² Camille Debord,¹ Catherine Godon,¹ Yannick Le Bris,¹ Olivier Theisen,¹ Frank Kroschinsky,^{4,5} Philippe Moreau,² Marie C. Béné,¹ Uwe Platzbecker^{4,5,6} and Marion Eveillard¹

A novel complete blood count-based score to screen for myelodysplastic syndrome in cytopenic patients

Br J Haematol. 2018 Dec;183(5):736-746.

$$\text{MDS-CBC score} = 1 / (1 + \exp(-(-21 \cdot 02807 + 0 \cdot 03294 \times \text{Ne-WX} - 0 \cdot 38466 \times \text{ANC} + 0 \cdot 10285 \times \text{MCV})))$$

508 patients:
 • 109 SMD
 • 399 Controls
 (>50 a +citopénies)

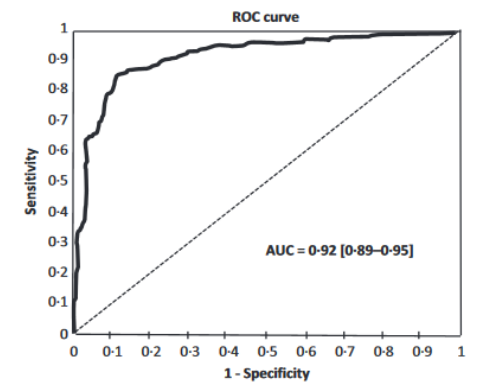
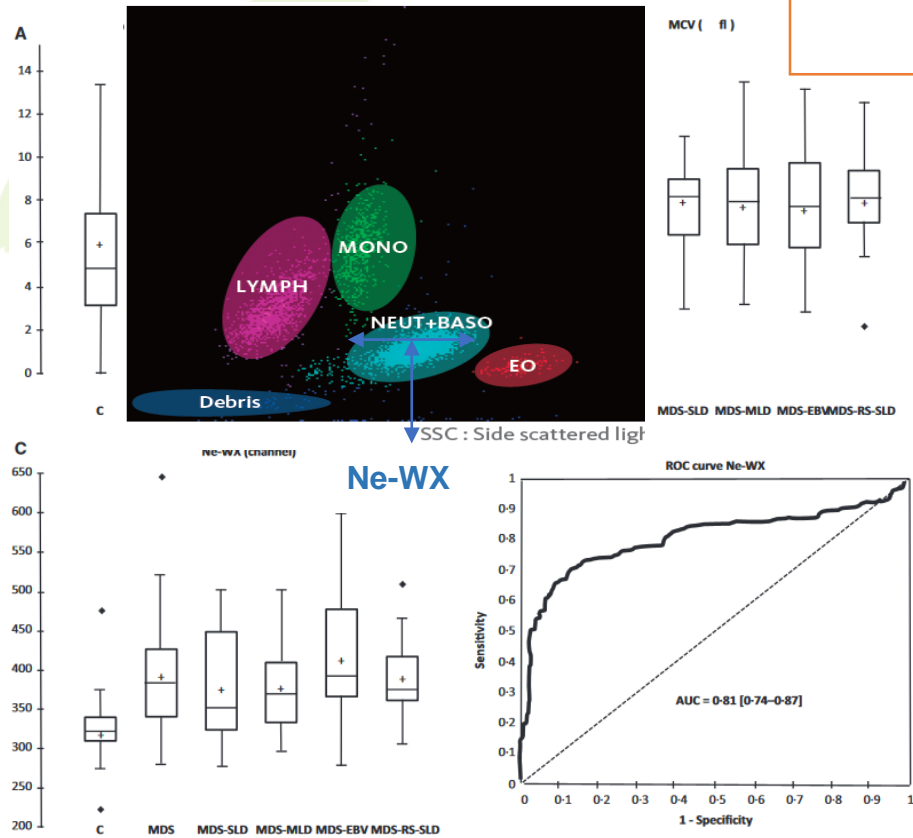
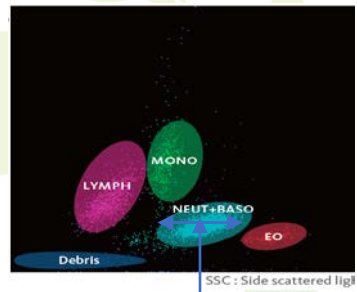


Fig 2. ROC curve of the MDS-CBC score (AUC = 0.92). AUC, area under the curve. Table III. Performance of the MDS-CBC score.

| Diagnosis | Positive | Negative | |
|--------------------------|----------|----------|-----------------|
| Leading cohort | | | |
| MDS | 94 | 15 | 86% Sensitivity |
| Controls | 46 | 353 | 88% Specificity |
| | 67% PPV | 96% NPV | |
| Validation cohort | | | |
| MDS | 28 | 6 | 82% Sensitivity |
| Controls | 3 | 25 | 89% Specificity |
| | 90% PPV | 81% NPV | |

CBC, complete blood count; MDS, myelodysplastic syndrome; NPV, negative predictive value; PPV, positive predictive value.

CO-116

DISTINCIÓN ENTRE SÍNDROMES MIELODISPLÁSICOS Y CITOPENIAS NO CLONALES MEDIANTE ANÁLISIS MORFOMÉTRICO CELULAR

102 patients:

- 32 SMD
- 48 HP
- 31 IRC

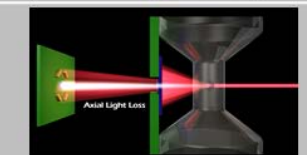
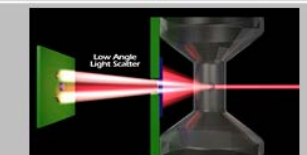
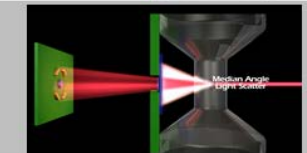
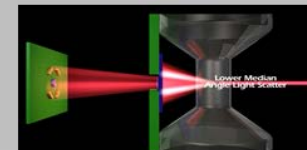
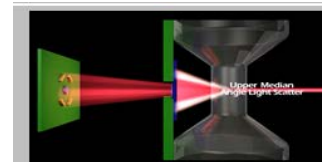
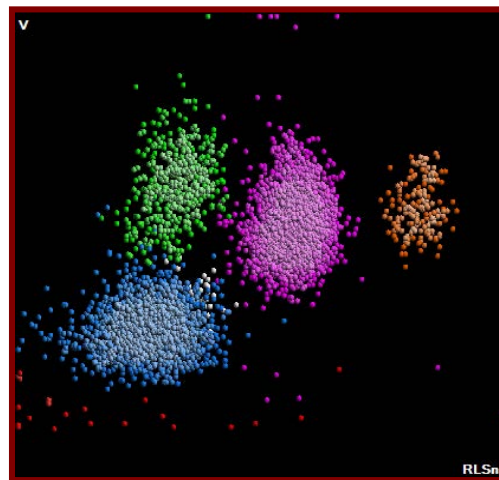
| Magnitud | SMD=23 (x±sd) | HP=48 (x±sd) | ERC=31 (x±sd) | p |
|-----------------|--------------------|--------------------|---------------------|------------------|
| V-NEU | 149,3 ± 9,0 | 144,9 ± 5,1 | 148,2 ± 11,6 | 0,084 |
| C-NEU | 143,4 ± 4,9 | 144,3 ± 2,8 | 145,1 ± 4,7 | 0,326 |
| SM-NEU (9-43°) | 132,0 ± 6,6 | 141,1 ± 5,6 | 137,7 ± 8,7 | <0,001 |
| SU-NEU (20-43°) | 132,5 ± 8,0 | 140,0 ± 4,8 | 137,7 ± 6,3 | <0,001 |
| SL-NEU (9-19°) | 127,6 ± 7,4 | 137,0 ± 7,9 | 132,4 ± 11,7 | <0,001 |
| SA-NEU (5°) | 163,7 ± 15,0 | 168,0 ± 18,0 | 163,9 ± 18,6 | 0,495 |
| AL2-NEU (0°) | 147,8 ± 8,9 | 149,4 ± 7,5 | 150,9 ± 10,9 | 0,467 |

CITOPÈNIA

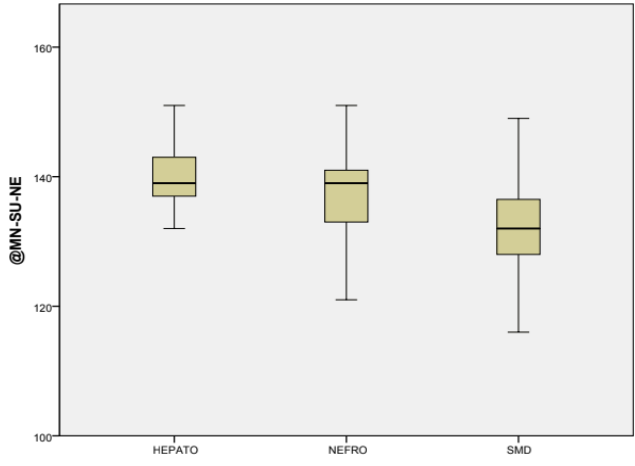
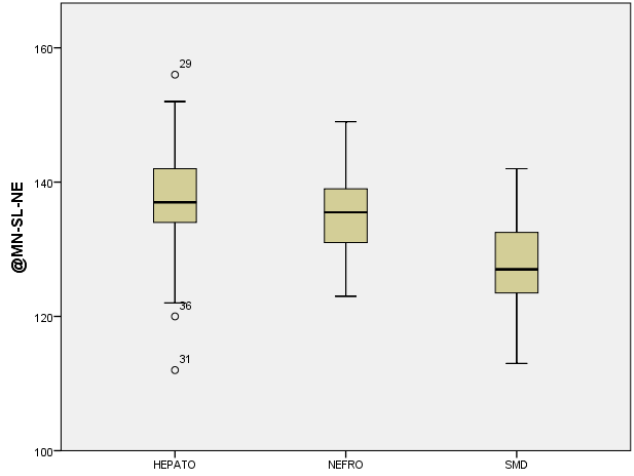
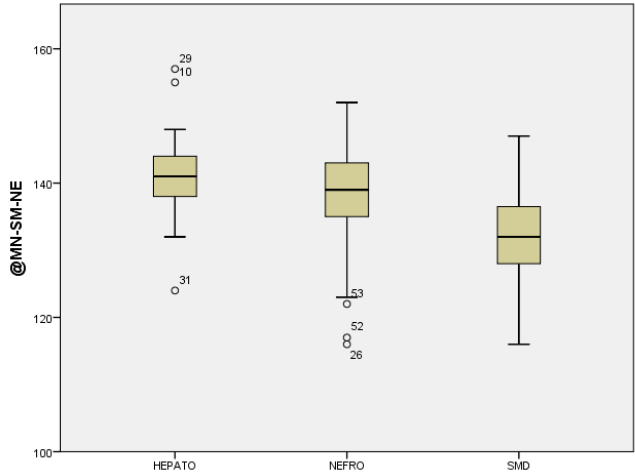
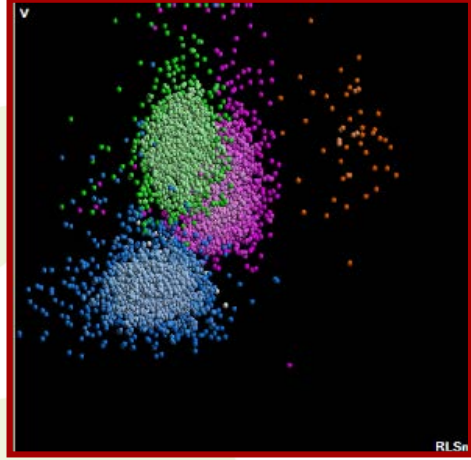
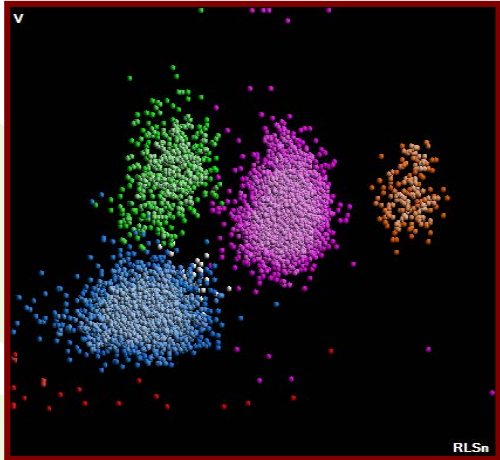
Hemoglobina < 10,0 g/dL

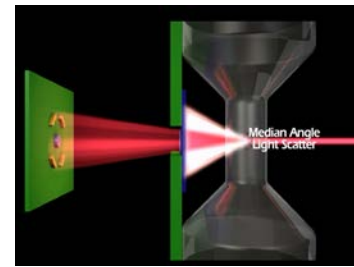
Neutròfils < 1,8 x10⁹/L

Plaquetes < 100 x10⁹/L



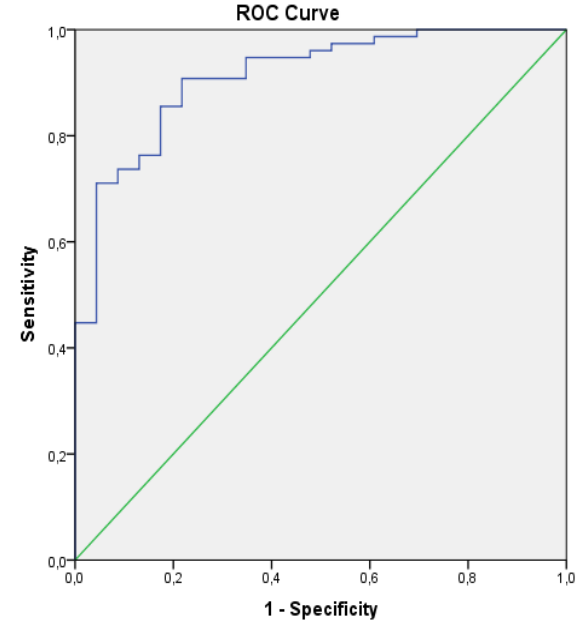
DISTINCIÓN ENTRE SÍNDROMES MIELODISPLÁSICOS Y CITOPENIAS NO CLONALES MEDIANTE ANÁLISIS MORFOMÉTRICO CELULAR





| Fórmula | AUC | IC 95% | p |
|-----------------|--------------|--------------------|-------------------|
| V-NEU | 0,378 | 0,234-0,522 | 0,078 |
| C-NEU | 0,623 | 0,465-0,781 | 0,076 |
| SM-NEU (9-43°) | 0,818 | 0,718-0,919 | <0,001* |
| SU-NEU (20-43°) | 0,782 | 0,661-0,903 | <0,001* |
| SL-NEU (9-19°) | 0,775 | 0,671-0,879 | <0,001* |
| SA-NEU | 0,562 | 0,371 | 0,430-0,694 |
| AL2-NEU | 0,555 | 0,429 | 0,413-0,696 |

CUT-OFF:
110,8
SENS: 90,8%
ESP: 78,3%



| Fórmula | AUC | IC 95% | p |
|---|--------------|--------------------|-------------------|
| Índice SMD [(SU-NEU + SL-NEU)xNEU%]/100] | 0,911 | 0,848-0,975 | <0,001* |

SMD vs Citopenias No Clonales

LIMITACIONS

- **Analitzador (tecnologia) depenent (Ne-WX, MSCV, Ret-He, MDW, etc.)**
- **Estandarització dels mètodes.**
- **Necessitat d'armonitzar els valors de referencia (RET, MRV, IRF,...)**
- **Reproducibilitat (variació biològica, estabilitat, anticoagulant (K2, K3), temperatura conserv,..)**
- **Disposar de Control de Qualitat (intern/extern).**
- **Definir els valors umbrals per els diagnòstic.**
- **Validació clínica per la presa de decisions.**

LA SEPSIS

 Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™



More than **1.7** million people get sepsis each year in the U.S.
About **270,000** Americans die from sepsis each year.

1 in **3**

One in three patients who die in a hospital have sepsis.

España:

200 sepsis/100.000 hab./año.
17000 mueren.

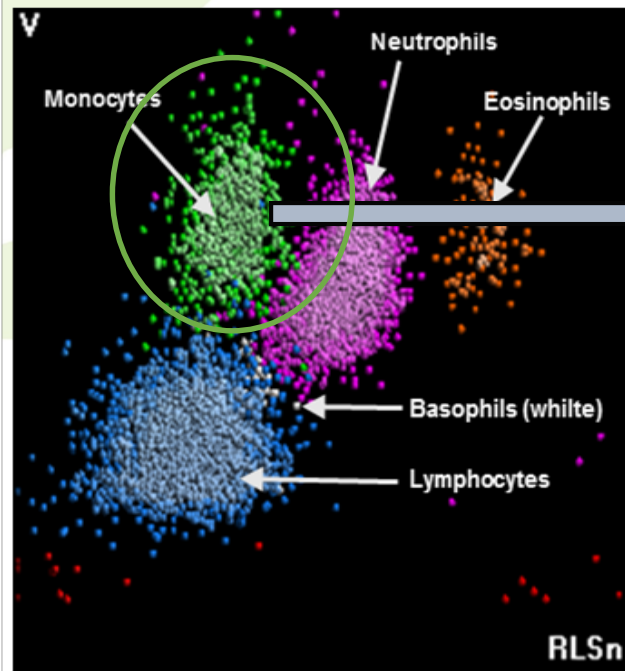
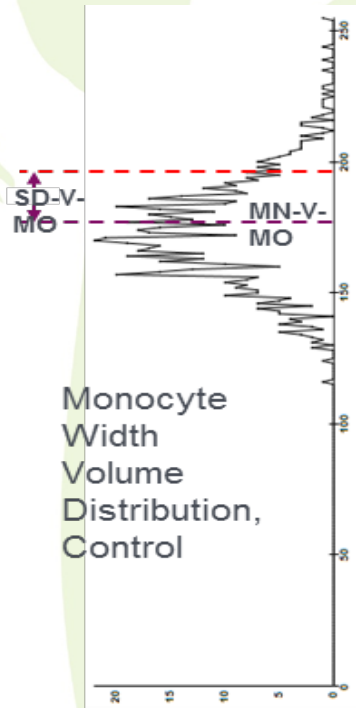
<https://www.cdc.gov/sepsis/datareports/index.html>

Cada 4 segundos muere un paciente de sepsis en el mundo.

Supone un gasto de aprox. 20 billones dólares /año en los Hospitales de US.
El 5,2% del gasto Hospitalario

Liu et al. JAMA 2014;312:90-92

ETERMINACIÓN DEL MDW . ¿INDICADOR SEPSIS?

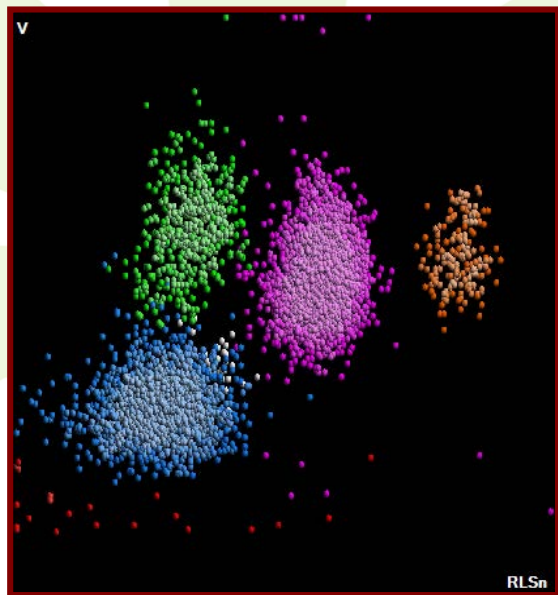


SEPSIS



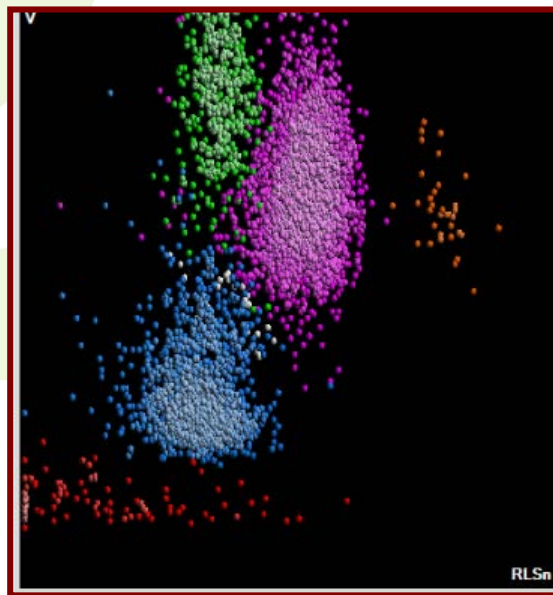
DxH-900

NO-SEPSIS



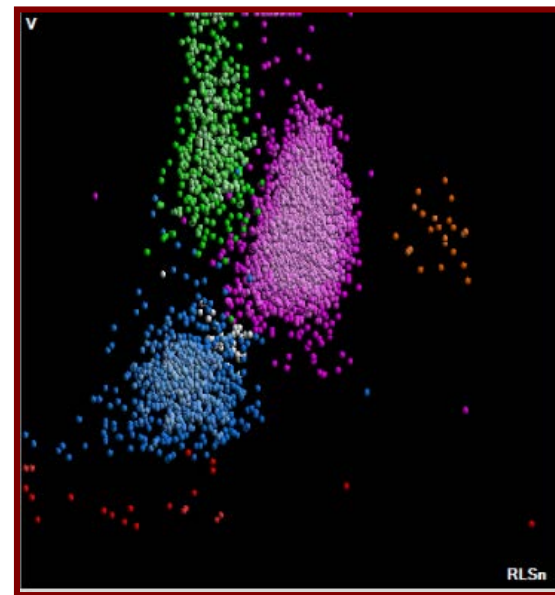
MDW: 18.7
LEU: $7.4 \times 10^9/L$

SEPSIS



MDW: 31.8
LEU: $25.3 \times 10^9/L$

SEPSIS



MDW: 27.8
LEU: $15.2 \times 10^9/L$

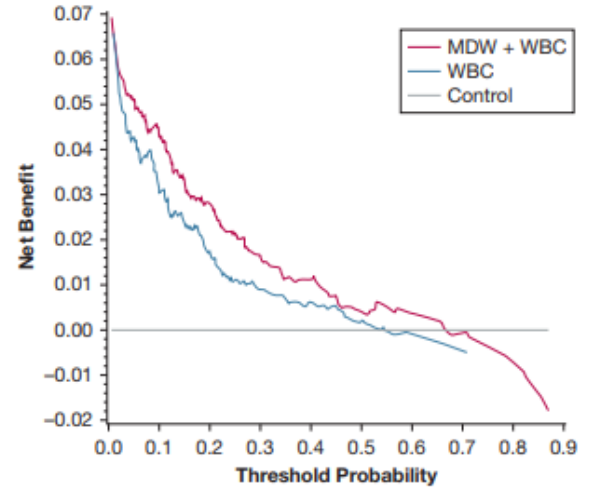
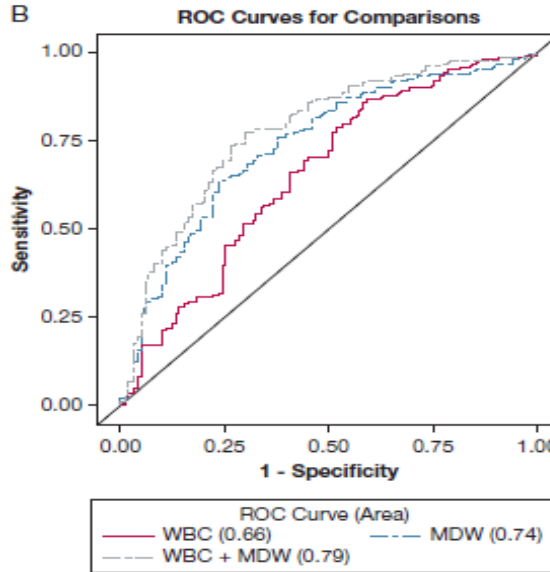
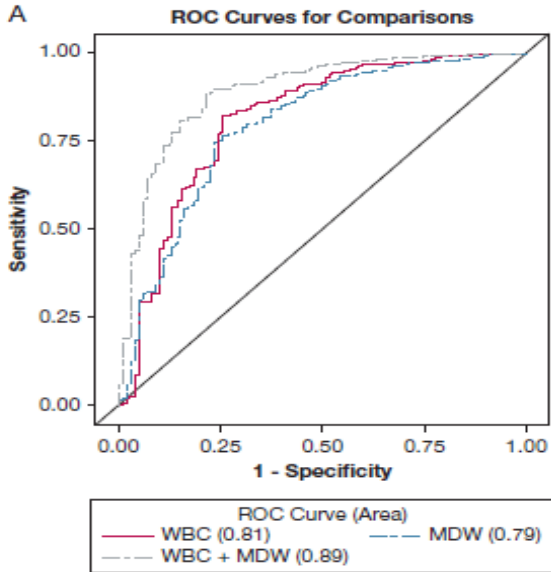
Improved Early Detection of Sepsis in the ED With a Novel Monocyte Distribution Width Biomarker



Crouser ED., et al. *Chest*. 2017 Sep;152(3):518-526

| Patient Categories | No. (%) |
|---------------------|-------------|
| Total | 1,320 (100) |
| Control | 879 (66.6) |
| SIRS | 203 (15.4) |
| Infection | 140 (10.6) |
| Sepsis ^a | 98 (7.4) |
| Sepsis | 79 (78.2) |
| Severe Sepsis | 13 (12.9) |
| Septic Shock | 6 (5.9) |

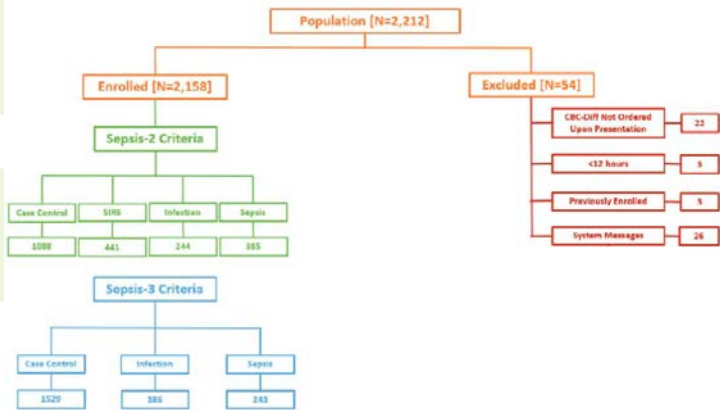
MDW: 20.5 ⇒ NPV: 98%



Monocyte Distribution Width: A Novel Indicator of Sepsis-2 and Sepsis-3 in High-Risk Emergency Department Patients*

Elliott D. Crouser, MD¹; Joseph E. Parrillo, MD²; Christopher W. Seymour, MD³;

Crit Care Med 2019 Aug;47(8):1018-1025

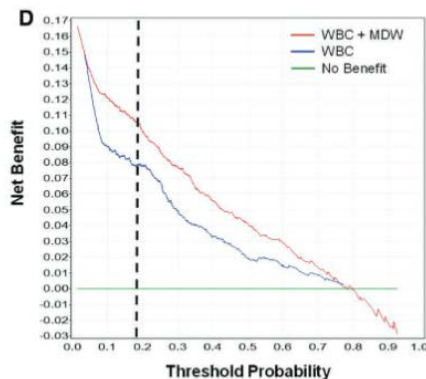
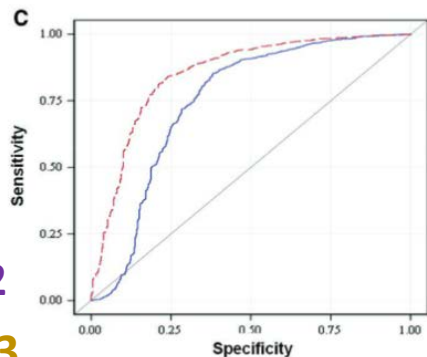
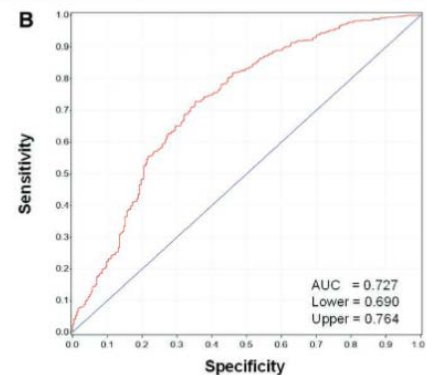
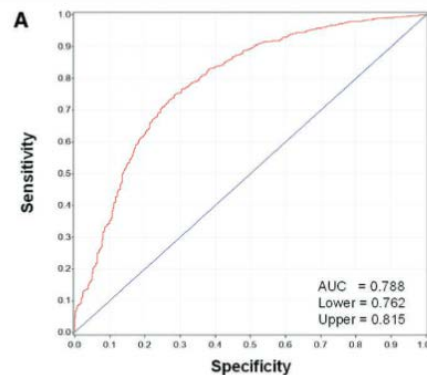


(AUC: 0.79) → NPV: 93% Sepsis-2

MDW: 20

(AUC: 0.73) → NPV: 94% Sepsis-3

MDW+WBC (AUC: 0.85)



ROC Curve (Area)
 — WBC (0.7463) — WBC+MDW (0.8518)

Per Recordar

- La determinació de les “noves” **magnituds hematimètriques**, és ràpida, fàcil i no suposa un temps afegit a la realització del hemograma o dels reticulòcits.
- Els **CPDs/CMPs** són magnituds que proporcionen informació sobre les **característiques morfològiques** de les diferents **poblacions cel·lulars** (reducció de la imprecisió interobservador).
- La majoria de **magnituds, CPDs (+CBC/DIFF)** podrien ajudar com a **screening i diagnòstic** de moltes **patologies hematològiques i no hematològiques** mitjançant regles de validació/ampliació.
- **Manca d'assajos clínics en busca de biomarcadors de patologia.**
- **La hematimetria (hemograma avançat) encara té molt per dir...**

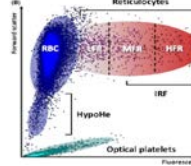
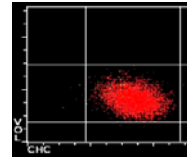
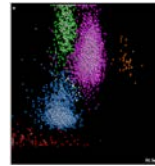
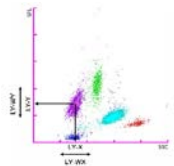
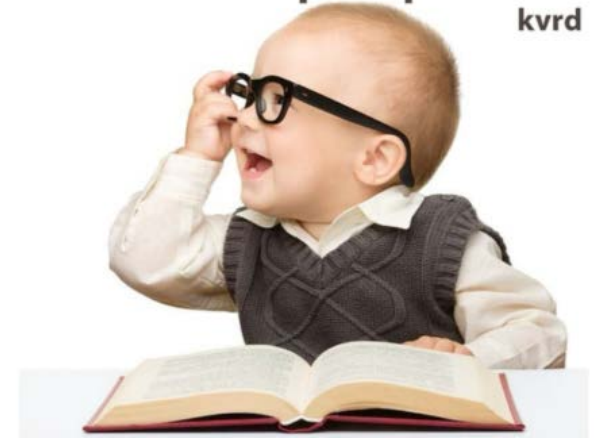
OBJECTIUS

- Despertar la curiositat envers de les utilitats que pot tenir l'hemograma.

- Consulteu alguna de les "noves magnituds" que pot oferir l'hemograma.

"La curiosidad por el saber es la motivación por aprender"

kvrđ





Trini

Lidia

Cristina

Maria

Alicia

Sophiane

Xavi

Alicia

M^a José

Mercè

Carla

Silvia

Yolanda

Cristian

Inés
Lucia
Ana
Paqui
Alba
Elisa
Tomás
Meritxell



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GRÀCIES !!!



