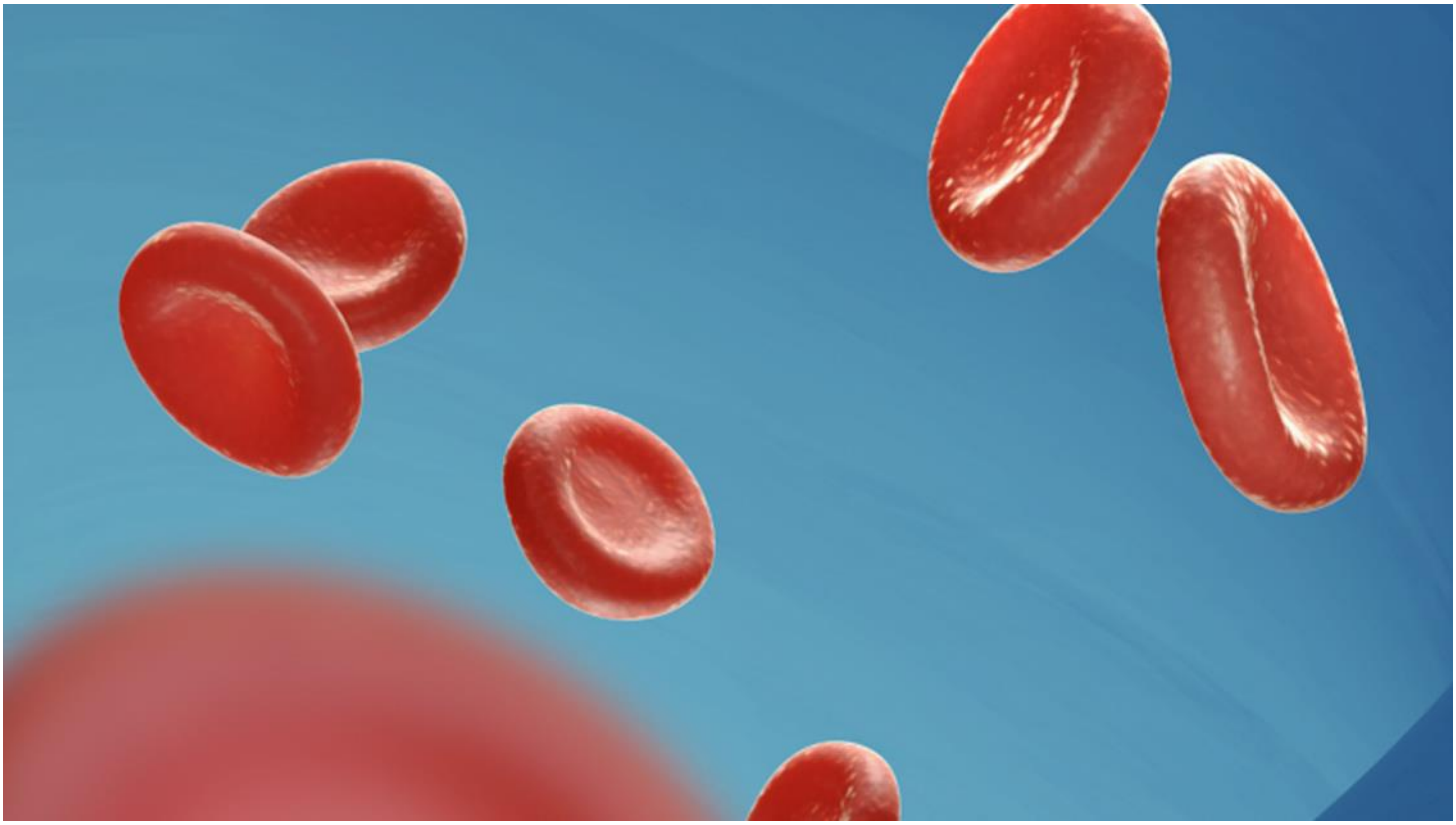
Literature List – Red Blood Cells

Customer Information

November 2021



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NEW New entries are highlighted by this icon.

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Table of contents

Reticulocytes (RET/ IRF)

NEW

Jeppesen JS *et al*. (2021)

Immature reticulocytes are sensitive and specific to low-dose erythropoietin treatment at sea level and altitude
Drug Test Anal; 13(7): 1331

https://analyticalsciencejournals.onlinelibrary.wiley.com/doi/10.1002/dta.3031

What we see as the essence: IRF and IRF/RBC ratio changes identified 90% of study participants treated with a micro-dose of recombinant human erythropoietin at sea level during and after the exposure period with a specificity of >99%. When analysing flow cytometry versus Sysmex XN-450, Sysmex is the more optimal measurement technique due to automation.

Jiang H *et al*. (2019)

Interferents of Automated Reticulocyte Analysis Integrated with Relevant Clinical Cases
Clin Chem; 65(7): 1251

https://www.clin-lab-publications.com/article/3060

What we see as the essence: XN-9000 showed high agreement with the manual counting method (r = 0.956) in a cohort of 510 samples. The analyser was able to correctly count RET% and RET# in presence of most interferences or indicate result unreliability in severe cases.

La Gioia A *et al*. (2018)

Short preheating at 41°C leads to a red blood cells count comparable to that in RET channel of Sysmex analysers in samples showing cold agglutination
J Clin Pathol; 71(8): 729

https://jcp.bmj.com/content/71/8/729.long

What we see as the essence: Detailed evaluation of the RET channel in terms of resolving cold-agglutinins. It provides comparable results like traditional manual 37°C/2h pre-treatment and can therefore be recommended to shorten TAT.

Morkis IVC *et al*. (2015)

Assessment of immature platelet fraction and immature reticulocyte fraction as predictors of engraftment after hematopoietic stem cell transplantation
Int J Lab Hematol; 37(2): 259

http://onlinelibrary.wiley.com/doi/10.1111/ijlh.12278/abstract

What we see as the essence: Both IRF% and IPF% can be used to predict neutrophil and platelet recovery, respectively. Work was done on XE-5000.

Yesmin S *et al*. (2011)

Immature reticulocyte fraction as a predictor of bone marrow recovery in children with acute lymphoblastic leukaemia on remission induction phase
Bangladesh Med Res Council Bull; 37(2): 57

http://www.banglajol.info/index.php/BMRCB/article/view/8435

What we see as the essence: In 52% of paediatric ALL patients, IRF% values rose before NEUT# values during recovery after chemotherapy. Therefore, monitoring of both parameters may be beneficial.

Gonçalo AP *et al*. (2011)

Predictive value of immature reticulocyte and platelet fractions in hematopoietic recovery of allograft patients
Transplant Proc; 43: 24

http://www.transplantation-proceedings.org/article/S0041-1345(10)01945-7/abstract

What we see as the essence: The immaturity fractions IRF and IPF offer an easy and early evaluation method of posttransplantational recovery of the bone marrow.

Reticulocyte haemoglobin equivalent (RET-H*e* / RBC-H*e*)

Hönemann C *et al*. (2021)

Reticulocyte Haemoglobin as a Routine Parameter in Preoperative Iron Deficiency Assessment
iMedPupJournals; 5(1): 154

Free online: https://www.imedpub.com/abstract/reticulocyte-haemoglobin-as-a-routine-parameter-in-preoperative-iron-deficiency-assessment-34623.html

What we see as the essence: The authors of the review recommend RET-H*e* as a routine preoperative parameter to identify patients at risk for latent iron deficiency. RET-H*e* helps to proactively avoid complications during surgery and prevent extended hospitalisation. In contrast to other biochemical parameters it is much cheaper and already available in many hospitals.

Kumar U *et al*. (2020)

Role of Reticulocyte Parameters in Anemia of First Trimester Pregnancy: A Single Center Observational Study
J Lab Physicians; 12(1): 15

Free online: https://www.thieme-connect.com/products/ejournals/abstract/10.1055/s-0040-1713585

What we see as the essence: A prospective study on first trimester pregnant women revealed that RET-H*e* values were different among normal, borderline and true anaemia, and RET-H*e* <27.8 pg had an AUC of 0.93 for diagnosis of IDA with a sensitivity of 93%.

Morton SU *et al*. (2020)

Screening With Reticulocyte Hemoglobin Increased Iron Sufficiency Among NICU Patients
Pediatr Qual Saf; 5(2): e258

Free online: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7190262/

What we see as the essence: The authors found that implementation of an iron supplementation guideline utilizing RET-H*e* values can improve iron sufficiency even for heterogeneous out-born neonatal intensive care unit patient populations. Normal RET-H*e* range was defined as 27–38 pg based on published literature and expert consensus.

Chinudomwong P *et al*. (2020)

Diagnostic performance of reticulocyte hemoglobin equivalent in assessing the iron status
J Clin Lab Anal; 34(6): e23225

Free online: https://onlinelibrary.wiley.com/doi/full/10.1002/jcla.23225

What we see as the essence: RET-H*e* (n = 953) was investigated in a variety of conditions, involving inflammation, and its diagnostic performance was evaluated in assessing the iron status. Iron deficiency anaemia (IDA) can be ruled out at a cut-off ≥30 pg. For RET-H*e* <30 pg the study proposed a diagnostic algorithm to identify/distinguish between IDA and non-ID anaemia.

Tantawy AA *et al*. (2019)

Reticulocyte Hemoglobin Content (Ret He): A Simple Tool for Evaluation of Iron Status in Childhood Cancer
J Pediatr Hematol Oncol; 42(3): e147

https://journals.lww.com/jpho-online/Abstract/2020/04000/Reticulocyte_Hemoglobin_Content__Ret_He___A_Simple.23.aspx

What we see as the essence: RET-He is considered an easy and affordable tool for assessment of iron deficiency anaemia (IDA) in children with cancer during chemotherapy. Due to the influence of underlying inflammatory conditions it is judged to be a more reasonable test than conventional iron parameters.

Tiwari A *et al*. (2018)

Applying newer parameter Ret-He (reticulocyte haemoglobin equivalent) to assess latent iron deficiency (LID) in blood donors-study at a tertiary care hospital in India
Vox Sang 2018; 113(7): 639

https://onlinelibrary.wiley.com/doi/abs/10.1111/vox.12700

What we see as the essence: RET-He can be used as a routine screening test to detect latent iron deficiency in blood donors. This could provide an opportunity to make appropriate and timely interventions like dietary changes or drug supplementation.

Levy S *et al*. (2018)

The clinical utility of new reticulocyte and erythrocyte parameters on the Sysmex XN 9000 for iron deficiency in pregnant patients
Int J Lab Hematol; 40(6): 683

https://onlinelibrary.wiley.com/doi/abs/10.1111/ijlh.12904

What we see as the essence: This study demonstrates the clinical efficacy of RET-He, %Hypo-He and %Micro-R for detecting ID in nonanemic pregnant patients. They are as well a cost-effective alternative.

Jarc E *et al*. (2017)

Comparison of erythrocyte and reticulocyte indices for the diagnosis of iron deficiency
Zdrav Vestn (Slovenian Med J); 86(1-2): 19

Free online: https://www.researchgate.net/publication/319877155

What we see as the essence: Reticulocyte indices (Sysmex RET-He and Siemens CHr) are directly comparable. RET-He showed a slightly better predictive power for iron deficiency identification in IDA. Hypo-He (Sysmex) and %HYPO (Siemens) are not exchangeable, both can be used for long-term iron deficiency evaluation.

Wirawan R *et al*. (2017)

Concordance between Reticulocyte Hemoglobin Equivalent and Reticulocyte Hemoglobin Content in CKD Patients Undergoing Hemodialysis
Acta Med Indones; 49(1): 34

Free online: http://www.actamedindones.org/index.php/ijim/article/view/316/pdf

What we see as the essence: A very strong correlation (r=0.91) and a good concordance was found between RET-He and CHr with a mean bias of 0.5 pg in chronic kidney disease patients undergoing haemodialysis. It indicates that RET-He and CHr can both be used for assessing iron status.

Toki Y *et al*. (2017)

Evaluation of the hypochromic erythrocyte and reticulocyte hemoglobin content provided by the Sysmex XE-5000 analyzer in diagnosis of iron deficiency erythropoiesis
Int J Hematol; 106(1): 116

http://rd.springer.com/article/10.1007/s12185-017-2212-6

What we see as the essence: RET-He was shown to be a clinically useful marker for determining iron deficiency in the general population and can also be used for the evaluation of the efficacy of iron administration.

Buttarello M *et al*. (2016)

Evaluation of the hypochromic erythrocyte and reticulocyte hemoglobin content provided by the Sysmex XE-5000 analyzer in diagnosis of iron deficiency erythropoiesis
Clin Chem Lab Med; 54(12): 1939

https://www.degruyter.com/view/j/cclm.2016.54.issue-12/cclm-2016-0041/cclm-2016-0041.xml

What we see as the essence: RET-He and %Hypo- He, measured on the XE-5000, allowed identification of patients with iron deficiency, especially those who had already developed anaemia. RET-He had a better sensitivity, presumably because it is more responsive to iron deficiency.

Mehta S *et al*. (2016)

Reticulocyte Hemoglobin vis-a-vis Serum Ferritin as a Marker of Bone Marrow Iron Store in Iron Deficiency Anemia
J Assoc Physicians India; 64(11): 38

Free online: https://www.japi.org/n3n5o506k424r4/j3x536k5l434e4w5/v2a4

What we see as the essence: This study showed that RET-He is a better predictor of bone marrow iron stores in patients with severe anaemia than serum ferritin.

Urrechaga E *et al*. (2016)

Percentage of hypochromic erythrocytes and reticulocyte hemoglobin equivalent predictors of response to intravenous iron in hemodialysis patients
Int J Lab Hematol; 38(4): 360

http://onlinelibrary.wiley.com/doi/10.1111/ijlh.12496/abstract

What we see as the essence: HYPO-H*e* and RET-H*e* are reliable parameters for the study of erythropoiesis status in haemodialysis patients.

Al-Ghananim RT *et al*. (2016)

Reticulocyte Hemoglobin Content During the First Month of Life in Critically Ill Very Low Birth Weight Neonates Differs From Term Infants, Children, and Adults
J Clin Lab Anal; 30(4): 326

http://onlinelibrary.wiley.com/doi/10.1002/jcla.21859/abstract

What we see as the essence: RET-H*e* values from the XE-2100 were lower in very low birth weight infants than in term infants, children and adults. RET-H*e* was 31.8 pg within 24 hr after birth and subsequently declined to a steady-state level of 28.4 pg.

Weimann A *et al*. (2016)

Delta-He, Ret-He and a New Diagnostic Plot for Differential Diagnosis and Therapy Monitoring of Patients Suffering from Various Disease-Specific Types of Anemia
Clin Lab; 62(4): 667

https://www.clin-lab-publications.com/article/1982

What we see as the essence: A diagnostic plot using RET-H*e* and Delta-H*e* was developed based on differences between different patient groups suffering from anaemia. Several case examples show the clinical utility of this plot for therapy monitoring.

Archer N *et al*. (2015)

Diagnosis of iron-deficient states
Crit Rev Clin Lab Sci; 52(5): 256

http://www.tandfonline.com/doi/pdf/10.3109/10408363.2015.1038744

What we see as the essence: This review gives an overview of the haematological, biochemical and genetic markers for identifying iron deficiency. RBC-H*e*, RET-H*e*, Delta-*e*, HYPO-H*e* and MicroR are mentioned besides the standard RBC indices.

Peerschke E *et al*. (2014)

Using the Hemoglobin Content of Reticulocytes (RET-He) to Evaluate Anemia in Patients With Cancer
Am J Clin Pathol; 142(4): 506

Free online: https://academic.oup.com/ajcp/article/142/4/506/1766909

What we see as the essence: RET-H*e* values above 31 or 32 pg could be used to rule out iron deficiency in cancer patients. In the present study the use of RET-H*e* would have reduced the number of biochemical iron studies by 66% (from 209 to 70).

Urrechaga E *et al*. (2013)

Erythrocyte and reticulocyte indices in the assessment of erythropoiesis activity and iron availability
Int J Lab Hematol; 35(2): 144

http://onlinelibrary.wiley.com/doi/10.1111/ijlh.12013/abstract

What we see as the essence: RET-H*e* and %HYPO-H*e* are helpful in assessing erythropoiesis and iron status.

Schoorl M *et al*. (2012)

Effects of iron supplementation on red blood cell hemoglobin content in pregnancy
Hematology Rep; 4(4): e24

Free online: http://www.pagepress.org/journals/index.php/hr/article/view/hr.2012.e24

What we see as the essence: RET-H*e* and RET-H*e*/RBC-H*e* ratio are sensitive markers for screening when a decrease in red blood cell haemoglobin content is observed and for monitoring short-term effects of iron supplementation. The authors recommend integrating these parameters into the protocol for anaemia screening and monitoring during pregnancy.

Schoorl M *et al*. (2012)

Temporary impairment of reticulocyte haemoglobin content in subjects with community-acquired pneumonia
Int J Lab Hematol; 34(4): 390

http://onlinelibrary.wiley.com/doi/10.1111/j.1751-553X.2012.01408.x/abstract

What we see as the essence: In patients with community-acquired pneumonia, acute inflammation results in decreased RET-H*e* values at an early stage, reflecting acute erythropoietic dysfunction.

Fernandez R *et al*. (2010)

Low Reticulocyte Hemoglobin Content Is Associated with a Higher Blood Transfusion Rate in Critically Ill Patients: A Cohort Study
Anesthesiology 112(5): 1211

Free online: https://anesthesiology.pubs.asahq.org/article.aspx?articleid=1932981

What we see as the essence: The authors conclude that low reticulocyte haemoglobin content (RET-He) is common at admission at ICU in nonanaemic patients and it is associated with higher RBC transfusion requirements than in patients with normal RET-He values (39.1% vs. 12.8%, P = 0.02).

Maier-Redelsperger M *et al*. (2010)

Strong association between a new marker of hemolysis and glomerulopathy in sickle cell anemia
Blood Cell Mol Dis; 45(4): 289

http://www.sciencedirect.com/science/article/pii/S1079979610001993

What we see as the essence: A special algorithm combining RBC-He, RET-He and lactate dehydrogenase bears the potential as a marker of haemolysis strongly correlated with albuminuria in sickle cell anaemia patients.

Jonckheere S *et al*. (2010)

Erythrocyte indices in the assessment of iron status in dialysis-dependent patients with end-stage renal disease on continuous erythropoietin receptor activator versus epoetin beta therapy
Acta Haematol; 124(1): 27

http://www.karger.com/Article/FullText/313785

What we see as the essence: Due to fluctuations of iron status parameters, a fixed time point should be used for iron status monitoring during erythropoietin therapy.

Leers MP *et al*. (2010)

The value of the Thomas-plot in the diagnostic work up of anemic patients referred by general practitioners
Int J Lab Hematol; 32(6 Pt 2): 572

http://onlinelibrary.wiley.com/doi/10.1111/j.1751-553X.2010.01221.x/abstract

What we see as the essence: The Thomas-plot is helpful in diagnosing patients referred from general practitioners and differentiating functional iron deficiency from classical iron deficiency.

Schoorl M *et al*. (2010)

Changes in red blood cell hemoglobinization during pregnancy
Ned Tijdschr Klin Chem Labgeneesk; 35: 206

Free online: https://www.nvkc.nl/sites/default/files/NTKC/2010-3-p206-208.pdf

Reprinted in Sysmex J Int; 20(1): 12

What we see as the essence: RET-He is a useful sensitive and early indicator of iron status in the second half of pregnancy and should ideally be measured in combination with zinc protoporphyrin (ZPP) and IRF.

Van Wyck DB *et al*. (2010)

Analytical and biological variation in measures of anemia and iron status in patients treated with maintenance hemodialysis
Am J Kidney Dis; 56(3): 540

http://www.ajkd.org/article/S0272-6386(10)00918-2/abstract

What we see as the essence: RET-He could prove superior to transferrin saturation (TSAT) and ferritin in monitoring iron status of haemodialysis patients due to a lower biological variation.

Miwa N *et al*. (2010)

Usefulness of measuring reticulocyte hemoglobin equivalent in the management of haemodialysis patients with iron deficiency
Int J Lab Hematol 32(2): 248

http://onlinelibrary.wiley.com/doi/10.1111/j.1751-553X.2009.01179.x/abstract

What we see as the essence: RET-He is equivalent to CHr and useful in managing haemodialysis patients with iron deficiency as it responds more rapidly than HGB.

Maconi M *et al*. (2009)

Erythrocyte and reticulocyte indices in iron deficiency in chronic kidney disease: comparison of two methods
Scand J Clin Lab Invest; 69(3): 365

http://informahealthcare.com/doi/abs/10.1080/00365510802657673

What we see as the essence: RET-He and CHr correlate and agree well in evaluating CKD patients needing iron support.

Mast A *et al*. (2008)

Reticulocyte hemoglobin content
Am J Hematol; 83(4): 307

Free online: http://onlinelibrary.wiley.com/doi/10.1002/ajh.21090/pdf

What we see as the essence: Reticulocyte haemoglobin can be used to differentiate iron deficiency from other causes of anaemia and as an early marker to monitor the therapy.

Thomas C *et al*. (2006)

The diagnostic plot: A concept for identifying different states of iron deficiency and monitoring the response to epoetin therapy
Med Oncol; 23(1): 23

http://link.springer.com/article/10.1385%2FMO%3A23%3A1%3A23

What we see as the essence: The Thomas-plot incl. RET-H*e* can be used for the differential diagnosis of anaemia and also gives therapy options.

Brugnara C *et al.* (2006)

Reticulocyte hemoglobin equivalent (Ret He) and assessment of iron-deficient states
Clin Lab Haematol; 28(5): 303

Free online: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1618805/pdf/clh0028-0303.pdf

What we see as the essence: RET-H*e* is a reliable marker of cellular haemoglobin content and can be used to identify iron-deficient states, particularly in dialysis patients. RET-H*e* and CHr are in good agreement.

Schoorl M *et al*. (2006)

Erythropoiesis activity, iron availability and reticulocyte hemoglobinization during treatment with hemodialysis and in subjects with uremia
Clin Lab; 52(11-12): 621

https://www.clin-lab-publications.com/article/160

What we see as the essence: Biochemical parameters reflecting functional iron availability and haematological parameters reflecting haemoglobinisation are interdependent.

Thomas L *et al*. (2005)

Reticulocyte hemoglobin measurement -- comparison of two methods in the diagnosis of iron-restricted erythropoiesis
Clin Chem Lab Med; 43(11): 1193

http://www.degruyter.com/view/j/cclm.2005.43.issue-11/cclm.2005.207/cclm.2005.207.xml

What we see as the essence: RET-He can replace CHr in the diagnostic Thomas-plot without loss of sensitivity or specificity.

Canals C *et al*. (2005)

Clinical utility of the new Sysmex XE 2100 parameter - reticulocyte hemoglobin equivalent – in the diagnosis of anemia
Haematologica; 90(8): 1133

Free online: http://www.haematologica.org/content/90/8/1133.long

What we see as the essence: RET-He is useful for the differential diagnosis of iron deficiency anaemia vs anaemia of chronic disease and could also be helpful in the identification of thalassaemia patients.

Buttarello M *et al*. (2004)

The new reticulocyte parameter (RET-Y) of the Sysmex XE 2100: its use in the diagnosis and monitoring of posttreatment sideropenic anemia
Am J Clin Pathol; 121(4): 489

Free online: https://doi.org/10.1309/W65295DTUWK7U1HH

What we see as the essence: RET-Y closely correlates with CHr and can be used for diagnosis and early monitoring after the administration of intravenous iron.

Extended RBC parameters (HYPO-He / HYPER-He / MicroR / MacroR)

Schoorl M *et al*. (2012)

Efficacy of Advanced Discriminating Algorithms for Screening on Iron-Deficiency Anemia and ß-Thalassemia Trait
Am J Clin Pathol; 138(2): 300

Free online: https://academic.oup.com/ajcp/article/138/2/300/1761358

What we see as the essence: The authors conclude that the advanced algorithms, derived from extended RBC parameters provided by the Sysmex XE-5000 analyser, are useful as laboratory devices for anaemia screening.

Persijn L *et al*. (2012)

Screening for hereditary spherocytosis in routine practice: evaluation of a diagnostic algorithm with focus on non-splenectomised patients
Ann Hematol; 91(2): 301

http://link.springer.com/article/10.1007%2Fs00277-011-1243-y

What we see as the essence: The hereditary spherocytosis diagnostic tool by Mullier *et al.* is useful and works but needs fine-tuning to the local patient population.

Mullier F *et al.* (2011)

Additional erythrocytic and reticulocytic parameters helpful for diagnosis of hereditary spherocytosis: results of a multicentre study
Ann Hematol; 90(7): 759

http://link.springer.com/article/10.1007%2Fs00277-010-1138-3

What we see as the essence: Combining several RBC parameters allows to efficiently screen for hereditary spherocytosis even in mild cases.

Urrechaga E *et al*. (2011)

The role of automated measurement of RBC subpopulations in differential diagnosis of microcytic anemia and β-thalassemia screening
Am J Clin Pathol; 135(3): 374

https://academic.oup.com/ajcp/article/135/3/374/1766023

What we see as the essence: Because of high sensitivity and specificity, the new index %MicroR-%HYPO-He was the most reliable index in the differential diagnosis of microcytic anaemias.

Urrechaga E. *et al*. (2011)

Erythrocyte and reticulocyte parameters in iron deficiency and thalassemia
J Clin Lab Anal; 25(3): 223

http://onlinelibrary.wiley.com/doi/10.1002/jcla.20462/abstract

What we see as the essence: Beta-thalassaemia can be recognised through high RBC, small MCV, high %MicroR and moderately increased IRF, whereas iron deficiency shows high RDW and %HYPO-H*e*

Urrechaga E *et al*. (2011)

The role of automated measurement of red cell subpopulations on the Sysmex XE-5000 analyzer in the differential diagnosis of microcytic anemia
Int J Lab Hematol; 33(1): 30

http://onlinelibrary.wiley.com/doi/10.1111/j.1751-553X.2010.01237.x/full

What we see as the essence: Because of high sensitivity and specificity, the new index %microcytic-%hypochromic was the most reliable index in the differential diagnosis of microcytic anaemia.

Urrechaga E *et al*. (2009)

Potential utility of the new Sysmex XE 5000 red blood cell extended parameters in the study of disorders of iron metabolism
Clin Chem Lab Med; 47(11): 1411

https://www.degruyter.com/view/journals/cclm/47/11/article-p1411.xml

What we see as the essence: The new parameters %HYPO-H*e* /%HYPER-H*e* and %MicroR/%MacroR appear to be sensitive for detecting small changes in the number of red cells with inadequate haemoglobinisation and volume in order to distinguish beta-thalassaemia from iron deficiency anaemia.

Nucleated red blood cells (NRBC)

Hüseyin N *et al.* (2021)

Nucleated red blood cells as predictor of all-cause mortality in emergency department
Am J Emerg Med; 46: 335

https://www.sciencedirect.com/science/article/abs/pii/S0735675720308871?via%3Dihub

What we see as the essence: A retrospective analysis of 204 samples from emergency department patients showed that NRBC was higher in patients that died compared to the ones that were discharged. NRBC was an independent predictor for mortality, with an AUC of 0.95, and a cut-off > 0 NRBC/µL had a sensitivity of 94.1% and specificity of 82.3%.

Valina O *et al.* (2020)

Evaluation of the Automated Nucleated Red Blood Cell (NRBC) Enumeration on Sysmex XN Analyser in Preterm and Term Neonates
Sysmex J Int: 30(1): 1

Free online: https://www.sysmex.co.jp/en/products_solutions/library/journal/vol30_no1/summary01.html

What we see as the essence: The authors compare manual NRBC count to an automated counting by XN-Series analyser for neonates, which correlates well. In addition, the mean NRBC count on different postnatal days were analysed and reference values have been stated.

Morton SU *et al.* (2020)

Association of nucleated red blood cell count with mortality among neonatal intensive care unit patients
A Pediatr Neonatol; 61(6): 592

Free online: https://linkinghub.elsevier.com/retrieve/pii/S1875-9572(20)30109-1

What we see as the essence: Neonatal ICU patients with NRBC count >0 had a significantly higher risk of mortality, and time to mortality decreased with higher NRBC counts. The authors claim that NRBC counts may be useful in refining prognostic models for neonates.

Menk M *et al.* (2018)

Nucleated red blood cells as predictors of mortality in patients with acute respiratory distress syndrome (ARDS): an observational study
Ann Intensive Care; 8(1): 42

Free online: https://annalsofintensivecare.springeropen.com/articles/10.1186/s13613-018-0387-5

What we see as the essence: The study results confirmed previous findings in critically ill patients suggesting that NRBC are equally predictive of mortality in acute respiratory distress syndrome (ARDS). NRBC-positive patients were found to require longer treatment with mechanical ventilation, extra-corporal gas exchange and had prolonged ICU stay when compared with NRBC-negative patients.

Monteiro Junior JG *et al.* (2015)

Nucleated Red Blood Cells as Predictors of All-Cause Mortality in Cardiac Intensive Care Unit Patients: A Prospective Cohort Study
PLoS One; 10(12): e0144259

Free online: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4695082/

What we see as the essence: "The presence of NRBC (XE-2100) was associated with a higher ICU mortality (49.4% vs 21.7%, P<0.001) as well as in-hospital mortality (61.4% vs 33.3%, p = 0.001)."

Cremer M *et al*. (2015)

Nucleated red blood cells as marker for an increased risk of unfavorable outcome and mortality in very low birth weight infants
Early Hum Dev; 91(10): 559

https://www.sciencedirect.com/science/article/abs/pii/S0378378215001231?via%3Dihub

What we see as the essence: This study of 438 low birth weight infants indicates that an NRBC count obtained 24-120 h after birth can serve as a surrogate marker for later severe morbidity and mortality. The optimal cut-off value was 2x10^9/L with 83% sensitivity and 75% specificity.

Tantanate C *et al*. (2014)

Performance evaluation of the automated nucleated red blood cell enumeration on Sysmex XN analyser
Int J Lab Hematol; 37(3): 341

http://onlinelibrary.wiley.com/doi/10.1111/ijlh.12291/abstract

What we see as the essence: NRBC counts from the XN-Series could replace manual counts: the precision of the XN-Series was superior and a small bias (manual counts slightly higher than NRBC counts from the XN-Series) was only observed for NRBC counts above 200/100 WBC.

Hotton J *et al*. (2013)

Performance and Abnormal Cell Flagging Comparisons of Three Automated Blood Cell Counters -Cell-Dyn Sapphire, DxH-800, and XN-2000
Am J Clin Pathol; 140(6): 845

https://academic.oup.com/ajcp/article/140/6/845/1761105

What we see as the essence: Repeatability, linearity and carryover was good for all tested analysers, and correlation between the analysers was good for HGB, MCV, PLT and WBC.

Quotes: "The XN showed a higher sensitivity than the SAPH and DxH for all flags of interest." "For the first time, we have decreased the slide review for our laboratory from 20% with the SAPH to 9.3% with the XN."

Parco S *et al*. (2013)

Public banking of umbilical cord blood or storage in a private bank: testing social and ethical policy in northeastern Italy
J Blood Med; 4: 23

Free online: http://www.dovepress.com/getfile.php?fileID=15732

What we see as the essence: An excellent correlation was found between manual NRBC counts and NRBC counts from the XE-2100 (r2 = 0.94) in umbilical cord blood. This number may be used to correct the WBC count and thereby guarantee an adequate WBC concentration for blood banking of umbilical cord blood.

Gasparović V *et al*. (2012)

Nucleated red blood cells count as first prognostic marker for adverse neonatal outcome in severe preeclamptic pregnancies
Coll Antropol; 36(3): 853

Free online: http://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=133776

What we see as the essence: An increased count of nucleated red blood cells in preterm new-borns born from pregnancies with severe preeclampsia seems to be the first significant marker for detecting adverse neonatal outcome.

Pipitone S *et al*. (2012)

Evaluation of automated nucleated red blood cells counting on Sysmex XE-5000 and Siemens ADVIA 2120
Clin Chem Lab Med; 50(10): 1857

http://www.degruyter.com/view/j/cclm.2012.50.issue-10/cclm-2012-0148/cclm-2012-0148.xml

What we see as the essence: The results show excellent analytical performances for the XE-5000, with high accuracy and precision. In agreement with previous studies, the authors also showed that despite similar performance in terms of analytical imprecision, the overall correlation with microscopy is higher for XE-5000 than for ADVIA 2120, i.e., correlation coefficient 0.97 vs. 0.67 and AUC 0.97 vs. 0.73, respectively.

Kuert S *et al*. (2011)

Association of nucleated red blood cells in blood and arterial oxygen partial tension
Clin Chem Lab Med; 49: 257

https://www.degruyter.com/document/doi/10.1515/CCLM.2011.041/html

What we see as the essence: The NRBC count is an independent risk indicator of poor prognosis and mortality, NRBC-positive patients required a longer stay in the intensive care unit.

Danise P *et al*. (2011)

Evaluation of nucleated red blood cells in the peripheral blood of hematological diseases
Clin Chem Lab Med; 50(2): 357

https://www.degruyter.com/view/journals/cclm/50/2/article-p357.xml

What we see as the essence: NRBC are found in nearly all onco-haematological diseases at diagnosis and frequently during therapy. They are absent at remission.

Danise P *et al*. (2009)

Nucleated red blood cells and soluble transferrin receptor in thalassemia syndromes: relationship with global and ineffective erythropoiesis
Clin Chem Lab Med; 47(12): 1539

https://www.degruyter.com/view/journals/cclm/47/12/article-p1539.xml

What we see as the essence: The NRBC count helps defining ineffective erythropoiesis in thalassaemia patients and supporting transfusion management.

Stachon A *et al*. (2007)

Nucleated red blood cells in the blood of medical intensive care patients indicate increased mortality risk: a prospective cohort study
Crit Care; 11(3): R62

Free online: http://ccforum.com/content/pdf/cc5932.pdf

What we see as the essence: The NRBC count is one indicator of mortality — persistence (observed in daily screenings) and high concentration are both indicators for poor prognosis.

Stachon A *et al*. (2006)

Poor prognosis indicated by nucleated red blood cells in peripheral blood is not associated with organ failure of the liver or kidney
Clin Chem Lab Med; 44(8): 955

https://www.degruyter.com/view/journals/cclm/44/8/article-p955_8.xml

What we see as the essence: The NRBC count is one indicator of mortality independent of other factors such as kidney or liver failure.

Stachon A *et al*. (2006)

Daily monitoring of nucleated red blood cells in the blood of surgical intensive care patients
Clin Chim Acta; 366(1-2): 329

http://www.sciencedirect.com/science/article/pii/S0009898105006923

What we see as the essence: NRBC count is an early indicator of mortality – daily screening is recommended.

Wang F-S *et al*. (2003)

Development and clinical application of nucleated red blood cell counting and staging on the automated haematology analyser XE-2100
Clin Lab Haematol; 25(1): 17

http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2257.2003.00476.x/abstract

What we see as the essence: The NRBC count correlates well with flow cytometry.

Stachon A *et al*. (2002)

Nucleated red blood cells indicate high risk of in-hospital mortality
J Lab Clin Med; 140(6): 407

https://www.translationalres.com/article/S0022-2143(02)00104-X/fulltext

What we see as the essence: NRBC are often an only transient observation, but they indicate a poor prognosis, whether transient or persistent.

Briggs C *et al*. (2000)

New quantitative parameters on a recently introduced automated blood cell counter - the XE 2100
Clin Lab Haematol; 22(6): 345

http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2257.2000.00330.x/abstract

What we see as the essence: The automated NRBC count was highly correlated with the manual reference count (r2=0.97) and thus eliminates the need for manual NRBC counts. The use of the 'optical' platelet count significantly improves the reliability of low platelet counts. The instrument will always report the most accurate platelet count on all samples, whether impedance or `optical'.

RBC fragments (FRC)

Hervent AS *et al*. (2015)

Evaluation of schistocyte analysis by a novel automated digital cell morphology application
Int J Lab Hematol; 37(5): 588

http://onlinelibrary.wiley.com/doi/10.1111/ijlh.12363/abstract

What we see as the essence: This performance evaluation showed that the CELLAVISION Advanced RBC Software Application is easy to use and provides a sensitive and reproducible measurement of schistocytes in peripheral blood.

Lesesve J *et al*. (2015)

Fragmented red cells reference range for the Sysmex XN®-series of automated blood cell counters
Int J Lab Hematol; 37(5): 583

https://onlinelibrary.wiley.com/doi/abs/10.1111/ijlh.12364

What we see as the essence: Normal values were determined on the XN-Series for the percentage fragmented red blood cells, FRC%: 0.14 +/- 0.35% (mean 0%). It was also found that HYPO-H*e* correlates with FRC% so, samples with both a high HYPO-H*e* and FRC% should be interpreted with care.

Lesesve J-F *et al*. (2012)

Fragmented red blood cells automated measurement is a useful parameter to exclude schistocytes on the blood film
Int J Lab Hematol; 34(6): 566

http://onlinelibrary.wiley.com/doi/10.1111/j.1751-553X.2012.01434.x/abstract

What we see as the essence: The automated FRC count offers a better degree of certainty than microscopy to exclude the presence of fragmented RBC.

Abe Y *et al.* (2009)

The effectiveness of measuring for fragmented red cells using an automated hematology analyser in patients with thrombotic microangiopathy
Clin Appl Thromb Hemost; 15(3): 257

Free online: http://cat.sagepub.com/content/15/3/257.full.pdf

What we see as the essence: In conclusion, the FRC level is a simple and useful marker for thrombotic microangiopathy (TMA), and an FRC level of 1.2% is recommended as the cut-off value for the diagnosis of TMA.

Imoto S *et al*. (2005)

Usefulness of sequential automated analysis of fragmented red blood cells for the differential diagnosis of TTP-hemolytic uremic syndrome following allogeneic hematopoietic cell transplantation
Lab Hematol; 11(2): 131

Free online: http://europepmc.org/abstract/med/16024337

What we see as the essence: Sequential monitoring of FRC% may be a reliable marker for a specific type of complication (TTP-HUS; thrombotic thrombocytopenic purpura haemolytic uraemic syndrome) after allogeneic haematopoietic precursor cell transplantation.

Banno S *et al*. (2005)

Quantification of red blood cell fragmentation by the automated hematology analyzer XE-2100 in patients with living donor liver transplantation
Clin Lab Haematol; 27(5): 292

http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2257.2005.00704.x/abstract

What we see as the essence: The determination of FRC% by the XE-2100 enables early diagnoses and monitoring of TTP (thrombotic thrombocytopenic purpura) or TMA (thrombotic microangiopathy) and will be useful in the clinical field.

Blood Bank mode

Cavagnetto C *et al*. (2021)

Residual red cells in blood components: A multisite study of fully automated enumeration using a hematology analyzer
Transfusion; 61(2): e258

Free online: https://onlinelibrary.wiley.com/doi/10.1111/trf.16196

What we see as the essence: The Blood Bank mode was tested at multiple sites and showed very good performance characteristics, with an LoD/LoQ of 6 RBC/µL and excellent linear correlation between expected and observed values in spiking experiments. Moreover, in a batch of routine manufactured blood components the Blood Bank mode identified all residual RBC contaminated samples correctly.

Malaria-infected RBC (MI-RBC)

NEW

M'Baya B *et al*. (2021)

Evaluation of the Sysmex XN-31 automated analyser for blood donor malaria screening at Malawi Blood Transfusion Services
Vox Sang; Online ahead of print

Free online: https://onlinelibrary.wiley.com/doi/10.1111/vox.13208

What we see as the essence: The malaria detection rate in 5,281 donor blood samples from malaria endemic area (Malawi) was significantly higher using XN-31 (11.6%) when compared with routine microscopy (6.5%). The latter only detected 22% of samples with low parasitaemia (< 100 parasites/µL). The XN-31 had superior sensitivity to routine microscopy (100% vs. 75%) whilst maintaining excellent specificity (98.9%).

Zuluaga-Idárraga L *et al*. (2021)

Performance of the hematology analyzer XN-31 prototype in the detection of Plasmodium infections in an endemic region of Colombia Malaria
Sci Rep; 11(1): 5268

https://www.nature.com/articles/s41598-021-84594-y

What we see as the essence: The XN-31 prototype (XN-31p) was evaluated against qPCR exhibiting a sensitivity of 90.0% and a specificity of 99.8%, thus similar to the performance of microscopy and Rapid Diagnostic Test (RDT). Sensitivity of XN-31p is inferior to microscopy and RDT in detecting *P. falciparum*, however, sensitivity and specificity for detecting *P. vivax* is similar to both. Results in a small number of samples indicate similar diagnostic accuracy in capillary blood as in venous blood.

Pillay E *et al*. (2019)

Evaluation of automated malaria diagnosis using the Sysmex XN-30 analyser in a clinical setting
Malaria J; 18(1): 15

Free online: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6341646/

What we see as the essence: The novel technology of the Sysmex XN-30 provides a robust, rapid, automated and accurate platform for diagnosing malaria. It allows precise recognition and demonstrated a sensitivity and specificity of 100% for malaria parasitaemia detection.

Post A *et al*. (2019)

The XN-30 hematology analyzer for rapid sensitive detection of malaria: a diagnostic accuracy study
BMC Medicine; 17(1): 103

Free online: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6543632/

What we see as the essence: The novel technology of the Sysmex XN-30 provides a robust, rapid, automated and objective platform for diagnosing and quantifying malaria. The XN-30 ensures the prompt initiation of the malaria treatment and the malaria anaemia together with the reliable treatment monitoring.

Dumas C *et al*. (2018)

Automated Plasmodium detection by the Sysmex XN hematology analyzer
J Clin Pathol; 71(7): 594

https://jcp.bmj.com/content/71/7/594.long

What we see as the essence: The study describes abnormal WDF scattergrams on the XN-Series for samples from patients infected with malaria. Most WDF scattergrams were not affected by Plasmodium falciparum infections but about 50% of non-falciparum infections caused scattergram abnormalities.

Erythrocyte sedimentation rate (ESR)

Schapkaitz E *et al*. (2017)

Evaluation of the InteRRliner automated erythrocyte sedimentation rate analyzer for a large academic laboratory
Int J Lab Hematol; 39(3): e66

http://onlinelibrary.wiley.com/doi/10.1111/ijlh.12614/abstract

What we see as the essence: Indicated by the high correlation coefficient of 0.96 the InteRRliner showed an excellent comparability to the HumaSed ESR method.

Kratz A *et al*. (2017)

ICSH recommendations for modified and alternate methods measuring the erythrocyte sedimentation rate
Int J Lab Hematol; 39(5): 448

Free online: https://onlinelibrary.wiley.com/doi/full/10.1111/ijlh.12693

What we see as the essence: The gold standard for the determination of the erythrocyte sedimentation rate is still the Westergren method. Alternative methods should be accepted when they have been appropriately validated and their results are expressed by comparison with the gold standard.

General

NEW

Nivaggioni V *et al*. (2021)

Detection of Southern Asian Ovalocytosis with Sysmex XN-10: A complement to the decision tree previously described
Int J Hematol; online ahead of print

https://onlinelibrary.wiley.com/doi/10.1111/ijlh.13733

What we see as the essence: The authors expanded the algorithm described in the Nivaggioni et al. 2020 publication with the addition of a step to detect Southeast Asian ovalocytosis (SAO) cases. All SAO samples were correctly classified using the Hypo-He/MicroR ratio, which achieved an AUC of 1.0.

NEW

Van der Vorm L *et al*. (2021)

Performance of the CellaVision DC-1 digital cell imaging analyser for differential counting and morphological classification of blood cell
J Clin Pathol; online ahead of print

https://jcp.bmj.com/content/early/2021/10/18/jclinpath-2021-207863.long

What we see as the essence: The accuracy, within-run imprecision, clinical sensitivity and specificity of the DC-1 were all adequate compared with prespecified acceptance criteria and the DI-60. Altogether, the DC-1 is a reliable automated cell imaging analyser for the differential white blood cell (WBC) count and morphological classification of both WBCs and red blood cells on peripheral blood smears.

NEW

Albichr IS *et al*. (2020)

Cross-evaluation of five slidemakers and three automated image analysis systems: The pitfalls of automation?
Int J Lab Hematol; 42(5): 573

https://onlinelibrary.wiley.com/doi/10.1111/ijlh.13264

What we see as the essence: Sysmex SP-10 and SP-50 showed an acceptable performance for differential leucocyte counting and a good correlation with haematology analyser results and manual differential on HemaPrep smears. SP-10 and SP-50 showed superior performance compared with the Siemens Advia Autoslider 1, Autoslider 2 and Abbot Alinity Hs slide maker stainers.

Rosetti M *et al*. (2021)

Parasitised red blood cells misclassified as giant platelets by an automated digital morphology analyser (Sysmex DI-60/ CellaVision): a case report and a retrospective EQA analysis
Br J Haematol; 192: e66

Free online: https://onlinelibrary.wiley.com/doi/10.1111/bjh.17276

What we see as the essence: The DI-60 is not intended to be used for diagnosing malaria, however this study shows how the capturing of abnormal cells by the instrument can aid laboratory technicians to reach a diagnostic conclusion for the patient. The study emphasises the usefulness of remote review.

Falvella FS *et al*. (2020)

Validation of the reticulocyte channel of Sysmex XN-9000 system for blood cell count in samples with suspected cold agglutination for use in a total laboratory automation setting
J Clin Pathol; 73(12): 847

https://jcp.bmj.com/content/73/12/847.long

What we see as the essence: 40 samples with increased MCHC (> 37.0 g/dL) due to cold agglutination were tested with two different methods: 1. manual heating at 37°C for two hours and 2. XN RET channel measurement. Both methods equally resolved the falsely altered MCHC and the authors support the implementation of automated reflex tests in Extended IPU to minimise manual operations and shorten the time to result.

Ortiz A *et al*. (2020)

Performance Comparison of Sysmex Hematology Analyzers XN-550 and XN-10
Sysmex J Int; 30(1): 9

Free online:
https://www.sysmex.co.jp/en/products_solutions/library/journal/vol30_no1/summary02.html#:~:text=Conclusion%3A%20The%20XN%2D550%20has,hospital%20laboratories%20and%20physician%20clinics.

What we see as the essence: The XN-550 is highly reliable with functionality comparable to the XN-10. It has shown high correlation coefficients and excellent comparative performance in all CBC, DIFF and RET parameters (except BASO%). The overall flagging comparison was excellent among the XN-10, the XN-550 and the manual differential.

Smit B *et al*. (2020)

Massive hemolysis due to *Clostridium perfringens*: a laboratory's perspective
Clin Chem Lab Med; 58(11): e295

Free online: https://www.degruyter.com/view/journals/cclm/ahead-of-print/article-10.1515-cclm-2020-0676/article-10.1515-cclm-2020-0676.xml

What we see as the essence: A case report describing laboratory findings in two patients with *Clostridium perfringens* sepsis. Massive haemolysis, ghost cells in peripheral blood smear, differences in haemoglobin parameters (total haemoglobin and intraerythrocytic haemoglobin) and distinct microcytic RBC populations may occur as indirect indicators and support early recognition.

Nivaggioni V *et al*. (2020)

Use of Sysmex XN-10 red blood cell parameters for screening of hereditary red blood cell diseases and iron deficiency anaemia
Int J Lab Hematol; 42(6): 697

Free online: https://onlinelibrary.wiley.com/doi/full/10.1111/ijlh.13278

What we see as the essence: A two-step algorithm, based on the XN RBC and reticulocyte parameters, delivers a good prediction and classification between patients with a hereditary RBC disease from iron deficiency anaemia and other patients. The proposed flowchart recommends how to manage MCHC < 36.5 g/dL (22.7 mmol/L) samples in addition to the CBC-O application to assist the diagnosis of RBC diseases. Overall it reaches a very good classification rate of 99.4%, confirmed by an external cohort.

Johnson S *et al*. (2019)

A CBC algorithm combined with immature platelet fraction is able to identify JAK2 V617F mutation-positive polycythaemia vera patients
Int J Lab Hematol; 41(2): 271

https://onlinelibrary.wiley.com/doi/abs/10.1111/ijlh.12967

What we see as the essence: The study proposes an algorithm based on CBC and IPF# parameters that allows to identify a cohort of high-likelihood polycythaemia vera (PV) patients and refer them for haematological review. IPF# > 20 × 10e9/L in combination with positive CBC criteria can identify JAK2 V617F mutation-positive PV patients.

Moioli V *et al*. (2019)

Mozhaisk haemoglobin variant effects on leukocyte differential channel using the Sysmex XN series
Chem Lab Med; 57(12): e324

https://www.degruyter.com/view/journals/cclm/57/12/article-pe324.xml

What we see as the essence: Case study showing an abnormal WDF scattergram with a decrease of the fluorescence signal, causing the flag 'WBC Abn Scattergram'. In association with the microscopic revision and further genetic analysis an unstable haemoglobin (Hb Mozhaisk) was confirmed.

Huisjes R *et al*. (2018)

Digital microscopy as a screening tool for the diagnosis of hereditary hemolytic anemia
Int J Lab Hematol; 40(2): 159

https://onlinelibrary.wiley.com/doi/pdf/10.1111/ijlh.12758

What we see as the essence: Advanced RBC Morphology from CellaVision was used to characterise hereditary haemolytic anaemia. Cutoffs were reported for several RBC abnormalities and showed a high sensitivity and specificity for detection of different conditions.

Jongbloed W *et al*. (2018)

Unstable haemoglobin variant Hb Leiden is detected on Sysmex XN-Series analysers
Clin Chem Lab Med; 56(9): e249

https://www.degruyter.com/view/journals/cclm/56/9/article-pe249.xml

What we see as the essence: Case study with an abnormal WDF scattergram observed on the XN-9000 causing the flag "WBC abnormal scattergram" which highlighted the inability to separate the white blood cell population. Further genetic analysis confirmed an unstable haemoglobin.

Cao J *et al*. (2017)

Establishing a Stand-Alone Laboratory Dedicated to the Care of Patients With Ebola Virus Disease
Lab Med; 48(2): 188

https://doi.org/10.1093/labmed/lmw072

What we see as the essence: The pocH-100i was used in a laboratory dedicated to detection of Ebola virus disease. Its accuracy was verified by comparison with the XE-2100 in the main laboratory, and its precision and reportable range were also consistent with Sysmex's claims.

Jo S *et al*. (2017)

Performance evaluation of recently launched Sysmex XN-550 Automatic Hematology Analyzer
Int J Lab Hematol; 39(1): e4

https://onlinelibrary.wiley.com/doi/abs/10.1111/ijlh.12571

What we see as the essence: The XN-550 showed a good analytical performance and strong correlation with XE-2100 and XN-3000 analysers for routine CBC parameters.

Teixeira C *et al*. (2017)

Automated detection of unstable hemoglobin variants by Sysmex XE-Series analyzers
Clin Chem Lab Med; 55(11): 243

https://www.degruyter.com/doi/10.1515/cclm-2017-0231

What we see as the essence: The authors tested 9 samples with known unstable HGB variants and reported that only the XE-2100 flagged the samples in contrast to the SIEMENS Healthineers ADVIA. This may help in diagnosing a congenital haemolytic anaemia.

Tailor H *et al*. (2017)

Evaluation of the Sysmex XN-550, a Novel Compact Haematology analyser from the XN-L ® series, compared to the XN-20 system
Int J Lab Hematol; 39(6): 585

https://onlinelibrary.wiley.com/doi/abs/10.1111/ijlh.12701

What we see as the essence: Samples from adult patients (N=202) were measured on the XN-550 and compared with an XN-20. Good correlations and low bias were observed for all parameters except for BASO%. PLT-O from the XN-550 showed no significant bias compared to PLT-F from the XN-20.

Berda-Haddad Y *et al*. (2017)

Increased mean corpuscular haemoglobin concentration: artefact or pathological condition?
Int J Lab Hematol; 39(1): 32

http://onlinelibrary.wiley.com/doi/10.1111/ijlh.12565/abstract

What we see as the essence: The use of the optical RBC parameters from the XN-Series can save time and help in the determination of the cause of increased MCHC.

Tamigniau A *et al*. (2017)

From XE-2100 to XN-9000, from SIS Standard to GFHC recommendations for slide review: potential impact on review rate and turnaround time
Ann Biol Clin (Paris); 75(3): 285

https://doi.org/10.1684/abc.2017.1242

What we see as the essence: Changing from the XE-2100 to XN-9000 and implementing the Biomedical Validation ruleset led to a significant reduction in review rate (from 35.8% to 25.9%) and TAT. In this hospital this resulted in a cost reduction of 7000 Euros over 6 months.

Egele A *et al*. (2016)

Classification of several morphological red blood cell abnormalities by DM96 digital imaging
Int J Lab Hematol; 38(5): e98

http://onlinelibrary.wiley.com/doi/10.1111/ijlh.12530

What we see as the essence: The authors report the cutoff values for most of the RBC abnormalities that can be detected by the Advanced RBC Morphology software.

Geara C *et al*. (2016)

Comparative study of quantitative performances between the new Sysmex XN-L (XN-550) haematology analyser and the XN-9000 in a routine laboratory
Int J Lab Hematol; 38(1): e10

https://onlinelibrary.wiley.com/doi/abs/10.1111/ijlh.12441

What we see as the essence: The XN-Series and XN-L Series were compared; correlations were good and the study showed that the XN-L Series provided the same high quality as the XN-Series.

Van Dievoet MA et al. (2016)

Performance evaluation of the Sysmex® XP-300 in an oncology setting: evaluation and comparison of hematological parameters with the Sysmex® XN-3000
Int J Lab Hematol; 38(5): 490

http://onlinelibrary.wiley.com/doi/10.1111/ijlh.12522/abstract

What we see as the essence: The XP-300 showed very good precision and linearity results, comparable with the XN-3000 analyser.

Cornet E *et al*. (2016)

Evaluation and optimization of the extended information process unit (E-IPU) validation module integrating the sysmex flag systems and the recommendations of the French-speaking cellular hematology group (GFHC)
Scand J Clin Lab Invest; 76(6): 465

http://www.tandfonline.com/doi/full/10.1080/00365513.2016.1199049?scroll=top&needAccess=true

What we see as the essence: Using the biomedical validation criteria, 21.3% of samples triggered a smear review. Modification of four criteria reduced the number of smears from 21.3% to 15.0% without loss of clinical value.

Bruegel M *et al*. (2015)

Comparison of five automated hematology analyzers in a university hospital setting: Abbott Cell-Dyn Sapphire, Beckman Coulter DxH 800, Siemens Advia 2120i, Sysmex XE-5000, and Sysmex XN-2000
Clin Chem Lab Med; 53(7): 1057

https://www.degruyter.com/view/journals/cclm/53/7/article-p1057.xml

What we see as the essence: A comparison of Abbott, Beckman Coulter, Siemens and Sysmex analysers found superior flagging performance of the XN-2000, especially for blasts and variant lymphocytes. Otherwise, the analysers were comparable.

Tabe Y *et al*. (2015)

Performance evaluation of the digital cell imaging analyzer DI-60 integrated into the fully automated Sysmex XN hematology analyzer system
Clin Chem Lab Med; 53(2): 281

https://www.degruyter.com/view/journals/cclm/53/2/article-p281.xml

What we see as the essence: This performance evaluation of the digital imaging analyser DI-60 showed a good agreement between results from the DI-60 and manual microscopy. In addition, blasts were correctly classified with 95% sensitivity and 99% specificity.

Egele A *et al*. (2015)

Automated detection and classification of teardrop cells by a novel RBC module using digital imaging/microscopy
Int J Lab Hematol; 37(6):e153

http://onlinelibrary.wiley.com/doi/10.1111/ijlh.12399

What we see as the essence: The authors report excellent detection of teardrop cells in samples from patients with myelofibrosis and MDS, using the Advanced RBC Morphology software.

Ferrero-Vacher C *et al*. (2015)

Utilisation des paramètres érythrocytaires Sysmex dans un cas d'hémolyse sévère (Erythrocytic parameters Sysmex in a case of severe haemolysis)
Annales de Biologie Clinique; 73(6): 729

Article in French: http://www.jle.com/fr/revues/abc/e-docs/utilisation_des_parametres_erythrocytaires_sysmex_dans_un_cas_dhemolyse_severeparametres_erythrocytaires_sysmex_et_hemolyse_305923/article.phtml

What we see as the essence: Case report of severe haemolytic anaemia with cold agglutinins, identified by increased MCHC and qualitative alarms. The RBC-O and HGB-O parameters from the RET channel, and the RBC most frequent volume (R-MFV) allowed to report the correct results.

Arneth B *et al*. (2015)

Technology and New Fluorescence Flow Cytometry Parameters in Hematological Analyzers
J Clin Lab Anal; 29(3): 175

Free online: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6807107/

What we see as the essence: This paper gives a good overview of the technology behind the XE-Series and the benefits of flow cytometry and automatic cell counting. It shows that the XE-5000 delivers faster accurate results than older analysers.

JO SY *et al*. (2015)

Performance evaluation of the new hematology analyzer Sysmex XN-series
Int J Lab Hematol; 37(2):155

https://onlinelibrary.wiley.com/doi/abs/10.1111/ijlh.12254

What we see as the essence: A good correlation was found between the XN- and XE-Series for all parameters. The XN-Series dramatically reduced the smear rate (by 58%). Even at counts below 500/µL the XN provided an accurate WBC count using the Low WBC mode.

Genevieve F *et al*. (2014)

Smear microscopy revision: propositions by the GFHC
feuillets de Biologie; VOL LVI N° 317

Free online:
https://www.sysmex.fr/fileadmin/media/f107/Documents/Haematology_Smear_microscopy_revision.pdf

What we see as the essence: The GFHC reviewed in detail the criteria used within the CBC to generate blood smears and has decided on a number of minimum recommendations, defining threshold values and various situations in which the blood smear review is desirable.

Hotton J *et al*. (2013)

Performance and Abnormal Cell Flagging Comparisons of Three Automated Blood Cell Counters: Cell-Dyn Sapphire, DxH-800, and XN-2000
Am J Clin Pathol; 140(6): 845

https://academic.oup.com/ajcp/article/140/6/845/1761105

What we see as the essence: Repeatability, linearity and carryover was good for all tested analysers, and correlation between the analysers was good for HGB, MCV, PLT and WBC.

Quotes: "The XN showed a higher sensitivity than the SAPH and DxH for all flags of interest." "For the first time, we have decreased the slide review for our laboratory from 20% with the SAPH to 9.3% with the XN."

Wang H *et al*. (2013)

Use of RBC-O and S-MCV Parameters of Sysmex XE-2100 in a Patient with RBC Cold Agglutination
Clin Lab; 59: 217

https://www.clin-lab-publications.com/article/1068

What we see as the essence: A combination of sample dilution and the use of RBC parameters from the RET channel on the XE-2100 is described to obtain accurate RBC parameters from samples with RBC cold agglutination without heating of the sample.

Briggs C *et al*. (2012)

Performance evaluation of the Sysmex haematology XN modular system
J Clin Pathol; 65: 1024

https://jcp.bmj.com/content/65/11/1024.long

What we see as the essence: The XN showed reduced sample turnaround time and reduced number of blood film reviews than the XE-2100 without loss of sensitivity and with more precise and accurate results for both platelets and low WBC counts.

Godon A *et al*. (2012)

Anomalies et erreurs de détermination de l'hémogramme avec les automates d'hématologie cellulaire Partie 3. Hémoglobine, hématies, indices érythrocytaires, réticulocytes*
Ann Biol Clin 2012; 70(2): 155

Article in French - Free online: http://www.jle.com/fr/revues/abc/e-docs/anomalies_et_erreurs_de_determination_de_lhemogramme_avec_les_automates_dhematologie_cellulaire_partie_3._hemoglobine_hematies_indices_erythrocytaires_reticulocytes_292317/article.phtml

What we see as the essence: A summary report about potential interferences of CBC parameters with focus on situations leading to abnormal HGB, RBC and MCV, resulting in abnormal calculated RBC indices, e.g. MCHC. Alternative strategies may support management of interferences.

Urrechaga E *et al*. (2011)

Erythrocyte and reticulocyte parameters in iron deficiency and thalassemia
J Clin Lab Anal; 25: 223

Free online: https://onlinelibrary.wiley.com/doi/full/10.1002/jcla.20462

What we see as the essence: Beta-thalassaemia can be recognised through high RBC, small MCV, high %MicroR and moderately increased IRF, whereas iron deficiency shows high RDW and %HYPO-He.

Reference intervals

NEW

Wilson S *et al.* (2021)

Continuous reference curves for common hematology markers in the CALIPER cohort of healthy children and adolescents on the Sysmex XN-3000 system
Int J Lab Hematol; Online ahead of print

https://onlinelibrary.wiley.com/doi/10.1111/ijlh.13670

What we see as the essence: First study that generated continuous reference intervals (curves) of healthy children and adolescents for 19 haematological XN parameters. Seven parameters required sex-specific reference curves. Continuous reference intervals were found to be accurate estimate of haematological reference ranges over the paediatric age range.

NEW

Bahr TM *et al.* (2021)

Neonatal Reference Intervals for the CBC Parameters “Micro-R” and “HYPO-He”: Sensitivity Beyond the Red Cell Indices for Identifying Microcytic and Hypochromic Disorders
J Pediatr; Online ahead of print

https://www.jpeds.com/article/S0022-3476(21)00757-5/fulltext

What we see as the essence: The authors created retrospectively neonatal reference intervals for MicroR% and HYPO-He. They can be measured as part of a neonate’s CBC with no additional phlebotomy volume or run-time and can identify microcytic and hypochromic disorders even when the red cell indices are normal.

Angelo A *et al.* (2021)

Umbilical cord blood hematological parameters reference interval for newborns from Addis Ababa, Ethiopia
BMC Pediatrics; 21: 275

Free online: https://bmcpediatr.biomedcentral.com/articles/10.1186/s12887-021-02722-z

What we see as the essence: This pilot study enrolled 139 umbilical cord blood samples from healthy newborns to establish reference values for the KX-21N. For WBC, RBC, and NEUT significant differences were found between caesarean and natural birth.

Florin L *et al.* (2020)

Establishment of common reference intervals for hematology parameters in adults, measured in a multicenter study on the Sysmex XN-series analyzer
Int J Lab Hematol; 42(3): e110

https://onlinelibrary.wiley.com/doi/abs/10.1111/ijlh.13151

What we see as the essence: The study provides reference intervals (CBC+DIFF+RET) that could serve as reference values for haematology parameters in adults for laboratories that use the XN-Series analysers.

Bohn MK *et al*. (2020)

Complex biological patterns of hematology parameters in childhood necessitating age- and sex-specific reference intervals for evidence-based clinical interpretation
Int J Lab Hematol; 42(6): 750

https://onlinelibrary.wiley.com/doi/10.1111/ijlh.13306

What we see as the essence: The study establishes a comprehensive paediatric (birth to 21 years) reference intervals for haematology parameters using the XN analyser. The data highlight the dynamic haematological profiles observed in healthy children and adolescents and the need for reference interval stratification by age and sex.

Ozarda Y *et al*. (2017)

A nationwide multicentre study in Turkey for establishing reference intervals of haematological parameters with novel use of a panel of whole blood
Biochem Med (Zagreb); 27(2): 350

Free online: https://www.biochemia-medica.com/en/journal/27/2/10.11613/BM.2017.038

What we see as the essence: Using the Cell Dyn and Ruby (Abbott), LH780 (Beckman Coulter) and XT-2000i (Sysmex) analysers, Turkish reference intervals were obtained for CBC-DIFF parameters. Analyser-specific reference intervals were reported for BASO%, BASO#, MCHC, RDW and MPV.

Ianni B *et al*. (2020)

Defining Normal Healthy Term Newborn Automated Hematologic Reference Intervals at 24 Hours of Life
Arch Pathol Lab Med; 145(1):66

Free online: https://meridian.allenpress.com/aplm/article-lookup/doi/10.5858/arpa.2019-0444-OA

What we see as the essence: Reference intervals on Sysmex XN-Series for normal healthy term newborns at 23-25 hours of life were prospectively established for CBC, IG%, IG#, IRF, RET-He, IPF and IPF#.

Arbiol-Roca A *et al*. (2018)

Reference intervals for a complete blood count on an automated haematology analyser Sysmex XN in healthy adults from the southern metropolitan area of Barcelona
EJIFCC; 29(1): 48

Free online: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5949618/

What we see as the essence: The aim of the study was to establish reference intervals for CBC, DIFF and reticulocytes for a Spanish population. Significant gender differences were found for RBC, PLT, HCT and HGB.