

The Immature Granulocyte Count – The first to know about inflammation

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Count more

The capability to count blood cells beyond the classical 5-part differential with high reliability is a challenge for modern haematology analysers. Sysmex offers the immature granulocyte count (IG) optionally on the XE-series and XT-series analysers. It is a standard diagnostic parameter on the XT-4000i, the XE-5000 and on the new XN-series as well.

The quality and reliability of the IG count has been proven in various publications (see Refs.), and was acknowledged through FDA (Food and Drug Administration) clearance in 2003. Hundreds of laboratories worldwide trust in the automated immature granulocyte (IG) count enabling them to decrease the need for manual counts substantially. Moreover, the wards benefit from the improved quality and utility of automated diagnostic information they receive from the lab.

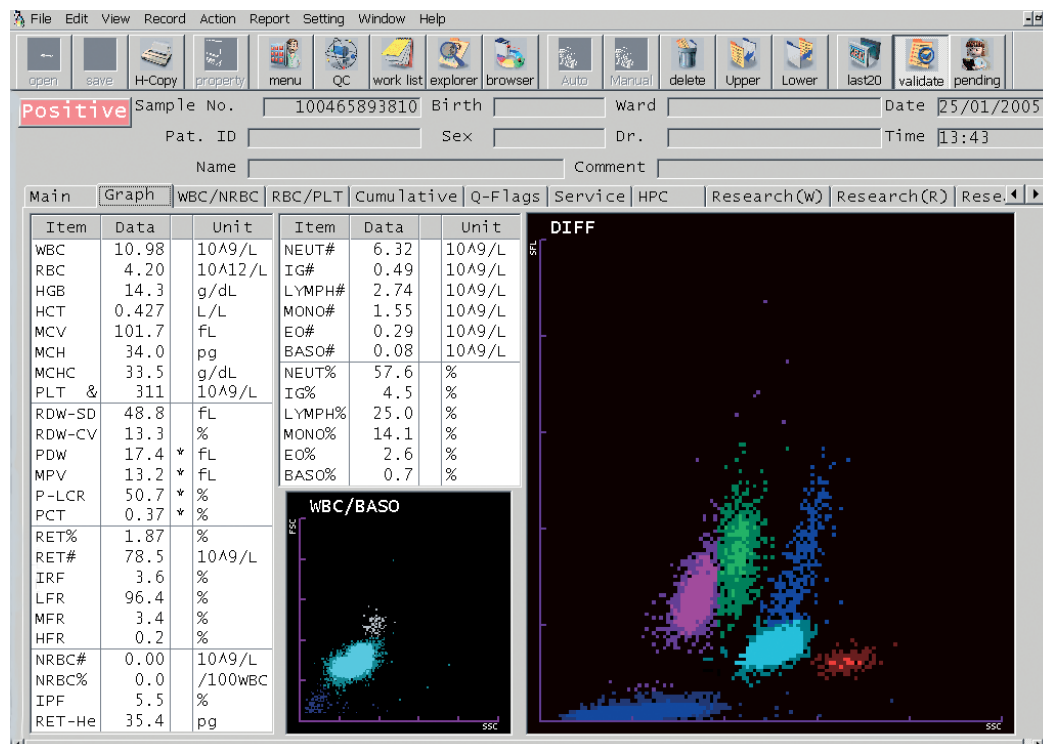


Fig. 1 The fully automated flow cytometric IG measurement of the XE-2100 results in a 6-part diff analysis

Basis for the clinical utility of the IG count is the knowledge and scientific proof of the type of cells included in the count. IG, as reported by the IG master, comprises metamyelocytes, myelocytes and promyelocytes. Hence, band cells and myeloblasts as well as promyelocytes type I (those that lack the status of granular formation) are clearly excluded from the count. Various publications confirm these findings.

Why depend on a 'flag' if you can count IG?

Continuous progress in the development of Sysmex' blood cell analysers permit the user to replace flagging of abnormal cell populations by an actual count of such cells. The IG master provides the absolute and relative IG count as reportable diagnostic parameters. This is based on fluorescence flow cytometry combined with a unique adaptive gating algorithm in the DIFF channel. Thus, the IG count provides for a true extended differential of pronounced reliability.

The excellent reproducibility of the IG count is due to its high statistical reliability when compared to the traditional 100-cell differential. At low IG concentrations of around $0.5 \times 10^9/L$ the analyser produces IG values with a CV (coefficient of variation) of only 7% whereas the routine manual differential offers a theoretical CV of approximately 50%.

Several publications from Dr. Rümke demonstrate the inaccuracy of the manual 100-cell WBC differential, caused by statistical limitations due to the low amount of cells actually counted compared to the fully automated WBC-Differential count. The famous Rümke tables show that if a sample contains 2% IG, the 100-cell differential could be reported with an IG count in the range from 0–5% IG. An evaluation of XE-IG Master vs. microscopy showed that the expected statistical variability in white blood cell differential counting was confirmed in actual laboratory practice.

Sample contains	95% prediction intervals of reported IG% with a 100 cell microscopical WBC differential	
1% IG	0	3
2% IG	0	5
3% IG	0	7
4% IG	1	8
5% IG	2	10
6% IG	2	11
7% IG	2	12
8% IG	3	14
9% IG	4	15
10% IG	5	16

Fig. 2 The expected statistical variability in white blood cell differential counting, 95% prediction intervals

When samples are flagged for the presence of IG on conventional haematology analysers, they usually require a microscopy differential count and a morphology check. Automated counting of IG by using the Sysmex XE-, XT- and XN-series, however, reduce the review rate for manual counting significantly. Results including the presence and concentration of IG become available within a few minutes – included in the complete CBC+DIFF analysis. For patients with a known medical history, for example patients under therapy monitoring, it is sufficient to supply the automated IG count, thus saving blood smears and working time.

But even in unknown patients, the precious time of laboratory personnel can be invested in checking the morphology of detected IG rather than counting them. With this, IG results provided by the lab are not only more reliable and more quickly available, but medical technologist also can cut down on time spent with smear evaluation significantly.

Clinically relevant information in inflammatory diseases

The appearance of immature granulocytes in the peripheral blood indicates a response to infection, inflammation or some other stimuli of the bone marrow at an early stage in critical patients, e.g. after polytraumata or on suspicion for sepsis. Hence, the fast and reliable determination of IG facilitates new diagnostic possibilities for related disorders.

Current areas of research regarding the diagnostic significance of circulating immature granulocytes focus on the early and rapid discrimination of bacterial from viral infections particularly in children. Another prime field of interest is the early recognition of bacterial infection in neonates and adults at risk of sepsis in intensive care units. First research results suggest that declining IG numbers or their absence in intensive care patients can be a prognostic marker for the survival of these patients.

Valuable information for immediate action

The high precision of the Sysmex IG counting method in the XE- and XT-series allows the redefinition of the reference interval. It thereby provides a more accurate tool for physicians to conclude a diagnosis or to request further patient investigation. Up to now the reference interval for an IG count has been defined at 0–1%. However, studies with Sysmex analysers using fluorescence flow cytometry have shown that a human adult population shows a maximum IG concentration of 0.5% or $0.03 \times 10^9/L$. This improved diagnostic tool compared to routine haematology analysis changes and affects routine processes in haematology testing. For every test order of any DIFF parameter, the IG value is displayed automatically together with other differential parameters. They are of assistance in patient monitoring, especially in the cumulative data display. Displays can be further adapted by the users to their liking. The IG results can also be transmitted to the host computer and/or a printer.

The parameter IG # and IG % are included in the comprehensive quality control system based on Sysmex's QC material e-Check (XE). The quality control spectrum for the IG parameters is complemented by the 'XbarM' moving calculation program of the XE- and XT-series based on fresh patient blood.

The flexibility of the XE- and XT-PRO software in conjunction with the capabilities of XE- and XT-series' core technology, fluorescence flow cytometry, allow development and addition of new reportable parameters continuously during the lifetime of the analyser. Because the IG Master is available as a separate, optional software module, all XE-2100, XT-2000i and XT-1800i users of today can benefit from its clinical utility simply by having the software installed.

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