A comparative evaluation of Automated Immature Granulocytes (IMG) count on Yumizen H2500 with IG count measured by Sysmex XN-3000 analyzer

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BACKGROUND

CBC analysis is the pivotal starting point for health screening, clinical diagnosis, as well as disease and therapy monitoring. The differential leukocyte count forms one of the most important parameters in quantifying different leukocytes including both mature and immature forms, detecting various morphological abnormalities or presence of unexpected atypical cells or blasts. Under physiological conditions, these populations are absent from the peripheral blood except for new-borns. Their presence in significant amount should lead to further investigations.

Immature Granulocyte count (IMG) is used in the assessment of various infections or sepsis and its severity [1,2], inflammatory conditions like Pancreatis[3], Appendicitis[4], Acute Respiratory Distress Syndrome"(ARDS)[5] , different diseases of bone marrow, transplant engraftment or growth factor therapy or hematopoietic neoplasms.

During an automated WBC differential count, the metamyelocytes, myelocytes and promyelocytes are counted as immature granulocyte (IMG) for many years previously by different HORIBA hematology analyzers while Sysmex analyzers report them as IG. The current prospective study has been undertaken to compare IMG parameters reported by Yumizen H2500 with the IG count of the Sysmex XN-3000 analyzer.

IMG measurement in the Yumizen H2500 is based on the Double Hydrodynamic Sequential System «DHSS» flow cytometry. Cells are detected, counted and measured using a combination of impedance and optical extinction (Figure 1).

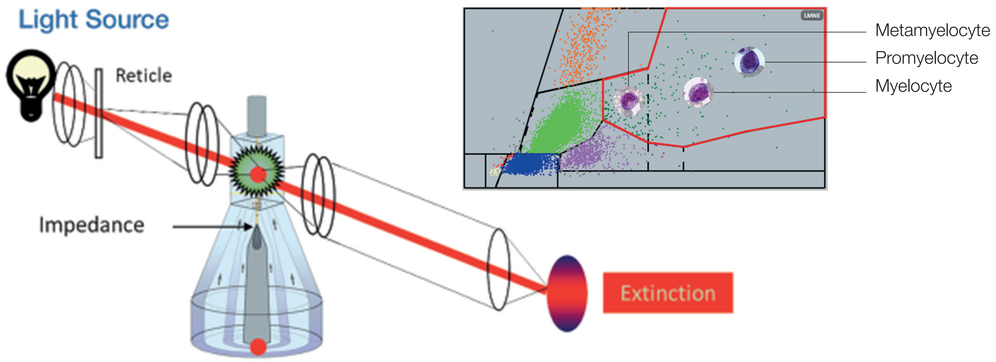

Figure 1 - IMG Measurement technology

Events are plotted in the LMNE matrix where X-axis is the volume and Y-axis is optical extinction, showing several clusters of cells.
Immature granulocytes are discriminated by their high volume and high optical extinction, denoting a complex nucleus structure and granulations (Fig 2).

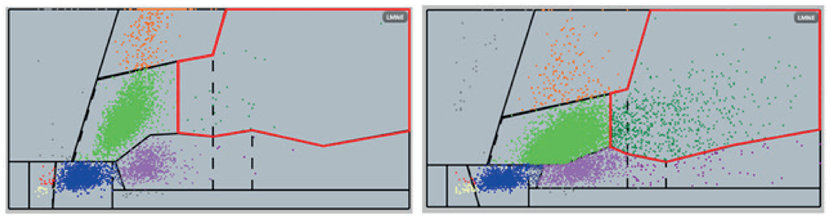

Figure 2: Low IMG count (left) Vs High IMG count (right) from HORIBA Yumizen H2500 LMNE matrix.

In the Sysmex XN-3000 analyzer, the IGs are measured in the white blood cell differential (WDF) channel where the cells are labeled with a dye binding to nucleic acids (Fluorocell WDF), then pass the beam of a semiconductor laser. High Side Scatter is measured for granulocytes, and fluorescence is higher for immature cells having more residual RNA.

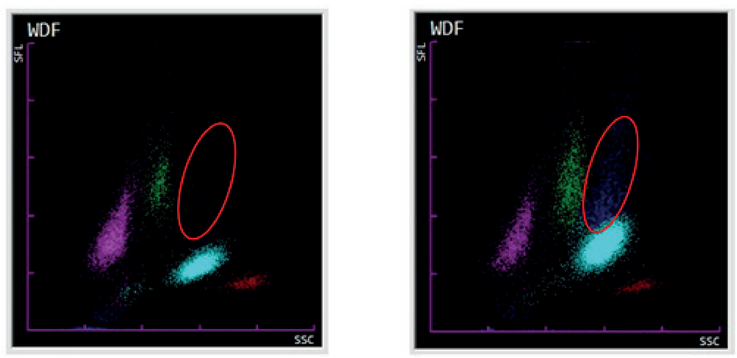

Figure 3:
Low IG count (left) vs High IG count (right)
from Sysmex XN-3000 WDF matrix.

METHODS

Total of 107 EDTA anticoagulated peripheral blood samples were randomly selected from daily pools of samples irrespective of the age, gender, or clinical condition samples, with wide ranges of immature granulocytes counts. All the samples were processed in duplicate on the Yumizen H2500 (HORIBA Medical, France) and the XN-3000 (Sysmex, Japan) within 4 hours of phlebotomy using both hematology analyzers in parallel for Immature Granulocyte determination. A peripheral smear was made for each sample and microscopically reviewed by performing 200 differential counts. Manual slide review was performed following CLSI H20-A2 guidelines. After outlier exclusion, 98 samples were statistically analyzed, IMG (available in Yumizen H2500) and IG (available in XN-3000) and IG% from manual slide review were correlated with Analyze-It v6.01.1 software.

RESULTS

The immature granulocyte counts ranged between 0 – 3.7 G/L by XN analyzer whereas 0 – 2.41 G/L by YH2500. Passing-Bablok regression analysis for IG# showed very good correlation, R=0.96 and R^2=0.92, slope 0.94 (95% CI: 0.838-1.0) and offset 0.011 (95% CI: 0.010 – 0.002).

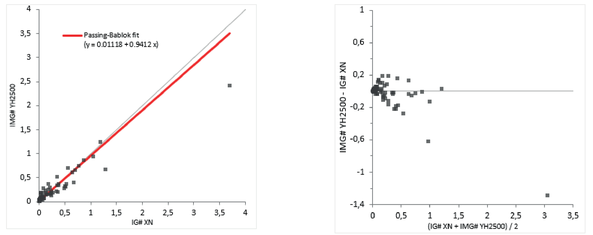

Figure 4:
Correlation and graph of difference YH2500
vs XN3000 IG# (absolute counts)

The immature granulocyte counts per 100 WBC ranged between 0.1 – 11.2% by XN analyzer whereas 0.2 - 12% by YH2500. Passing-Bablock regression analysis for IG % showed very good correlation (R=0.91, R^2=0.83), slope 0.877 (95% CI 0.706 - 1) and offset 0.218 (95% CI 0.126 – 0.30).

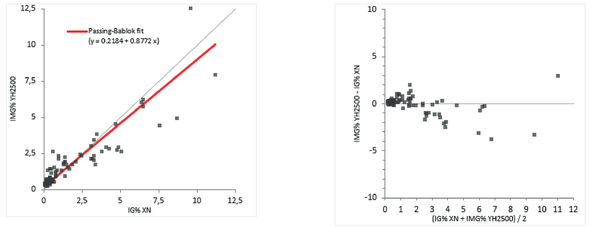

Figure 5:
Correlation and graph of difference YH2500
vs XN3000 IG% (counts per 100 leukocytes)

Manual microscopy also showed a good agreement with YH2500 (R=0.90, R^2=0.80), slope 0.888 (95% CI 0.733 – 1.2) and offset 0.45 (95% CI 0.35 – 0.50).

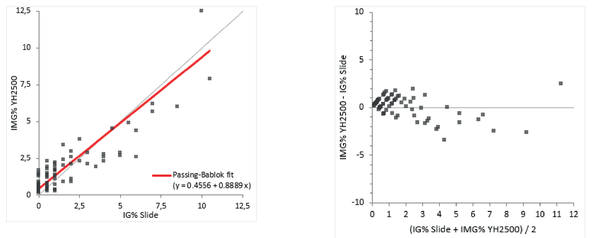

Figure 6:
Correlation and graph of difference YH2500
IMG% vs manual slide review counts per 100
leukocytes

CONCLUSION

The IMG counts by Yumizen H2500 showed a good correlation and agreement with Sysmex XN 3000 IG counts which indicates that IMG results of both instruments are interchangeable. Yumizen H2500 showed good correlation with manual counts.

References

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