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SHORT COMMUNICATION

Performance Evaluation of the Atellica Hema 580 Automated Slidemaker and Stainer for Morphology Review

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SUMMARY

Background: **Improved measurement technologies for automated peripheral blood smear (PBS) preparation have led to a more efficient workflow. In this report, we evaluated the Atellica Hema 580 automated slidemaker/stainer (Siemens Healthineers, Tarrytown, NY, USA).**
Methods: **The quality of PBS prepared and stained on the Atellica Hema 580 slidemaker/stainer were compared with manual films stained on the Hematek 3000. A 200-cell differential and morphology assessment were performed by two competent morphologists.**
Results: **Macroscopically, the automated PBS were of excellent quality, with a gradual transition in thickness, smooth edges, and sufficient length. The morphology was comparable between manual and automated PBS. Correlations between the manual and automated PBS were 0.95 (95% confidence interval: 0.92 to 0.96) for neutrophils, 0.63 (95% CI: 0.50 to 0.74) for monocytes and 0.90 (95% CI: 0.85 to 0.93) for lymphocytes.**
Conclusions: **The performance of Atellica Hema 580 automated slidemaker/stainer was comparable to the manual method and represents a reliable automated solution for medium to large sized laboratories.**
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KEYWORDS

validation, automated slidemaker/stainer, quality, Atellica Hema

INTRODUCTION

Atellica HEMA 580 Analyzer (Siemens Healthineers, Tarrytown, NY, USA). This multi-parameter automated analyzer performs a FBC and DIFF by impedance variation and fluorescence flow cytometry. The system is composed of an analyzer, a compressor unit (Atellica data manager: external data management) and an automated slidemaker stainer. Peripheral blood smears (PBS) are prepared according to the hematocrit and use the May-Grunwald Giemsa or modified Wright staining The full blood count (FBC) and differential (DIFF) is one of the most important diagnostic and screening laboratory tests. Recently, Siemens Healthineers launched a new generation protocol. The slidemaker stainer uses the wedge method which consists of adjustable settings

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for sample volume, speed, and angle of the wedge [1]. This has been shown to improve the consistency of the cell distribution and thereby the precision of the DIFF count [2]. Automated staining offers several advantages including efficient workflow, shorter staining times, and enhanced sample throughput. The Atellica HEMA 580 has a throughput of 120 slides per hour. Nonetheless, only a few studies have evaluated the quality and performance characteristics of automated slide makers and stainers [2-4]. Therefore, this study evaluated the performance of the Atellica Hema 580 automated slidemaker stainer compared to reference manual PBS.

MATERIALS AND METHODS

The automated slidemaker stainer, which is 91 cm wide x 72 cm deep x 74 cm high was installed at the Charlotte Maxeke Johannesburg Academic Hospital, Johannesburg, South Africa (Table 1). Daily quality control and maintenance were performed according to the manufacturer's specifications. A total of 105 patient samples were selected from the routine workload between April and May 2023. These samples included normal and abnormal hematology profiles representative of the patient population. Samples were collected in K_2EDTA tubes (Vacutainer®, Becton Dickinson, Plymouth, UK) for analysis. PBS were prepared and stained on the automated slidemaker stainer using the Wright-Giemsa stain and compared to manual PBS, stained with Wright-Giemsa Stain on the Hematek 3000 (Siemens Healthineers, Tarrytown, NY, USA).

The quality of PBS prepared and stained on the Atellica Hema 580 automated slidemaker stainer were evaluated and graded as excellent; good; adequate for diagnosis, suboptimal or poor. A 200-cell DIFF was performed, using light microscopy equipped with 50 x and 100 x objectives, in the monolayer of the automated and manually prepared PBS of each sample. This was performed by two competent morphologists according to the Clinical and Laboratory Standards Institute H20-A2 verification protocol [5]. Others included immature granulocytes, blasts, abnormal lymphocytes, plasma cells, nucleated red blood cells. The 95% confidence intervals for imprecision of the DIFF counts were derived from the standard error of proportion calculations. Red blood cell (RBC) morphological assessment was performed in terms of size, shape, and pallor based on the International Council for Standardization in Hematology recommendations [6]. This study was approved by the Human Research Ethics Committee of the University of the Witwatersrand (M090688).

RESULTS AND DISCUSSION

Macroscopically, the automated PBS were of excellent quality for morphological assessment, with a gradual transition in thickness, smooth edges, and sufficient length (Table 2). Stain artefact and precipitant were observed in 9 (8.6%) automated PBS; however, all PBS were judged acceptable for morphological assessment. Morphological assessment revealed that the erythrocyte stain and morphology of RBC were comparable between manual and automated PBS. In addition, the quality of the platelet stain was comparable between the manual and automated PBS. The distribution of white blood cells (WBC) within the monolayer were comparable between the manual and automated normal and abnormal PBS. A 'line' of cells with increased WBC clumps was observed at the tail of most of the automated PBS. This morphologically significant finding has been described with other automated slide-makers. Previously, Simson et al. [3], observed a 'line' of cells with increased WBC clumps in 16.5% of the 139 samples examined on the Beckman Coulter LH755 automated slide-maker (Beckman Coulter Inc., Miami, FL, USA) [3]. Nonetheless, consistent with our findings, there were no significant differences in the distribution of WBC types and DIFF counts between the manual and automated PBS. In the analysis of the 200-cell DIFF counts, correlations in the neutrophil, monocytes, lymphocyte, eosinophil, other and nucleated red blood cell percentages between the manual and automated smears were very strong/strong (Figure 1). Basophils, however, showed a poor correlation as these cells accounted for a very low proportion of the total WBC.

CONCLUSION

The performance of Atellica Hema 580 automated slidemaker stainer was comparable to the manual method. This automated slidemaking and staining technology provided improved workflow efficiency, standardization, and stain reliability. This represents a reliable automated solution for medium to large sized laboratories.

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Declaration of Interest:
The author(s) declare no conflicts of interest with respect to the authorship and/or publication of this article.

Table 1. Atellica Hema 580 slidemaker and stainer setup.

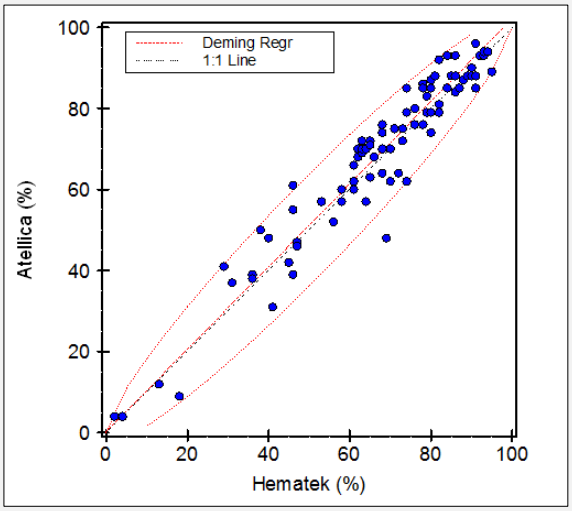
Specifications	Maintenance
Input-160 slides with continuous feeding capability Drop volume < 5 µL Wedge landing angle on the slide 40 - 45 Wedge stays in contact with the drop before making the smear for < 2,000 ms Smear speed < 5,000 steps/s	Daily start-up Weekly shutdown Glass particles tray cleaned weekly Staining wells cleaned monthly Staining plate cleaned monthly Replace stain and alcohol air valves six-monthly

Frosted, rounded corner, beveled edges, 1.0 mm thick glass slides (FF-100, Matsunami, Osaka, Japan).

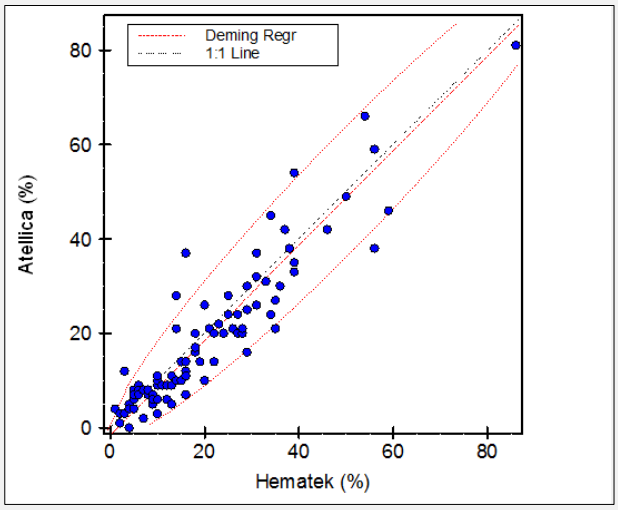
Table 2. Quality assessment for slidemaker and stainer.

Parameters	Atellica automated method	Reference manual method
Approximately 2.5 cm long, terminating 1 cm from the edge	excellent	excellent
Narrower than the width of the slide with smooth edges	excellent	excellent
The gradual transition from thick to thin areas ending in a feather edge	excellent	good
No staining artefacts/stain precipitate	adequate	excellent
Sufficient working area with evenly distributed neutrophils, monocytes, and lymphocytes	excellent	good
The side edges should contain less than 2 to 3 times the number of cells per 100 x field than the body of the film	adequate	excellent
Except for certain forms associated with pathological states less than 2% of the white blood cells should be disrupted or unidentifiable	good	excellent
Nuclei and cytoplasm of different cell types stained satisfactorily	excellent	good

Neutrophil %
0.95, 95% confidence interval 0.92 to 0.96



Lymphocyte %
0.90, 95% confidence interval 0.85 to 0.93



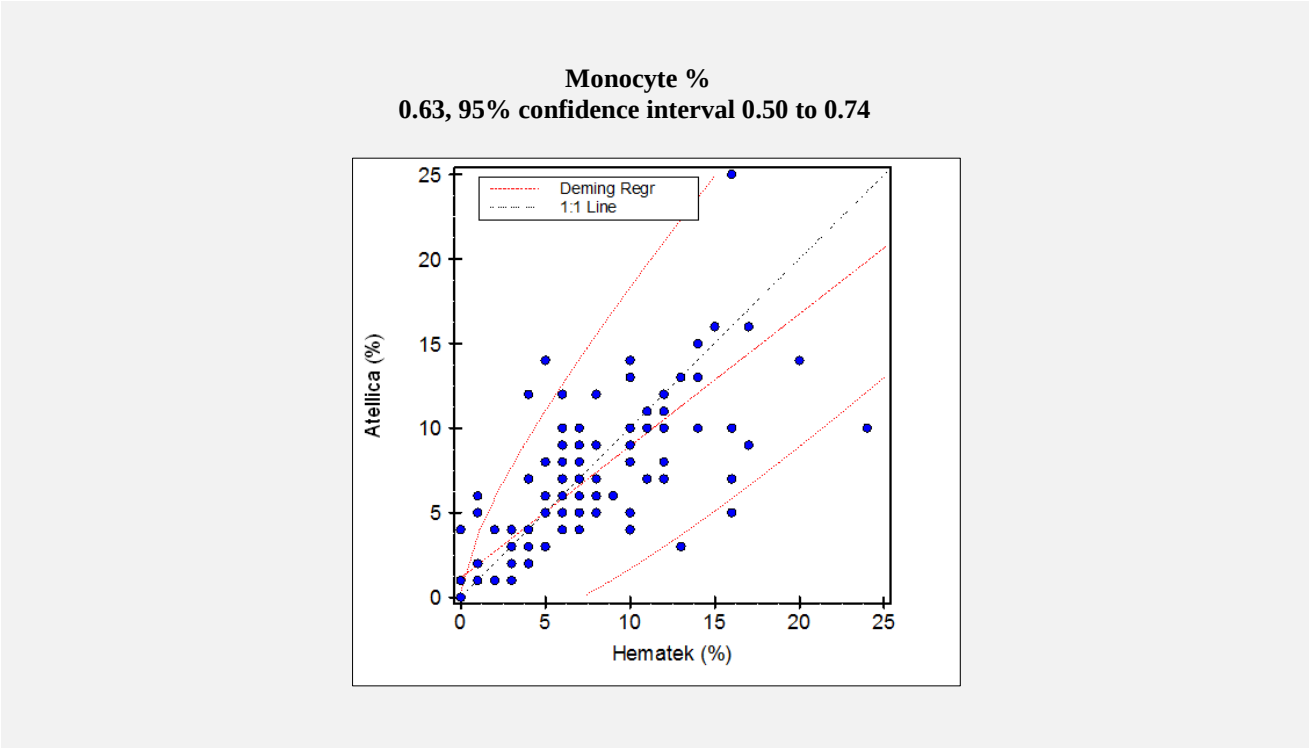


Figure 1. Correlation of the neutrophil, lymphocyte, and monocyte percentages between the manual and automated peripheral blood smears.

References:

1. Atellica-Hema 580 Analyzer operators guide. Tarrytown, NY: Siemens Healthineers; 2021. https://www.siemens-healthineers.com/hematology/systems/atellica-hema-570-580-analyzers

2. Pawlick G, Relopez J. Kaiser Permanente interlaboratory abnormal cell study comparing slide quality of the Sysmex SP-100 automated slide preparation unit to manual technique. Sysmex Journal International. 2000;10:26-9. https://www.sysmex.co.jp/en/products_solutions/library/journal/vol10_no1/summary04.html

3. Simson E, Gascon-Lema MG, Brown DL. Performance of automated slidemakers and stainers in a working laboratory environment - routine operation and quality control. Int J Lab Hematol 2010 Feb;32(1 Pt 1):e64-76. (PMID: 19220552)

4. Kwak MS, Jeong IH, Cho SS, Woo KS, Han JY. Performance Evaluation of the Abbott Alinity hs Blood Slide Maker/Stainer. Ann Lab Med 2022 Jul 1;42(4):482-4. (PMID: 35177570)

5. Clinical Laboratory Standards Institute. H20-A2: Reference Leukocyte (WBC) Differential Count (Proportional) and Evaluation of Instrumental Methods, 2nd edn. Wayne, PA: Clinical Laboratory Standards Institute; 2007. https://clsi.org/media/1400/h20a2_sample.pdf

6. International Council for Standardization in Hematology, Writing Group; Briggs C, Culp N, Davis B, d'Onofrio G, Zini G, Machin SJ; International Council for Standardization of Hematology. ICSH guidelines for the evaluation of blood cell analysers including those used for differential leucocyte and reticulocyte counting. Int J Lab Hematol 2014 Dec;36(6):613-27. (PMID: 24666725)