

Performance evaluation of the Diatron Aquila 3-part diff hematology analyzer with micro sampling collection tubes

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Abstract:

Patient micro sampling blood collection is becoming increasingly popular due to the growth of point of care and near patient testing which offers a convenient means to assist in the diagnosis of various disease states, in patient management and in treatment monitoring. The aim of this study was to evaluate the performance of Diatron Aquila hematology analyzer using this sample type and to compare it with results obtained on venous blood samples. For this study 50 blood donors were selected and venous blood was collected into K2-EDTA anticoagulated tubes and capillary blood was collected by finger stick from each donor. The results obtained demonstrated no statistical or clinical differences between hematological indicators with either sample type - venous or capillary. The Diatron Aquila hematology analyzer can measure human blood collected into regular EDTA Vacutainer type tubes or micro sampling EDTA tubes.

Materials and Methods:

50 fresh samples (finger stick capillary and venous) were collected from blood donors to micro sampling EDTA tubes from Sarstedt Microvet 200, Kabe GK 150 and to standard Vacutainer EDTA tubes and analyzed in parallel on the Diatron Aquila hematology analyzer.

Diatron control material Diacon 3 (low, normal and high level) was measured on Aquila every time prior to performing sample analysis.

Table 1. Study Range

Parameter	Range
White blood cells (WBC), $\times 10^9/L$	4,2 - 14,6
Red blood cells (RBC), $\times 10^{12}/L$	3,9 - 5,6
Hemoglobin (HGB), g/L	118,6 - 169,7
Mean corpuscular volume (MCV), fL	77,5 - 94,8
Red cell distribution width	13,5 - 15,9

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Platelets (PLT), $\times 10^9/L$	121,6 - 282,9
Lymphocyte percentage (LYM%), %	6,7 - 45,2
Medium size cells percentage (MID%), %	5,0 - 26,4
Granulocytes percentage (GR%), %	41,8 - 88,2

Instruments and methods:

The Diatron Aquila Hematology analyser is a quantitative, fully-automated, multi-parameter, bench-top hematology analyzer with on-board reagents designed for in vitro diagnostic use for the enumeration of the following 22 hematology parameters:

WBC, LYM%, LYM#, MID%, MID#, GRA%, GRA#, RBC, HGB, HCT, MCV, MCH, MCHC, RDWSD, RDWCV, PLT, MPV, PCT, PDWSD, PDWCV, P-LCR*, P-LCC*.

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The evaluation of the 50 normal blood samples was performed within two hours of collection in micro sampling tubes and standard EDTA tubes. All the samples were measured in duplicate. The order of analysis was the follows:

- All samples were carefully inverted manually 10 times to ensure thorough mixing prior to starting automated cell counting.
- Automated cell counting :
 - All quality control material and samples were analyzed in the Aquila hematology analyzer following the instructions described in the Aquila user manual.

Results and discussion:

For the statistical analysis, the MedCalc® software was used and the correlation coefficient, r , for each measured parameter (table 2) was calculated.

The hematological analysis of venous and micro sampling blood demonstrated no significant clinical or statistical differences in the important parameter ranges between the two sample types of blood collection. This was true all parameters apart for PDW-sd and PDW-cv where a statistical difference was present. This difference has been described previously in scientific literature and is the result of the collection of the blood procedure for the micro sampling tubes as the pressure of the blood collection activates the platelets changing their shape and size.

Table 2. Correlation of venous and micro sampling blood parameters

PARAMETER	DESCRIPTION	UNIT	COEFFICIENT OF CORRELATION, R SIGNIFICANCE LEVEL P<0,0001
WBC	White Blood Cell count	cells/ μ L	0,9917
RBC	Red Blood Cell count	cells/ μ L	0,9794
HGB	Hemoglobin concentration	g/L	0,9852
MCV	Mean Corpuscular Volume	fl	0,9899
HCT	Hematocrit	percentage	0,9751
MCH	Mean Corpuscular Hemoglobin	pg	0,9841
MCHC	Mean Corpuscular Hemoglobin Concentration	g/L	0,9847
RDW-SD	Red Cell Distribution Width - SD	fl	0,9801
PDW-SD	Platelet Distribution Width - SD	fl	0,9146
RDW-CV	Red cell Distribution Width - CV	%	0,9726
PDW-CV	Platelet Distribution Width - CV	%	0,8545
PLT	Platelet count	cells/l	0,9928
PCT	Thrombocrit	percentage	0,9815
MPV	Mean Platelet Volume	fl	0,9808
	White blood cell 3-part differential:		

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PARAMETER	DESCRIPTION	UNIT	COEFFICIENT OF CORRELATION, R SIGNIFICANCE LEVEL P<0,0001
	count and % of lymphocyte cells		
LYM, LYM%	count and % of medium size cells		0,9920 and 0,9897
MID, MID%	count and % of granulocyte cells	cells/l, and %	0,9931 and 0,9869
GRA, GRA%			0,9954 and 0,9923

Conclusion:

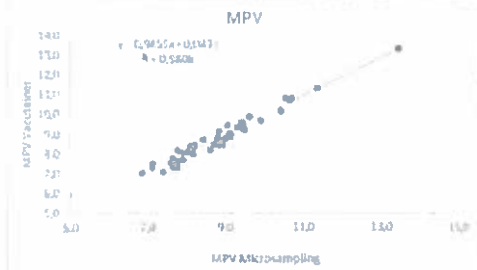
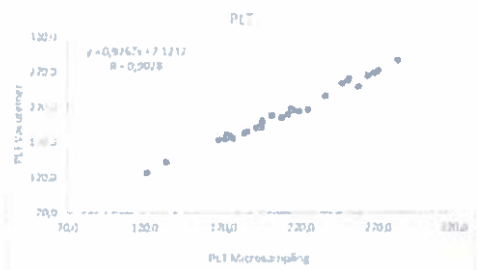
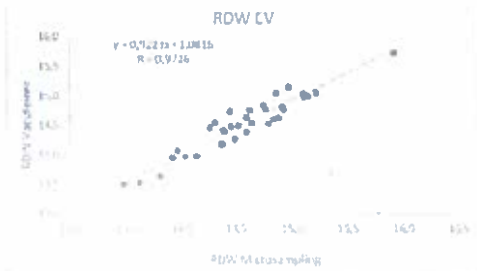
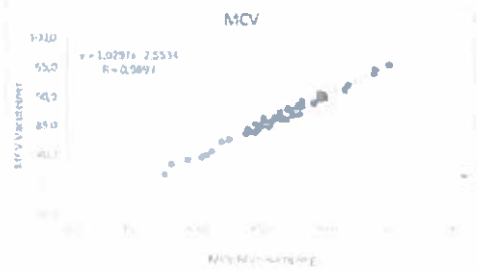
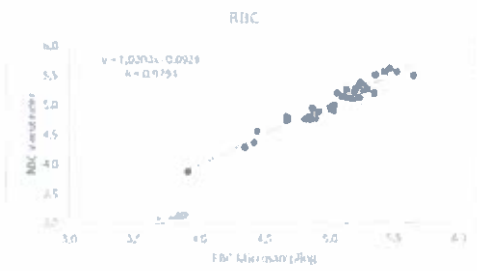
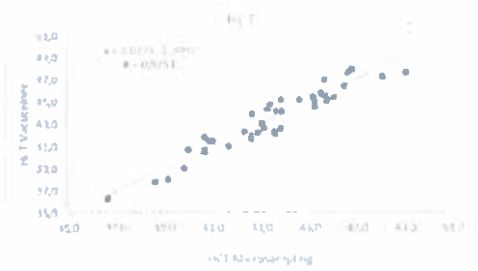
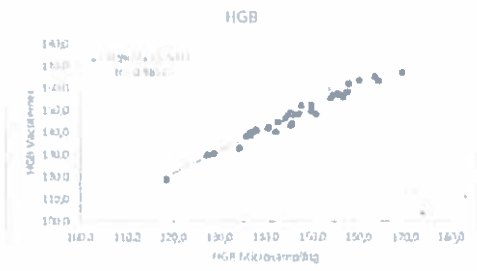
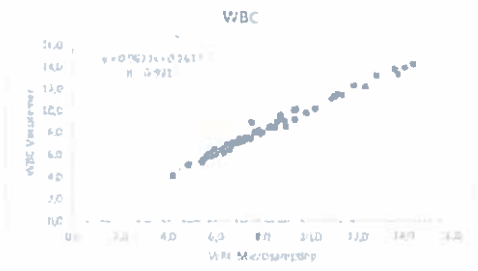
The Diatron Aquila Hematology analyzer can be used to measure human blood collected in standard EDTA collection tubes (Vacutainer type) or with micro sampling tubes as the hematology analysis of all the measured parameters did not show any clinical significance. This will allow the required sample collection volume to be reduced and deliver fast results near to the patient. This system can safely be used in point-of-care and near patient testing scenarios giving several advantages over venous blood sampling: it is less invasive, requires smaller amounts of blood volume and can be performed quickly and easily.

Bibliography:

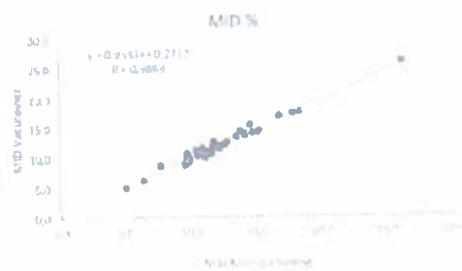
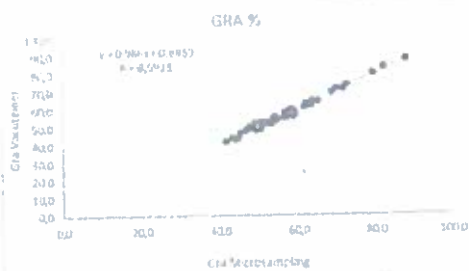
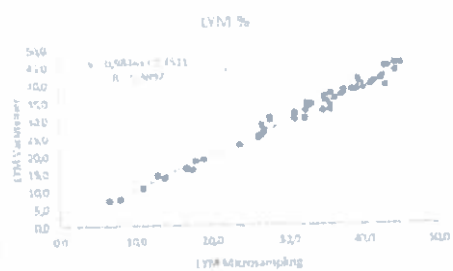
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- [2] Clinical and Laboratory Standards Institute (CLSI) (2010): GP44 – A4: Procedures for the Handling and Processing of Blood Specimens for Common Laboratory Tests; Approved Guideline – Fourth Edition.
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Annex 1: Correlation graphs




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