

Comparing granulocyte / neutrophil counts using four methodologies



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Aims

The aim of the study is to establish that the granulocyte count of a 3-part differential analyser correlates well when compared to the neutrophil count of other instruments and methodologies.

Objectives

The neutrophil count is an important parameter in determining the treatment outcomes, with regards to chemotherapy, for both oncology and haematology patients and also for some other drug therapies.

A three-part differential analyser (PocH-100i, Sysmex) is currently in operation at the neighbouring Spire Roding Hospital in a Point of Care Testing (POCT) environment so the analyser (ABX Micros ES 60) being studied was also compared to the existing instrumentation.

The ABX Micros ES 60 analyser provides a rapid, laboratory standard full blood count, with a 3-part differential. Combined with ease of use, small footprint and CPA compliance it is ideal for the POCT environment.

The ABX Micros ES 60 produces a granulocyte count, consisting of neutrophils, eosinophils and basophils, as part of the 3-part impedance differential. The neutrophils make up more than 95% of the granulocyte population and therefore the granulocyte count from the ABX Micros ES 60 should correlate well with a neutrophil count from other methodologies provided that there are no flags alerting the operator of elevated eosinophil or basophil populations.

Methods

A study of 133 samples, less than 4 hours old, were processed by a 5-part differential analyser (ABX Pentra 80, HORIBA Medical) at Spire Hartwood and then two 3-part differential analysers (ABX Micros ES 60, HORIBA Medical) and the (PocH - 100i, Sysmex) at Roding Hospital.

Flags refer to those triggered by samples in the ABX Micros ES 60 instrument.

In addition, blood films were made on each sample and stained using May-Grunwald/Giemsa. Manual differential counts were performed and the results were compared.

The WBC and neutrophil / granulocyte counts from all methodologies were compared using regression.

Results were also divided into results with or without WBC flagging.

Results

Exclusions

Differentials could not be obtained on the PocH-100i for 7 of the samples. These results were therefore excluded from the study.

WBCs

The WBC counts of all methodologies were excellent with or without the presence of flags:

WBC without flags R² values

| | PocH-100i | ABX Pentra 80 |
|------------------|-----------|---------------|
| - | | |
| ABX Micros ES 60 | 0.9950 | 0.9940 |
| PocH-100i | - | 0.9966 |

WBC with flags R² values

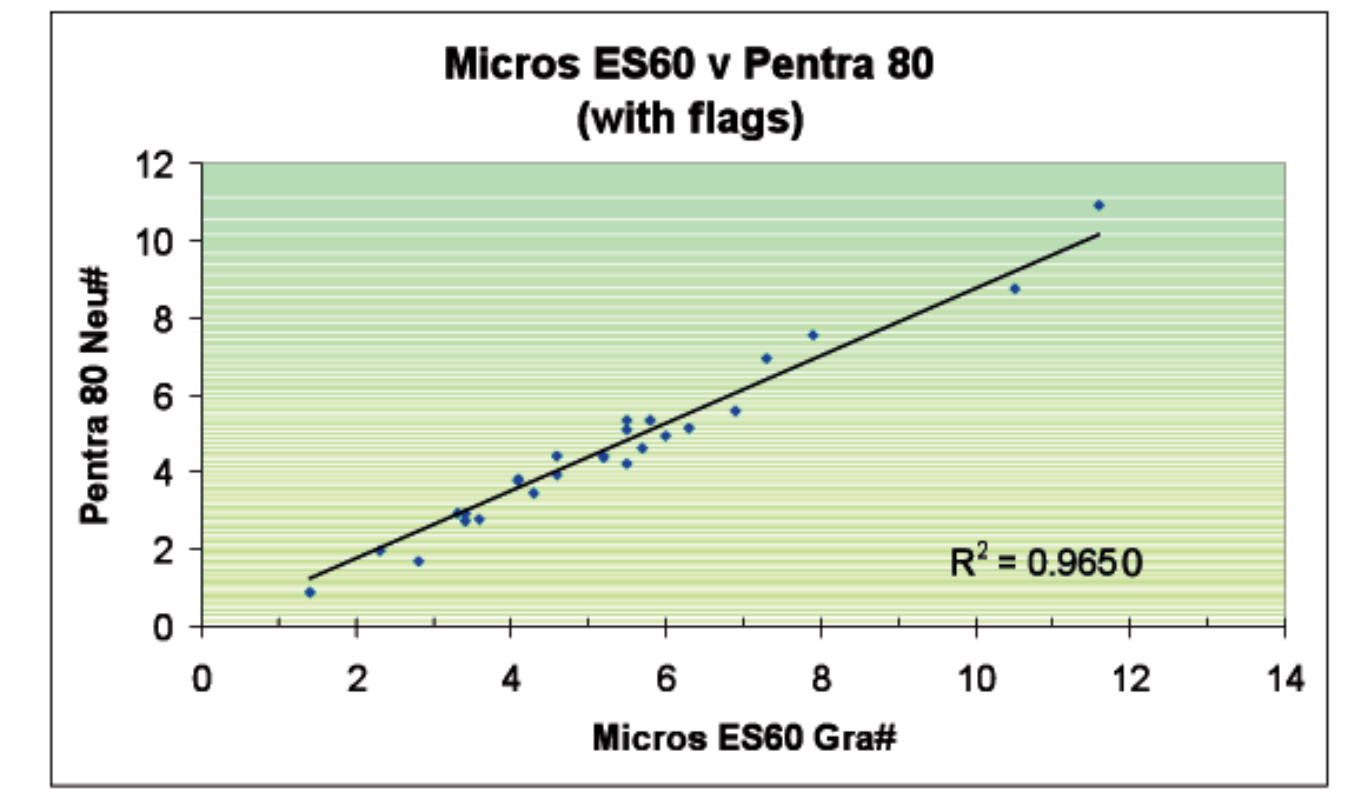
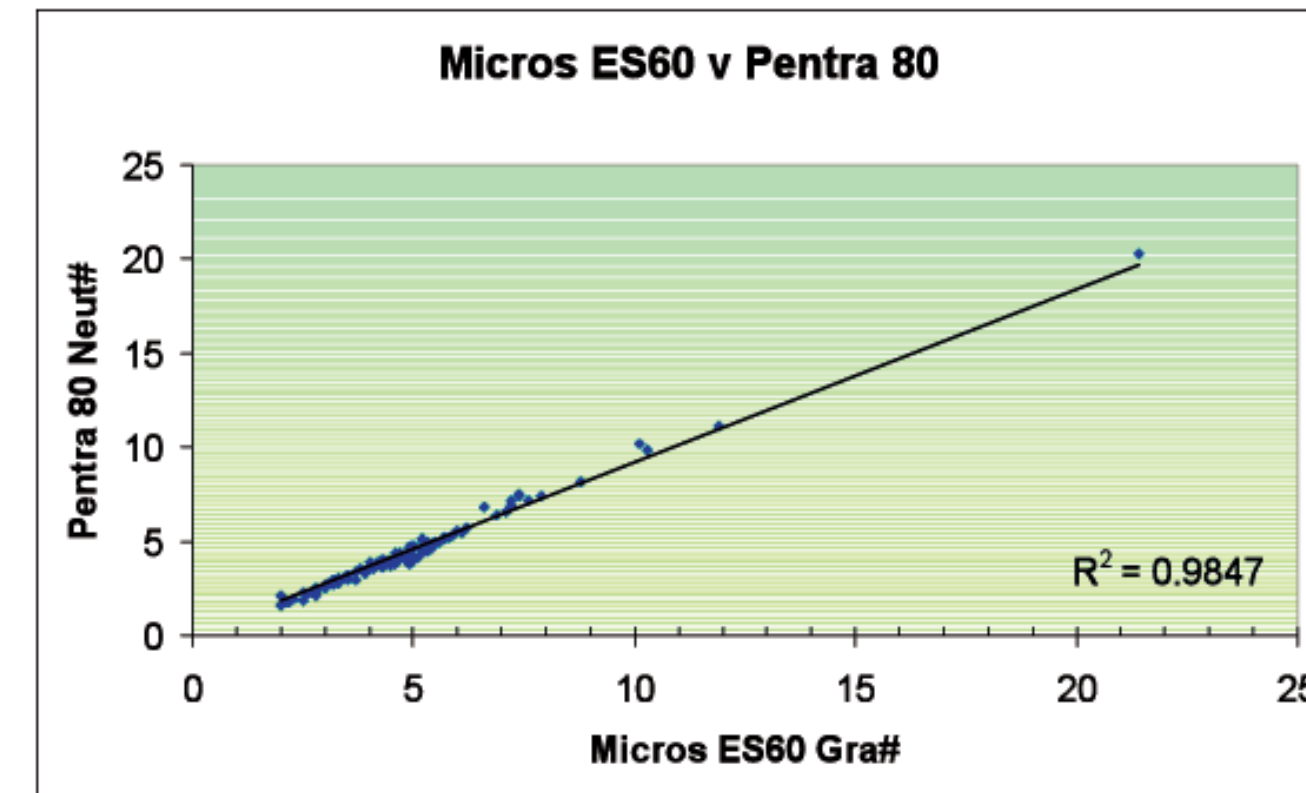
| | PocH-100i | ABX Pentra 80 |
|------------------|-----------|---------------|
| - | | |
| ABX Micros ES 60 | 0.9935 | 0.9873 |
| PocH-100i | - | 0.9959 |

Granulocytes and Neutrophils

ABX Micros ES 60 vs ABX Pentra 80

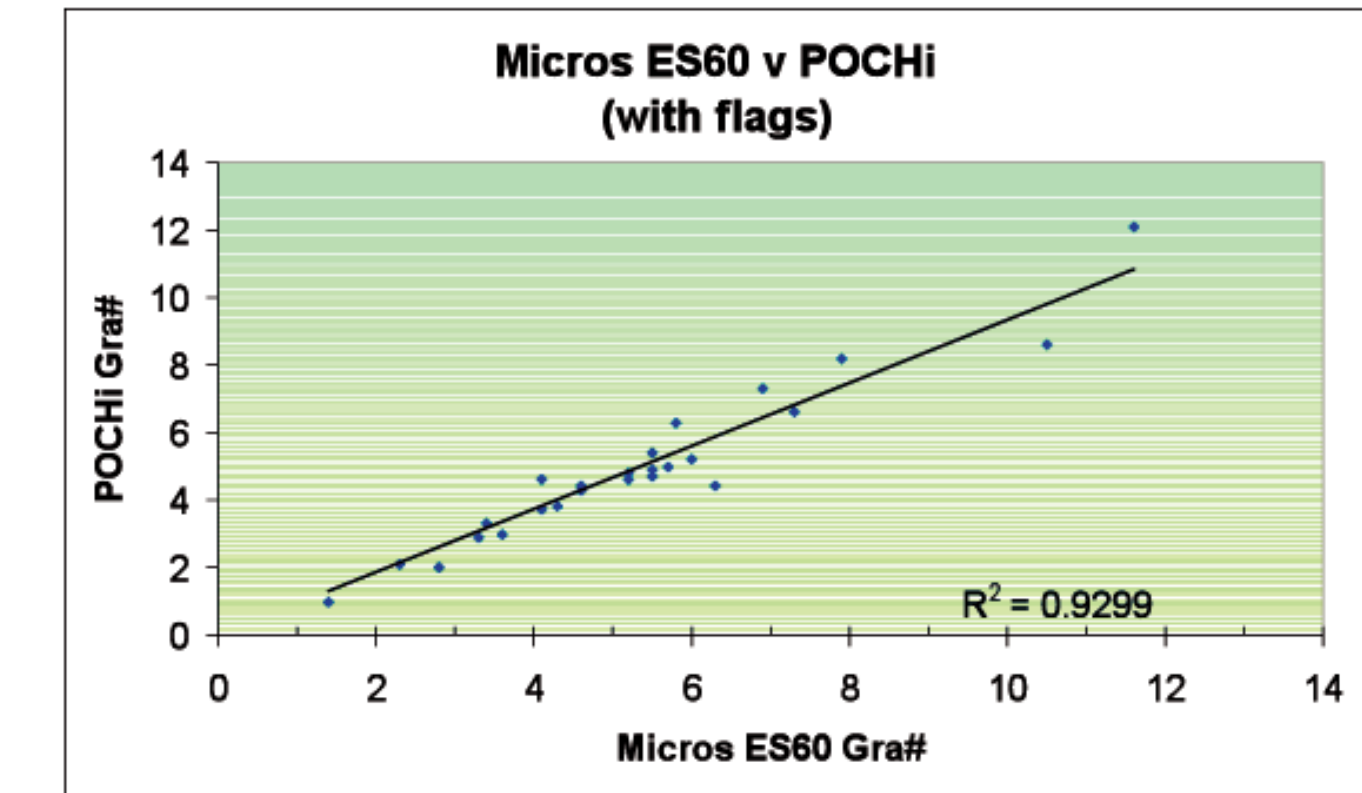
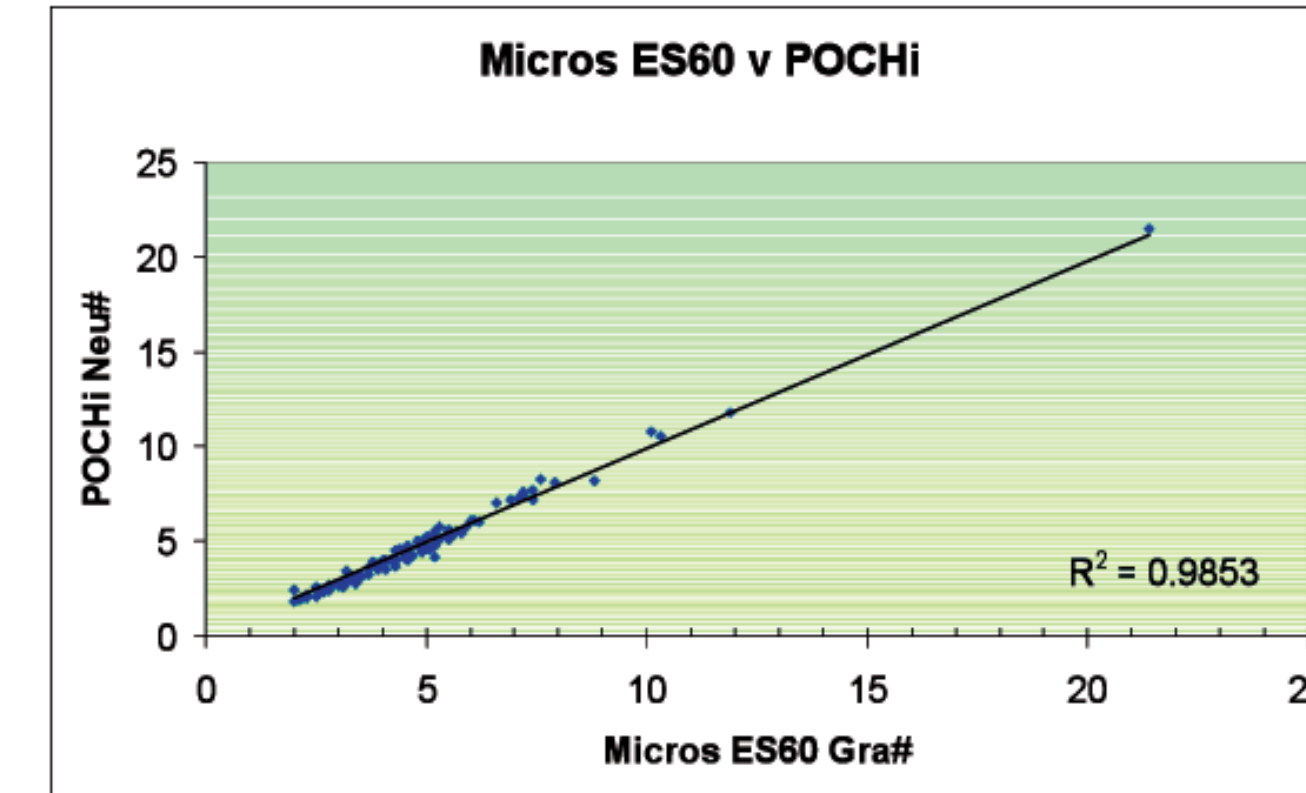
There was excellent correlation between the two instruments.

The granulocyte vs neutrophil regression was impressive with R² values of 0.9847 and 0.9650 respectively



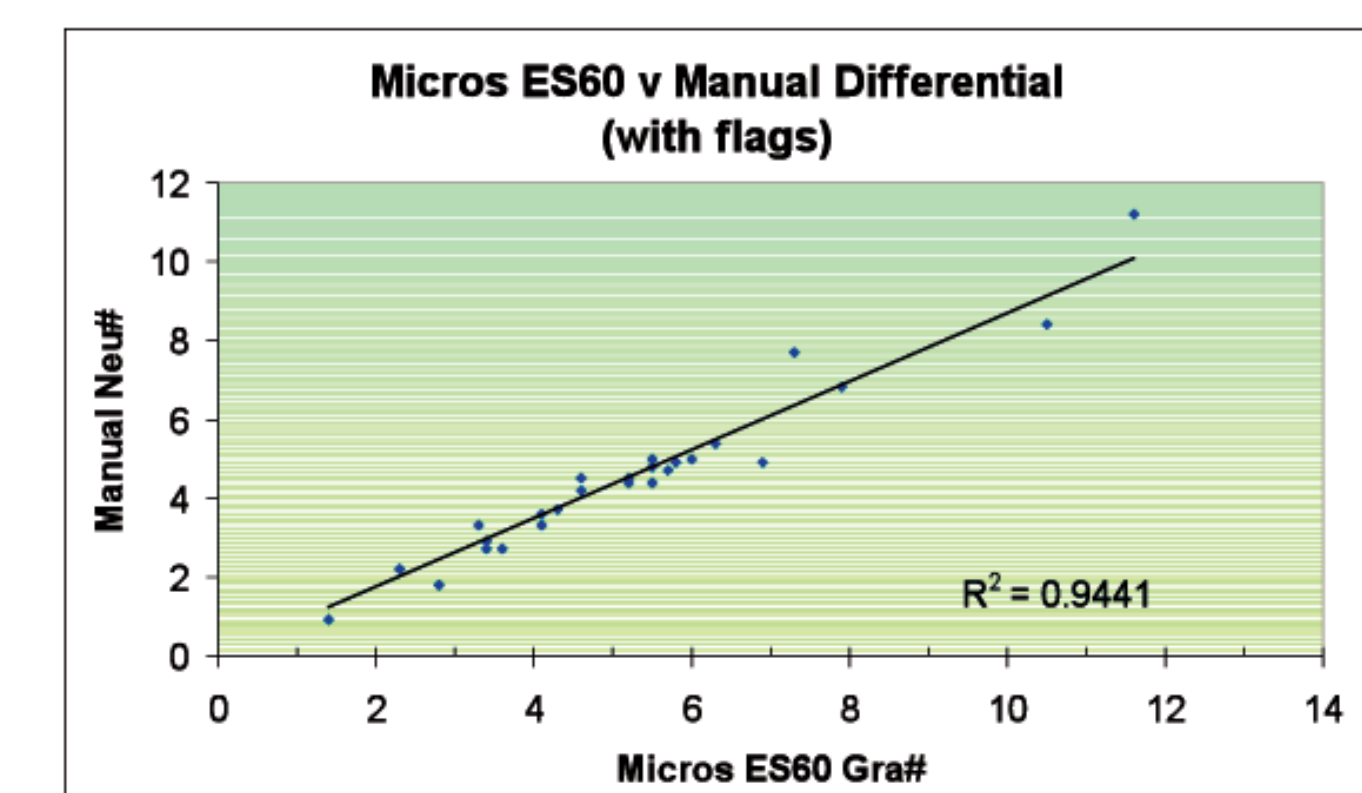
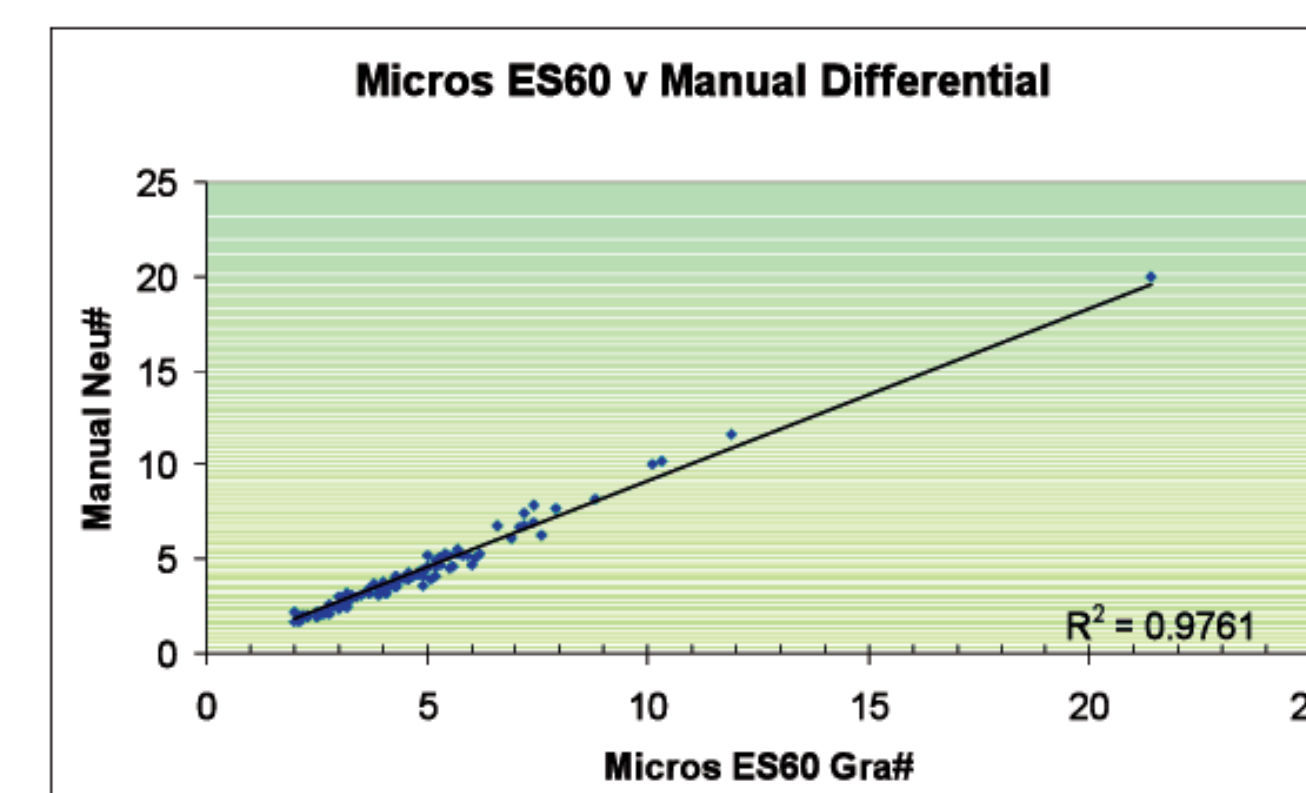
ABX Micros ES 60 vs PocH-100i

The two instruments showed excellent correlation where no flags were present (R² = 0.9853) but was not as good where flags were present (R² = 0.9299) although still acceptable



ABX Micros ES 60 vs Manual differential

The WBC from the ABX Pentra 80 was used to calculate the absolute neutrophil counts from the manual differentials. The instruments showed excellent correlation (R² = 0.9761) where there were no flags and good correlation where flags were seen (R² = 0.9441)

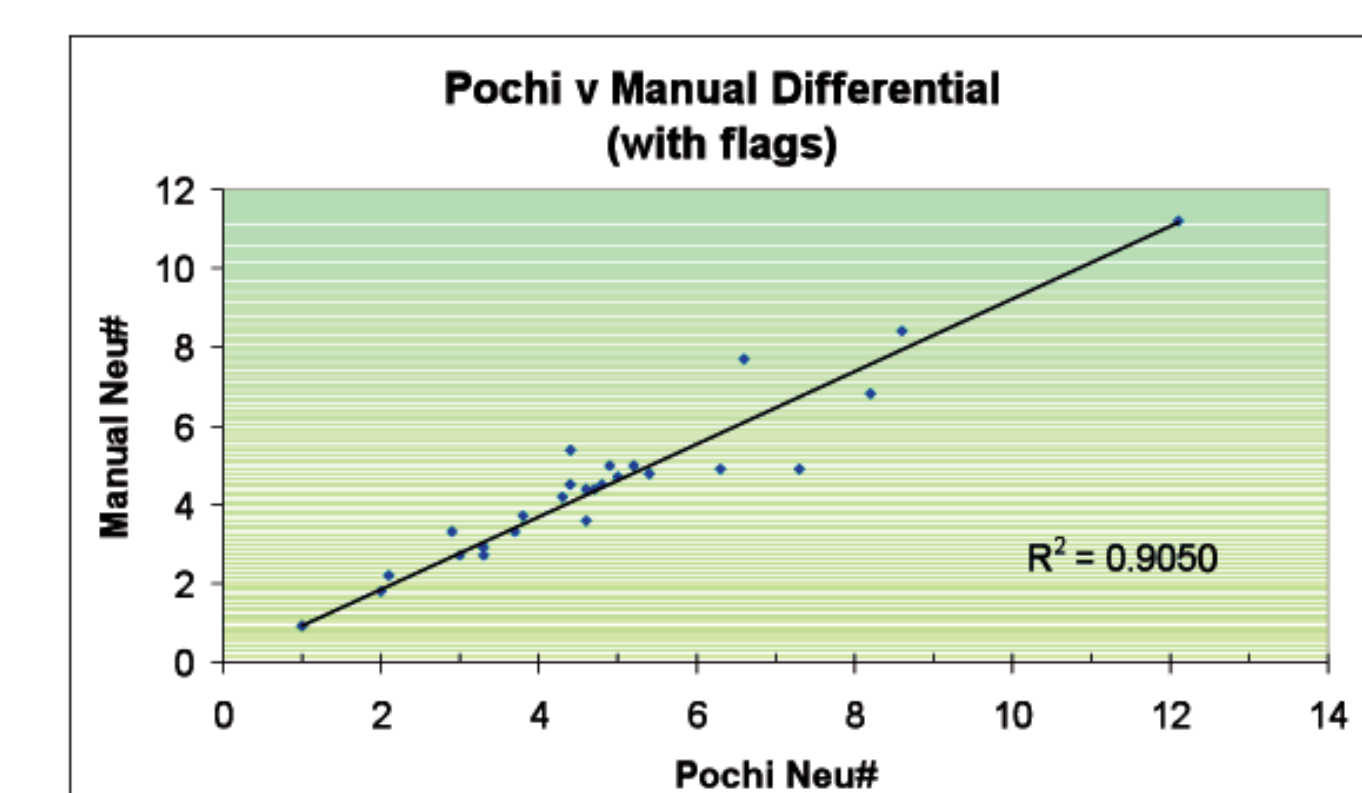
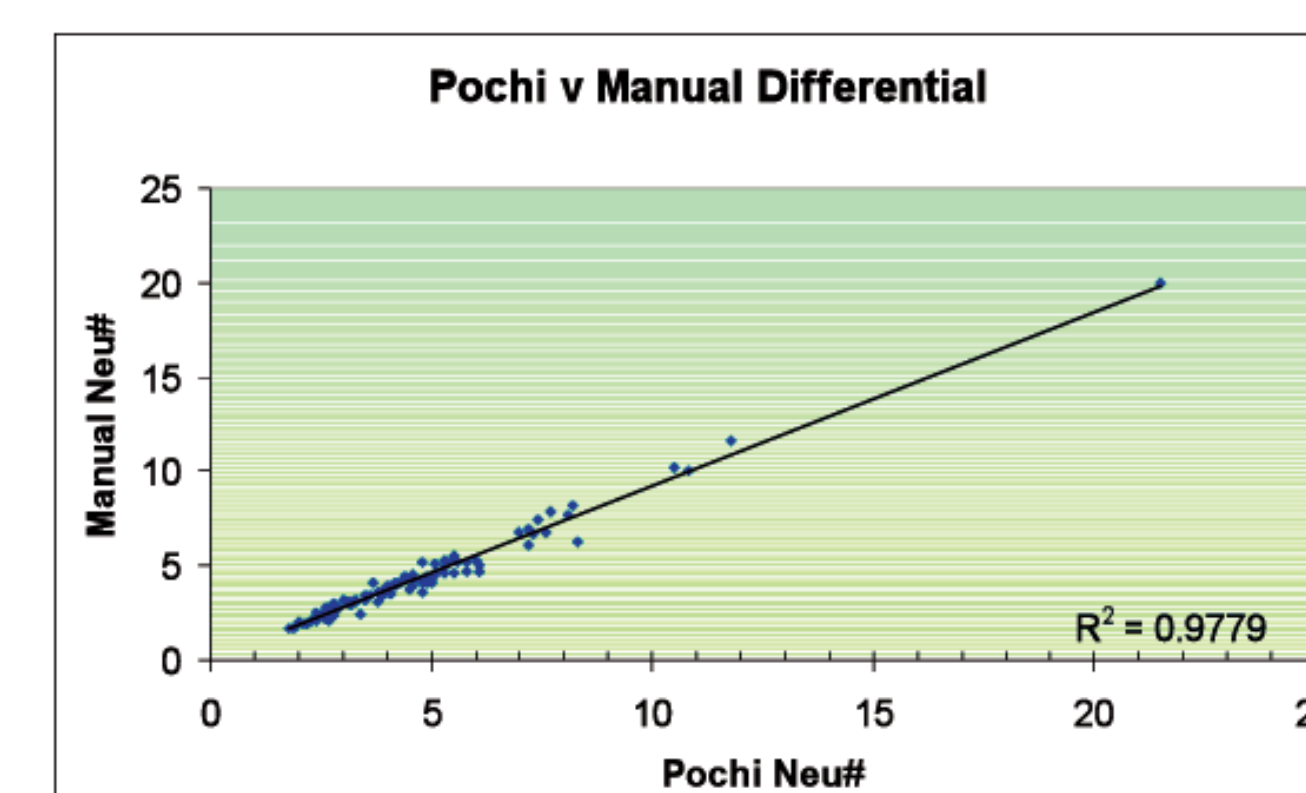


PocH-100i vs ABX Pentra 80

The instruments showed excellent correlation (R² = 0.9891) where there were no flags and good correlation where flags were seen (R² = 0.9526)

PocH-100i vs Manual Differential

The WBC from the ABX Pentra 80 was used to calculate the absolute neutrophil counts from the manual differentials. The instruments showed excellent correlation (R² = 0.9779) where there were no flags but correlation was not as good where flags were seen (R² = 0.9050)



ABX Pentra 80 vs Manual Differential

The instrument showed good correlation with manual differential even where flags were present (R² = 0.9844 and 0.9749)

Summary of Granulocyte/Neutrophil results

Granulocyte/Neutrophil without flags R² values

| | PocH-100i | ABX Pentra 80 | Manual |
|------------------|-----------|---------------|--------|
| - | | | |
| ABX Micros ES 60 | 0.9853 | 0.9847 | 0.9761 |
| PocH-100i | - | 0.9891 | 0.9779 |
| ABX Pentra 80 | - | - | 0.9844 |

Granulocyte/Neutrophil with flags R² values

| | PocH-100i | ABX Pentra 80 | Manual |
|------------------|-----------|---------------|--------|
| - | | | |
| ABX Micros ES 60 | 0.9299 | 0.9650 | 0.9441 |
| PocH-100i | - | 0.9526 | 0.9050 |
| ABX Pentra 80 | - | - | 0.9749 |

Discussion

All methodologies showed excellent correlation for the WBC whether or not there were flags present. For this reason it was possible to compare differential methodologies clearly.

All instrumentation showed acceptable correlation for neutrophils/granulocytes particularly in the absence of flags where there was very little distinction between methodologies. This is an interesting finding given that the ABX Micros ES 60 produces a granulocyte count whereas the other instrumentation produce neutrophil counts. By taking the granulocyte count as a neutrophil count, the ABX Micros ES 60 does not appear to be disadvantaged by comparison. Indeed, the correlation between the granulocyte/neutrophil count of the two 3-part differential instruments are very comparable with an R² of 0.9853.

Only one significant eosinophilia was seen in the samples processed.

This produced appropriate flagging in the ABX Micros ES 60. In the PocHi, the differential result was flagged as 'unreliable'. It may be significant that the granulocyte count of the ABX Micros ES 60 and the neutrophil count of the PocH-100i in this instance showed remarkable correlation but there is insufficient statistical data to draw a reliable conclusion.

As expected, correlation where instrument flags were present was not as good however the values were still acceptable with the worse correlation between the PocH-100i and manual differential and between the PocH-100i and the ABX Micros ES 60. The best correlation, unsurprisingly, was seen between the five part differential analyser and manual differential but the ABX Micros ES 60 also compared well with both manual and automatic 5-part differentials

CONCLUSIONS

Any concerns in using a 3-part differential instrument at the point of care producing a granulocyte count as opposed to a neutrophil count were dispelled by this study. This was of particular value in assessing the suitability of the instrument where a neutrophil count is required for patient treatment such as with oncology or haematology patients. The granulocyte count can be considered a neutrophil count in the absence of flags and therefore the ABX Micros ES 60 is a suitable instrument for all point of care settings.