Differential counting of blood leukocytes using automated microscopy and a decision support system based on artificial neural networks--evaluation of DiffMaster Octavia.

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The morphological appearance of blood cells has an established association to clinical conditions. A novel system, DiffMaster Octavia for differential counting of blood leukocytes, has been evaluated. The system consisted of a microscope, 3-chip color charge coupled device (CCD) camera, automated motorized stage holder, electronic hardware for motor and light control and software for automatic cell location and image processing for preclassification of blood cells using artificial neural networks. The DiffMaster test method, was evaluated on 322 routine blood samples (400 cells per sample) using manual microscopy as reference method. The results showed a correlation of determination $(r(2))$ of 0.8-0.98 for the normal cell classes and blast cells. The DiffMaster correctly preclassified 89% of all leukocytes with a good reproducibility. After verification of the cell classes, the agreement between the test and reference method was 91% whether the sample was abnormal or normal. The clinical sensitivity was 98% and specificity 82%. The sensitivity to identify blast cells was slightly higher with the DiffMaster than manual microscopy. Similar levels of short-term imprecision for the two methods were found for all cell classes. In conclusion this study shows that the DiffMaster can provide a decision support system which, together with a qualified morphologist, can generate leukocyte differential count reports of high quality.