NEW TRENDS IN IMAGING TECHNOLOGY UTILIZATION IN MORPHOLOGY.

Automation of microscopic blood smears evaluation process.

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Cellular morphology evaluation via microscopic analysis is a routine practice in clinical laboratories. Correct morphological evaluation is an analytical operation, which often makes a significant part of diagnosis determination. Morphological evaluation quality is directly proportional to evaluator's experience and therefore the education in the field of morphology makes a substantial contribution in the education of laboratory assistants and physicians. During the education, morphology learning level depends on educational materials quality and lecturer's experience. Present state information technologies appeals to learning modernization in the field of morphology and extends the learning activity with the digital imaging utilization. Digital technology utilization offers new possibilities of sharing common morphological findings' databases, digital imagine cells export, creation of digital archives of microscopic preparations and last, but not the least, educational utilization of such archives and databases of referential cells.

Keywords: morphology, microscopic analysis, digital imaging, validation, standardization, automation

In recent years, Swedish company CellaVision has been developing DM 96 and DM 8 devices, which, based on microscopic picture digitalization, enable pre-classification of cell populations in peripheral blood overlays, stained by classic May-Grünwald-Giemsa or Wright methods. Based on 300 evaluated parameters of each nuclear cell and the referential cell database, DM 96/DM 8 systems classify nuclear cells – leucocytes – into 18 cell groups and perform a morphological classification of erythrocytes and thrombocytes. Device software requests user's validation of cells pre-classification result for the final result output. In case of the variance between pre-classification and user's opinion, the user can transfer problematic cells into other group, add a comment to finding or enlist cells, which remained unclassified by the device. Validated result can be stored in a database, sent via e-mail to a consultation with a specialist and disposed of in any way within the work with digital files, directly from DM computer.

Optional software equipment of DM 96/DM 8 devices – DIFF IQ educational software – enables students to make a comparison of their morphology knowledge with an expert evaluation. The educational software principle consists in a cell database creation, developed from blood smear evaluation by an expert. Cells from such a database are submitted to a group of students, who perform their own morphological classification. DIFF IQ software compares the result of individual students' morphological classification with an expert morphological classification and recorded for both individuals and groups of students. All results are converted to graphs and supplied with percentage rating of each individual's morphological classification success rate. The analysis of unsuccessfully classified cells can be performed at each of results, helping to disclose weak points in knowledge of certain cell groups' morphology.

Asides from the pre-classification of peripheral blood cells smear, DM96 is via Body Fluid Application software capable of performing body fluids cells pre-classification at microscopic preparations processed through cytospin method and stained by May-Grünwald-Giemsa or Wright methods. The system performs complete sample scan, using 10x and subsequently 50x magnification. Interesting sample areas can be archived, sent to evaluation or used for educational purposes.

Scanning method utilization is successfully used for the digitalization of bone marrow samples and other microscopic preparations.

Within the field of morphological evaluation, CellaVision DM 96/DM8 introduce standardization, time saving and lower stress load for specialists, who may focus on pathological preparations, difficult to be evaluated, and contribute to laboratories' modernization and automation. DM96/DM8 digital morphology tools use communication technologies, enabling quick consultation with experts from remote referential workplaces and realization of quality educational program in the field of cell morphology. Digital morphology systems support up-to-date telehematology projects. At present, there are over 200 CellaVision DM96/DM8 devices stationed in workplaces across Europe.

Technical solution: motorized microscope, digital camera, desktop PC Win XP, automated dosing of immersion oil, bi-directional communication in LIS (laboratory information system) via ASTM protocol, Ethernet 100Mbps (LAN), possibility of connection to e-mail, RS 232 interface, barcode printer. Data storage device. Saved file format: JPEG