

Computer-Aided Immunofluorescence Microscopy (CAIFM) in the diagnosis of autoimmune and infectious diseases

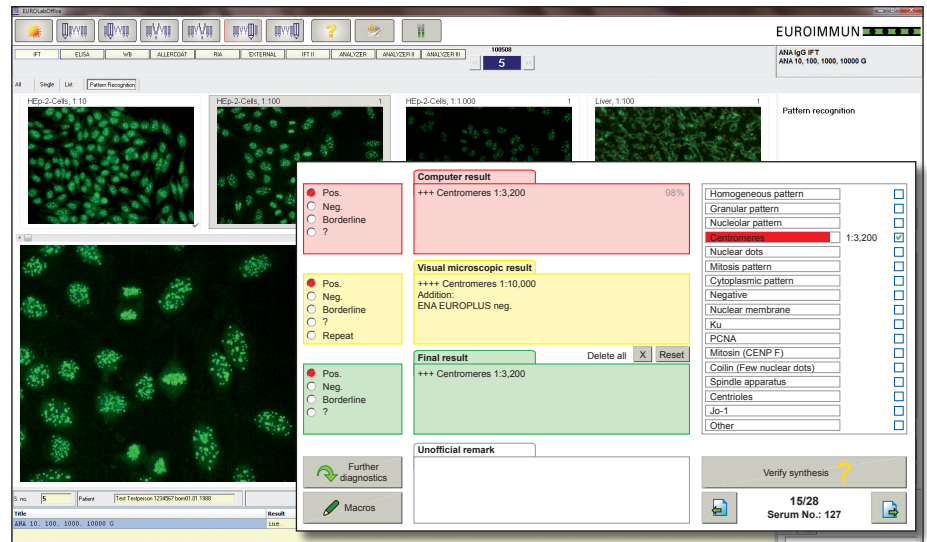
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EUROPattern Microscope



Representation of results in EUROPattern

Introduction

Indirect immunofluorescence (IIF) has not been able to keep pace with most other analytical techniques used in diagnostic laboratories. Whereas there are some automated technical solutions for IIF incubation about to appear on the market, the performance of result evaluation is still in its infancy. The patterns are predominantly recorded and interpreted by visual microscopic examination and the results documented in paper or electronic form.

The user is forced to permanently alternate between the microscopic image and the records – and to shift his point of focus is tiring and often leads to incorrect allocation of results, especially since the evaluation is generally performed in a dark room. CAIFM was developed to support the laboratory experts in diagnosing antibodies.

Microscope configuration

A motorised camera-microscope with special IIF relevant functions was designed (EUROPattern by EUROIMMUN), containing a magazine with a capacity for 50 slides, each with 10 reaction fields, or 10 slides, each with 50 reaction fields. A matrix code scanner enables slide identification and an incremental encoder identifies the field position.

Interactive microscopy

Starting with any of the 500 reaction fields by entering an ID or by mouse click, the substrates are selectively or consecutively visualized without eye-pieces at the computer screen. The slides are moved and focussed using a 3D actuator. Results are interpreted by the expert, they are entered via mouse and keyboard, images are recorded at the push of a button and automatically allocated and archived together with the results. A dark room is not required because the images on the screen are very bright. Owing to the casing around magazine and microscope stage, sunlight is kept out and the fluorescence in the substrates is protected from fading.

Automatic pattern recognition

The 500 reaction fields are examined and interpreted automatically. The system auto-focuses and takes an adjustable number of images by means of a camera, followed by visual or software-based diagnosis. The EUROPattern software allows automated assessment of IIF patterns, at present for anti-nuclear antibodies on HEp-2/HEp-2010 cells. The software performs a positive/negative differentiation and identifies deposited patterns, including many pattern combinations. If a sample has been incubated at different dilutions, the software merges the results of the individual analyses into one

report form, which shows the recognised pattern and the antibody titer. Fluorescence image and computer interpretation are displayed together on the computer screen to be confirmed with one mouse click or modified if deemed necessary. In an optional two-step screening approach, all images defined as negative are sorted out, and the expert individually confirms or reclassifies only the remaining positive results.

Laboratory management software

The EUROPattern Microscope is integrated into EUROLabOffice (EUROIMMUN) which supports IIF processing by automatic protocol generation, interconnection with further laboratory devices (e.g. dilution/incubation systems) or analytical techniques (ELISA, Immunoblot, RIA), data exchange with the pattern recognition software, merging of test results and archiving IIF images in electronic report forms.

Conclusion

CAIFM reinforces the practical suitability of IIF. Results are interpreted at the office PC, the hands stay clean. The clinical pathologist can view all available IIF images by a simple mouse click and does not need to consult the microscope again in the event that a result must be checked for confirmation.

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