ELSEVIER SCIENCE IRELAND

Analytical Cellular Pathology 6 (1994) 1–2

ANALYTICAL CELLULAR PATHOLOGY

Guest editorial

Progress in diagnostic pathology by quantification

For almost 100 years microscopical diagnoses have been made by subjective evaluation of morphologic criteria in stained cellular preparations or tissue sections. In tumour pathology the subjective cytological or histological diagnosis still represents the golden standard, reaching the highest certainty levels in the TNM classification of the UICC. Despite modern techniques, mentioned below, this classical type of diagnosis will remain the basis and the first step of diagnostic pathology.

However, the huge amount of histological and cytological knowledge has been rising asymptotically to reach a saturation point. There is not much scientific or diagnostic progress to be expected by additional subjective description of light microscopical structures in tumour pathology. Even all the information contained in modern methods of diagnostic pathology is not available if results are only subjectively described. This may be obvious for the immunhistochemical evaluation of proliferation markers, hormone receptors or oncogene products as well as for in situ hybridization to detect chromosomal aneuploidies, oncogene amplifications, loss of surpressor genes or viral infections. Other parameters, such as nuclear DNA content, a priori require quantification.

The quantification of morphological features of cells and tissues by image analysis has only gained scientific, but not routine application. Yet, and this despite the fact that, measurements of DNA are meanwhile widely accepted as a significant aid in diagnosis and grading of malignant tumours in routine pathology after 20 years of research. In Germany today about 26 pathology institutes use diagnostic DNA cytometry in the daily routine workup of tumours. Cytometric quantification of immunohistochemical demonstration of proliferation markers or hormone receptors may add significant prognostically and therapeutically relevant information. DNA in situ hybridization to detect chromosomal aneuploidies in interphase nuclei, oncogene amplifications or loss of surpressor genes similarly require quantitative evaluation. Without quantification the results of these sophisticated techniques will be less accurate and informative.

All of these parameters may be quantified by flow as well as by static cytometry. The latter has the advantage of measurements in morphologically selected and classified cells or tissue compartments in routine preparations, available in all insti-

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0921-8912/94/$07.00
SSDI 0921-8912(93)00201-W

tutes for pathology. The former has the advantage that measurements are less time consuming and more representative. Recently, laser scan microscopes were introduced as a new tool, for example for the quantification of oncogene amplifications or of chromosomal aberrations.

Obviously, measurement of different cellular parameters result in qualitatively improved and more reliable diagnoses:

- DNA aneuploidy may identify prospective malignancy in moderate dysplasias of squamous epithelia.
- Exact assessment of proliferation distribution in prostatic carcinoma may identify tumours with an extremely low probability of progression.
- Breast cancers with high progesterone content most likely will respond to hormonal therapy.
- Tetrasomy of chromosome 16 may identify papillary neoplasias as cancers.

I am convinced that the combination of modern methods of pathology and of cytometry will yield qualitatively new types of diagnoses. Pathologists who do not accept the challenge of both methods, will loose diagnostic competence. Thus diagnostic routine pathology has to face quantification of various microscopical parameters for diagnostic purposes if the discipline is to participate in scientific progress.

Analytical Cellular Pathology is a young European journal devoted to quantification in scientific and diagnostic pathology, irrespective of the methods employed. It is the official journal of the European Society for Analytical and Cellular Pathology; I would like to encourage all pathologists not only to subscribe ACP as a relevant European journal for quantitative pathology, but also to submit manuscripts to this journal which will act as a forum in the exciting field of modern diagnostic pathology.

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