Introduction

Molecular pathology

New approaches to old questions

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The past decade has shown an explosive advancement of our knowledge and technology in several biomedical research areas, in particular within disciplines such as molecular biology and immunology. This has been largely due to the rapid evolution of recombinant DNA techniques, the achievements in the field of antibody preparation and extended possibilities of affinity cytochemistry. In parallel, technological developments in the area of instrumentation for the analysis of cell structures and cell function do now allow the combination of specific probes with sensitive and high resolution microscopy and cytometry. In the study of disease these advances have led to a spectacular increase of our knowledge of the molecular basis of several disorders and to a more precise diagnosis.

In the field of molecular pathology roughly two levels can be discerned in the investigation of tissue and cell characteristics. On the one hand, the establishment of the phenotype of a certain tissue under investigation is of importance, in particular in case of malignancies. Determining the type and stage of differentiation of the tumour cells is of relevance in determining proper therapeutic protocols and for the establishment of prognostic parameters. In addition to routine histology or morphological studies at the ultrastructural level, a major approach in this area is the use of antibodies in combination with several immunocytochemical techniques. Monoclonal antibodies are now widely accepted as diagnostic reagents in several disciplines of clinical pathology. These immunoreagents can recognize typical markers of certain differentiation programmes of cells, viral constituents or proliferation markers.

A second area of molecular pathology tries to identify genotypic abnormalities in intact cells or within complex tissues. This level of diagnosis is largely aided by the recent development in the non-radioactive in situ hybridization procedures and the routine application of the polymerase chain reaction (PCR) in laboratory medicine.

In this issue the usefulness of several of these approaches in molecular diagnosis is reviewed, with special focus on their applications in oncological research and diagnosis. Furthermore, new insights into the pathogenesis of cancer and the processes underlying cancer metastases clearly demonstrate how a molecular approach of this disease has had clear implications in our recent understanding of cancer and indicate how they may influence future therapeutic protocols.