

Biochemistry of Cancer: An Introduction to This Issue

The papers collected in this issue introduce key problems of molecular oncology. Malignant cell growth is based on autonomic and unlimited proliferation of a cell clone expanding out of its own tissue and growing in non-homologous tissues. A tumor is a population of genetically unstable cells that are poorly linked to each other. Constant selection pressure placed by the “host” organism and/or chemotherapy causes their constant evolution and the appearances of unique features of tumor growth.

All attributes of neoplastic cells reflect certain peculiarities of behavior of normal cells in some conditions and so full understanding of the nature of malignant growth is impossible without full understanding of cell biology. Cellular and molecular oncology is an integral part of cell biology, and significant progress in the understanding of various aspects of this problem has been achieved through comparative studies of neoplastic cells and their normal precursors. In this regard we should mention control of the cell cycle and apoptosis, mechanisms of cell immortalization, mechanisms of maintenance of genetic stability and their impairments during tumor transformation, signal transduction pathways from receptors to the nucleus, etc. Components of these signaling pathways, oncogenes and oncoproteins, have been found to be generators of constant proliferative stimuli. At the same time these pathways are also under negative control by gene-suppressors of tumor growth. Intracellular communications regulating the status and behavior of normal cells also determine the ability of tumor cells to invade and metastasize. The nature of cancer cannot be understood without knowledge of the biology of normal cells, and vice versa.

The specificity of molecular oncology experimentation is that studies in this area must clarify biology of a tumor cell and its characteristic features such as autonomic growth, immortalization, invasion, or evolution. It is a very difficult but also a very interesting task. Studies in this field sequentially add new blocks in the erection of the building of our knowledge of the nature and behavior of tumor cells. Molecular events and their cellular consequences are inseparably linked in the molecular biology of tumor growth.

Many prejudices still exist in basic oncology. We will just mention a few. It is still widely believed that constitutive stimulation of cell proliferation exhausts the nature of cancer, that transformation means malignant

transformation or that there is antagonism between the mechanisms of differentiation and transformation. In reality, there is a large and evident distance between redundant proliferation usually appearing as the result of viral or spontaneous transformation and a malignant clone able to form a tumor in an organism. The problem of the relation between differentiation and tumor transformation includes not only antagonism but also the interaction of these processes in tumor formation.

The papers of this issue have been written by distinguished experts in basic oncology. They reflect experience, viewpoints and partialities of their authors. These papers introduce front line of studies on nature of cancer. We want to believe that we are not far from understanding principles of malignant growth. Basic oncology elucidates the nature of cancer, and this will indicate approaches of practical application. Although our knowledge of the nature of cancer is not complete, the results of basic oncological studies are used in diagnostics, prophylaxis, and therapy of cancer. Let us just mention several applications of molecular studies in clinical oncology: tumor markers in immunological and molecular diagnostics of cancer and hemoblastoses, vaccination against “viral” tumors, “differentiating” therapy, possible approaches for increasing tolerance to radio- and chemotherapy, and counteracting the formation of multiple drug resistance of tumors. All of these problems are discussed in papers of this issue in terms of basic studies.

The papers are organized into few groups. Oncogenes and suppressor genes and signaling pathways involved in the realization of their effects are described in reviews by B. P. Kopnin, P. M. Chumakov, E. A. Komarova, A. V. Gudkov, A. G. Tatosyan and O. A. Mizenina, and M. A. Krasilnikov. F. L. Kissel'ov considers papilloma virus as a model for studying the mechanisms of viral carcinogenesis. Pathways of natural evolution of tumors are discussed in a review by G. I. Deichman. Mechanisms of drug resistance and evolution of tumors are considered in the paper by A. A. Stavrovskaya. Special problems concerning differentiation in tumors and its relation to transformation and its role in diagnostics and therapy of tumors are discussed in reviews by G. I. Abelev and N. L. Lazarevich.

We hope that the introduction of these very important scientific and practical problems of molecular oncology by experts in this field will attract the interest of young scientists and stimulate their activity.

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