
Preface

Exciting new developments and discoveries of the last two decades are beginning to shed light on the complex biology of brain tumors and are advancing our understanding of the cellular and molecular processes involved in their initiation, progression, and clinical and biological behavior. The disease process in brain tumors is quite complex and the resulting tumors are characterized by a high degree of biological and clinical diversity. Thus, despite the advances of the last two decades, prognosis for patients with malignant brain tumors remains abysmal. Significant progress in the diagnosis, treatment and, ultimately, prevention of these tumors will require both the timely harnessing of the advances in basic and clinical brain tumor research, and a continuing concerted effort at increasing our understanding of brain tumor biology, in particular, the molecular genetic changes and perturbations of cellular pathways involved in brain oncogenesis and which drive the biological and clinical behavior of the tumors. Brain tumor diagnosis and prognosis, which is still largely based on histopathology and other clinical criteria, will, in the future, acquire a significant molecular component, with the incorporation of knowledge of genes that are mutated, over-expressed, deleted, silenced, or functionally altered in the tumors. Treatment strategies for brain tumors, rather than being empirical, will be rationally developed based on an understanding of the cellular and molecular mechanisms and targets that have been activated, suppressed, or otherwise altered. The discovery of new therapeutics will employ novel paradigms of rational drug discovery that incorporate structural biology, genomics, proteomics, computational chemistry and high throughput approaches. Advances in genetic epidemiology and neuro-oncogenesis will lead to the definition of high risk genotypes and phenotypes and provide the basis for genetic counseling of individuals and populations at risk for brain tumors, and facilitate the development of brain tumor prevention strategies.

The goal of *Brain Tumors* is to bring together the major scientific advances and developments in important areas of brain tumor research of the last two decades. The explosion of knowledge in the neurosciences and in neuro-oncology that has marked this period make this a timely and much needed undertaking. The chapters, organized into three main sections, emphasize recent research advances, rather than a review of established knowledge. The first section is devoted to the molecular biology, genetics, epidemiology, and pathology of brain tumors, and includes chapters on molecular profiling, molecular pathology and classification, in vitro and in vivo brain tumor models, brain metastasis and progenitor cell biology. The second section focuses on the cellular and genetic pathways involved in brain oncogenesis, malignant progression, and therapeutic response. Individual chapters cover oncogenes and tumor suppressor genes, DNA damage and repair, invasion and migration, cell cycle, growth factors, signaling, apoptosis, and developmental biology. The final section covers areas relevant to brain tumor therapy, with chapters focusing on advances in pharmacological concepts, therapeutic modalities, novel therapeutic targets, rational drug design, gene and viral therapy, drug delivery, and the blood–brain barrier, immunotherapy, and brain imag-

ing. *Brain Tumors* provides for the established brain tumor scientist and clinician, as well as, for the new investigator, graduate, or undergraduate student, a comprehensive, up-to-date guide to the critical research topics in the rapidly evolving area of neuro-oncology. The contributors of the chapters in this volume are all leaders at the frontiers of basic and clinical neuro-oncology research and practice whose work over the years has helped define the field. To each of them, I express my deepest thanks for a scholarly contribution that has resulted in a volume that is a major effort to better understand and ultimately eradicate, or at least minimize, human suffering from brain tumors.

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