Phagocytosis of Dying Cells

Dmitri V. Krysko 2009-01-14 Phagocytosis has been at the forefront of cell biology for more than a century. Initially, phagocytosis, which comes from Greek words meaning “devouring cells,” was discovered in the late 19th century by Ilya Metchnikoff, who was awarded, together with Paul Ehrlich, the Nobel Prize in Physiology and Medicine in 1908 “in recognition of their work on immunity.” At that time Metchnikoff had already identified a function for phagocytes not only in host defense but also as scavengers of degrading host cells during metamorphosis of tadpoles, thus providing one of the first descriptions of apoptotic cell clearance by macrophages (Kaufmann 2008). Since then, much has been learned about phagocytosis, and the previous several decades have witnessed outstanding progress in understanding the functions and the molecular mechanisms of phagocytosis. Two main types of targets are cleared by phagocytes: microbial pathogens and dying cells. Rapid recognition and clearance of dying cells by phagocytes plays a pivotal role in development, maintenance of tissue homeostasis, control of immune responses, and resolution of inflammation. Clearance of dying cells can be divided into several stages, including sensing, recognition, binding and signaling, internalization, and immunological responses. In this book, our contributors address these different stages of dead cell clearance and examine how impaired clearance of dying cells may lead to human diseases. We have attempted to provide sufficient cross-referencing and indexing to enable the reader to easily locate the ideas elaborated in the different chapters.

Phagocytosis of Dying Cells

Regina E. Cocco 2000

Recognition and Phagocytosis of Dying Cells

Ulrich Hirt 2001

Aptosis in Cancer Pathogenesis and Anti-cancer Therapy

Christopher D. Gregory 2016-08-24 This book discusses properties of apoptosis and other cell death modalities in cancer pathogenesis and treatment. Its nine chapters discuss modulation of anti-tumor inflammatory and immune responses, effects on the tumor microenvironment, to strategies for improving pro-apoptotic therapies, mechanisms and implications for disease pathogenesis, axl and mer receptor tyrosine kinases, immunogenic apoptotic cell death and anti-cancer immunity and cancer cell death-inducing radiotherapy. This book places the onco-biology of apoptosis in clear and objective perspective through an expertly synthesized series of reviews. Apoptosis in Cancer Pathogenesis and Anti-cancer Therapy is a deft and thorough exploration of cutting-edge research in apoptosis and anti-cancer mechanisms from basic biology to oncology. It highlights a rapidly growing field within cancer research and is essential reading for oncologists, biochemists and advanced graduate students alike.

The Resolution of Inflammation

Adriano Rossi 2008-03-17 This book provides readers with an up-to-date and comprehensive view on the resolution of inflammation and on new developments in this area, including pro-resolution mediators, apoptosis, macrophage clearance of apoptotic cells, possible novel drug developments.

Immunobiology Interactive

Kenneth Murphy 2010-06-22 The Janeway’s Immunobiology CD-ROM, Immunobiology Interactive, is included with each book, and can be purchased separately. It contains animations and videos with voiceover narration, as well as the figures from the text for presentation purposes.

Cytoskeleton

Jose C. Jimenez-Lopez 2017-05-17 The cytoskeleton is a highly dynamic intracellular platform constituted by a three-dimensional network of proteins responsible for key cellular roles as structure and shape, cell growth and development, and offering to the cell with “motility” that being the ability of the entire cell to move and for material to be moved within the cell in a regulated fashion (vesicle trafficking). The present edition of Cytoskeleton provides new insights into the structure-functional features, dynamics, and cytoskeleton’s relationship to diseases. The authors’ contribution in this book will be of substantial importance to a wide audience such as clinicians, researchers, educators, and students interested in getting updated knowledge about molecular basis of cytoskeleton, such as regulation of cell vital processes by actin-binding proteins as cell morphology, motility: their implications in cell signaling, as well as strategies for clinical trial and alternative therapies based in multigargeting molecules to tackle diseases, that is, cancer.

IgM Antibodies Enhance the Phagocytosis of Apoptotic Cells by Immature Dendritic Cells

Ekta Patel 2009 The clearance of dying cells is critical for maintaining tissue homeostasis, the prevention of autoimmunity, and the control of inflammation. The body produces billions of apoptotic cells (ACs) everyday, which normally are cleared by cells of the innate immune system, such as dendritic cells. These phagocytic cells recognize markers on the AC surface. If there is inefficient clearance, these cells progress to secondary necrosis and release pro-inflammatory factors, which can lead to inflammatory responses and autoimmune diseases. Numerous studies have shown that natural antibodies (NAbs) recognize ACs, but our understanding of their role in immune responses is limited. To evaluate whether antibodies are important for enhancing the phagocytosis of dying cells, mice were immunized with ACs to induce increased levels of anti-AC antibodies. An AC-binding assay showed that post-immunization sera had increased levels of both IgM and IgG antibodies binding to the surface of ACs, but not healthy cells, which was also seen with the NAb T15 IgM that recognizes phospholipidicine determinants. To
determine whether IgG antibodies are essential for apoptotic clearance, sera from AC immunized mice were depleted of IgG by passage on a protein-G column. In a phagocytic AC clearance assay, IgM antibodies were shown to be primarily responsible in aiding phagocytic cells to clear ACs, and there was no essential role for IgG in the process. Therefore, the results showed that IgM-natural antibodies, the T15 NAb and IgM antibodies induced by AC immunization, recognize apoptotic cells and enhance the ability of immature dendritic cells to phagocytose these cells.

Cell Death-Tobias Ntuli 2015-12-16 This book is a collection of selected and relevant research, concerning the developments within the Cell Death field of study. Each contribution comes as a separate chapter complete in itself but directly related to the books topics and objectives. The target audience comprises scholars and specialists in the field.

Apoptosis and Development-2015-10-05 Apoptosis and Development, the latest volume of Current Topics in Developmental Biology continues the legacy of this premier serial with quality chapters authored by leaders in the field. This volume covers research methods in apoptosis and development, and includes sections on such topics as the non-lethal role of apoptotic proteins and germ line cell death in Drosophila. Continues the legacy of this premier serial with quality chapters authored by leaders in the field. Includes descriptions of the most recent advances in the field Covers research methods in apoptosis and development, and includes sections on such topics as the non-lethal role of apoptotic proteins and germ line cell death in Drosophila.

Chronic inflammation in conditions associated with a deficient clearance of dying and dead cells, their remnants, and intracellular constituents-Luis Enrique Muñoz 2015-06-17 In multicellular organisms, states with a high degree of tissue turnover like embryogenesis, development, and adult tissue homeostasis need an instantaneous, tightly regulated and immunologically silent clearance of these dying cells to ensure appropriate development of the embryo and adult tissue remodelling. The proper and swift clearance of apoptotic cells is essential to prevent cellular leakage of damage associated molecular patterns (DAMPs) which would lead to the stimulation of inflammatory cytokine responses. In addition to the clearance of apoptotic cells (cellfocytosis), backup mechanisms are required to cope with DAMPs (HMGB-1, DNA, RNA, S100 molecules, ATP and adenosine) and other intracellular material (uric acid, intracellular proteins and their aggregates) released from cells, that were not properly cleared and have entered the stage of secondary necrosis. Furthermore, under certain pathologic conditions (e.g. gout, cancer, diabetes) non-apoptotic cell death may transiently occur (NETosis, necroptosis, pyroptosis) which generates material that also has to be cleared to avoid overloading tissues with non-functional cellular waste. Efficient efferocytosis is therefore indispensable for normal tissue turnover and homeostasis. The characterization of various signalling pathways that regulate this complex and evolutionarily conserved process has shed light on new pathogenetic mechanisms of many diseases. Impaired clearance promotes initiation of autoimmunity as well as the perpetuation of chronic inflammation, but may also foster anti-tumor immunity under certain microenvironmental conditions. Immunological tolerance is continuously being challenged by post-apoptotic remnants. In peripheral lymphoid tissues, phagocytes encounter apoptotic and necrotic remnants and cell debris. Phagocytes engulf dying and dead cells by a mechanism known as apoptosis. Apoptosis is essential for survival of the body as a whole and has critical roles in various developmental processes and the immune system. In Cell Death, Douglas R. Green provides a clear and

Cell Death-Tobias Ntuli 2015-12-16 This book is a collection of selected and relevant research, concerning the developments within the Cell Death field of study. Each contribution comes as a separate chapter complete in itself but directly related to the books topics and objectives. The target audience comprises scholars and specialists in the field.

Chronic inflammation in conditions associated with a deficient clearance of dying and dead cells, their remnants, and intracellular constituents-Luis Enrique Muñoz 2015-06-17 In multicellular organisms, states with a high degree of tissue turnover like embryogenesis, development, and adult tissue homeostasis need an instantaneous, tightly regulated and immunologically silent clearance of these dying cells to ensure appropriate development of the embryo and adult tissue remodelling. The proper and swift clearance of apoptotic cells is essential to prevent cellular leakage of damage associated molecular patterns (DAMPs) which would lead to the stimulation of inflammatory cytokine responses. In addition to the clearance of apoptotic cells (cellfocytosis), backup mechanisms are required to cope with DAMPs (HMGB-1, DNA, RNA, S100 molecules, ATP and adenosine) and other intracellular material (uric acid, intracellular proteins and their aggregates) released from cells, that were not properly cleared and have entered the stage of secondary necrosis. Furthermore, under certain pathologic conditions (e.g. gout, cancer, diabetes) non-apoptotic cell death may transiently occur (NETosis, necroptosis, pyroptosis) which generates material that also has to be cleared to avoid overloading tissues with non-functional cellular waste. Efficient efferocytosis is therefore indispensable for normal tissue turnover and homeostasis. The characterization of various signalling pathways that regulate this complex and evolutionarily conserved process has shed light on new pathogenetic mechanisms of many diseases. Impaired clearance promotes initiation of autoimmunity as well as the perpetuation of chronic inflammation, but may also foster anti-tumor immunity under certain microenvironmental conditions. Immunological tolerance is continuously being challenged by post-apoptotic remnants. In peripheral lymphoid tissues, phagocytes encounter apoptotic and necrotic remnants and cell debris. Phagocytes engulf dying and dead cells by a mechanism known as apoptosis. Apoptosis is essential for survival of the body as a whole and has critical roles in various developmental processes and the immune system. In Cell Death, Douglas R. Green provides a clear and

Autoimmunity-Katerina Chatzidionysiou 2015-06-17 Autoimmunity is defined as an immune response against a self-antigen. This abnormal immune response can lead to tissue damage and to the development of autoimmune disease. From organ-specific autoimmune diseases, such as myasthenia gravis, to non-organ-specific, such as systemic lupus erythematosus, autoimmune diseases represent a heterogeneous group of disorders which affect approximately 6% of the population. The pathogenesis of many autoimmune diseases is complex and remains not completely understood. The aim of this book is to present current knowledge regarding pathogenic mechanisms of autoimmune diseases, clinical aspects of specific autoimmune diseases, like vitiligo, celiac disease and autoimmune liver disease, as well as insights regarding specific therapies.

Cell Death-Douglas R. Green 2018-09-30 One million cells in our bodies die every second—they commit suicide by a mechanism known as apoptosis. Apoptosis is essential for survival of the body as a whole and has critical roles in various developmental processes and the immune system. In Cell Death, Douglas R. Green provides a clear and

Myeloid Cells in Health and Disease-Siamon Gordon 2020-07-10 The structure, functions, and interactions of myeloid cells have long been the focus of research and therapies development. Yet, much more remains to be discovered about the complex web of relationships that makes up the immune systems of animals. Scientists today are applying genome-wide analyses, single-cell methods, gene editing, and modern imaging techniques to reveal new subclasses of differentiated myeloid cells, new receptors and cytokines, and important interactions among immune cells. In Myeloid Cells in Health and Disease: A Synthesis, Editor Siamon Gordon has assembled an international team of esteemed scientists to provide their perspectives of myeloid cells during innate and adaptive immunity. The book begins by presenting the foundational research of Paul Ehrlich, Elie Metchnikoff, and Donald Metcalf. The following chapters discuss evolution and the life cycles of myeloid cells; specific types of differentiated myeloid cells, including macrophage differentiation; and antigen processing and presentation. The rest of the book is organized by broad topics in immunology, including the recruitment of myeloid and other immune cells in the inflammation process and the repair of damaged tissue the vast arsenal of myeloid cell secretory molecules, including metalloproteinases, tumor necrosis factor, histamine, and perforin receptors and downstream signaling pathways that are activated following ligand-receptor binding roles of myeloid cells during microbial and parasite infections contributions of myeloid cells in atherosclerosis myeloid-derived suppressor cells in tumor development and cancer Myeloid Cells in Health and Disease: A Synthesis will benefit graduate students and researchers in immunology, hematology, microbial pathogenesis, infectious disease, pathology, and pharmacology. Established scientists and physicians in these and related fields will enjoy the book’s rich history of myeloid cell research and suggestions for future research directions and potential therapies.

Apoptotic and Non-apoptotic Cell Death-Shigezaku Nagata 2017-04-07 This volume focuses on apoptotic and non-apoptotic programmed cell death, including necroptosis, pyroptosis, and ferroptosis, and presents recent findings in the field. It discusses the crucial role that apoptotic and non-apoptotic cell death play in various pathological conditions, such as skin diseases, inflammatory bowel diseases, and virus infections. Further, it highlights the mechanisms underlying the recognition and clearance of dead cells, and the subsequent biological responses triggered by phagocytosed macrophages and factors released from dying cells. Offering insights into cell death, it is a valuable resource for researchers and clinicians developing novel strategies to treat various diseases that are closely associated with cell death.

Apoptotic Cell Clearance in Health and Disease-Estee Kuran 2018-12-27 Clearance of apoptotic cells is essential for proper development, homeostasis and repair of injured tissues in multicellular organisms. Thus, cellular and molecular players taking part in the sequential events of this process are of great interest. Research in the last 20 years has indicated that specific ligands and receptors take part in the attraction of immune cells toward apoptotic targets and in the interactions between apoptotic cells and professional as well as non-professional phagocytes that engulf them. Moreover, phagocytosis of apoptotic cells (effecocytosis) leads to significant phenotypic changes in the engulfing cells suggesting that it is a major fate-determining event for phagocytes. Particularly, effecocytosis has an important impact on the inflammation-resolution axis as well as embryonic development and tissue morphogenesis. Deficiencies in these processes can result in health threats, such as autoimmunity, atherosclerosis, bone loss, obesity, infertility, neurodegeneration, fibrosis and cancer. This eBook brings together 24 original research and review manuscripts that cover various aspects of apoptotic cell removal during normal development and homeostasis as well as in tumorigenesis and regenerative processes following injury.

Autoimmunity-Katerina Chatzidionysiou 2015-06-17 Autoimmunity is defined as an immune response against a self-antigen. This abnormal immune response can lead to tissue damage and to the development of autoimmune disease. From organ-specific autoimmune diseases, such as myasthenia gravis, to non-organ-specific, such as systemic lupus erythematosus, autoimmune diseases represent a heterogeneous group of disorders which affect approximately 6% of the population. The pathogenesis of many autoimmune diseases is complex and remains not completely understood. The aim of this book is to present current knowledge regarding pathogenic mechanisms of autoimmune diseases, clinical aspects of specific autoimmune diseases, like vitiligo, celiac disease and autoimmune liver disease, as well as insights regarding specific therapies.
Comprehensive view of apoptosis and other cell death mechanisms. Taking a bottom-up approach, he starts with the enzymes that perform the execution process (a family of proteases termed caspases) and examines their cellular targets and the ways in which they are activated. He then looks at the molecular machinery that links signals that cause cell death to caspases, emphasizing the importance of the BCL-2 family of proteins and the role of cytochrome c released from mitochondria. The final stage of the process, phagocytic removal of dead or dying cells, is also covered. Green outlines the roles of apoptosis and death mechanisms such as necrosis in embryogenesis, neuronal selection, and the development of self-tolerance in the immune system. In addition, he explains how cell death defends the body against cancer and traces the evolutionary origins of the apoptosis machinery back over a billion years. This new edition contains critical new information on recent exciting advances in the field, such as new forms for cell death and important insights into the mechanisms and control of apoptosis. The book is thus of great use to all biologists interested in how cells function in the context of multicellular organisms and will appeal to everyone from undergraduates encountering the topic for the first time to researchers actively working in the field.

**Complement Protein C1q**
Elizabeth Victoria Clarke 2014 Deficiency in C1q, the recognition component of the classical complement cascade and a key opsonin involved in apoptotic cell clearance, leads to lupus-like autoimmune diseases characterized by auto-antibodies to self proteins and aberrant T and B cell activation. Studies have suggested that these pathological consequences may result from impaired clearance of apoptotic cells. To investigate how C1q may modulate inflammation resulting from diminished apoptotic cell clearance, I applied a novel system consisting entirely of primary human cells: human monocye-derived macrophages (Mac) and dendritic cells (DC), ingesting autologous apoptotic human lymphocytes (C1q-polarized Mac; or C1q-polarized DC), and either autologous or allogeneic human T cells. This physiologically relevant experimental system enabled characterization of the C1q-polarized Mac or C1q-polarized DC functional phenotype and subsequent Mac and DC-mediated T cell activation, avoiding the caveats of other systems using either transformed cell lines or non-physiologic presentation of C1q. The results demonstrate that C1q influences intracellular signaling and gene expression of both secreted protein and cell surface receptors. That is, C1q-polarized Mac exhibited enhanced STAT1 phosphorylation that is correlated with attenuated NLRP3 inflammasome activation and sequential induction of type I IFN-α, IL-27, and IL-10 in LPS-stimulated Mac relative to Mac ingesting apoptotic lymphocytes alone. C1q-polarized DC also exhibited enhanced IL-27 expression relative to DC ingesting apoptotic lymphocytes without C1q. Under the same conditions C1q-polarized Mac showed suppressed induction of CD40 and enhanced expression of PD-L1 and PD-L2 expression while C1q-polarized DC exhibited reduced CD86 induction and elevated PD-L2 and CD39 expression relative to DC ingesting apoptotic cells alone. Finally, C1q-polarized Mac reduced allogeneic and autologous Th17 and Th1 subset proliferation, and initiated a trend towards increased regulatory T cell proliferation relative to Mac ingesting LAL alone. Moreover, relative to DC ingesting AC in the absence of C1q, C1q-polarized DC decreased allogeneic Th17 and Th1 proliferation. These data demonstrate that a functional consequence of C1q-polarized Mac and DC is the regulation of T effector cell activation, thereby "sculpting" the adaptive immune system to avoid autoimmunity while clearing dying cells. Importantly, these studies identify novel target pathways for therapeutic intervention in SLE and other inflammatory autoimmune diseases.

**Flow Cytometry and Cell Sorting**
Andreas Radbruch 2013-03-14 The analysis and sorting of large numbers of cells with a fluorescence-activated cell sorter (FACS) was first achieved some 30 years ago. Since then, this technology has been rapidly developed and is used today in many laboratories. A Springer Lab Manual Review of the First Edition: "This is a most useful volume which will be a welcome addition for personal use and also for laboratories in a wide range of disciplines. Highly recommended." CYTOBOS

**Immunologic Cell Death in Cancer: From Benchside Research to Bedside Reality**
Abhishek D Garg 2016-04-29 Classically, anti-cancer therapies have always been applied with the primary aim of tumor debulking achieved through widespread induction of cancer cell death. While the role of host immune system is frequently considered as host protective in various (antigen-bearing) pathologies or infections yet in case of cancer overtime it was proposed that the host immune system either plays no role in therapeutic efficacy or plays a limited role that is therapeutically unemployable. The concept that the immune system is dispensable for the efficacy of anticancer therapies lingered on for a substantial amount of time; not only because evidence supporting the claim that anti-cancer immunity played a role were mainly contradictory, but also largely because it was considered acceptable (and sometimes still is) to test anticancer therapies in immunodeficient mice (i.e. SCID athymic mice lacking adaptive immune system). This latter practice played a detrimental role in appreciating the role of anticancer immunity in cancer therapy. This scenario is epitomized by the fact that for a long time the very existence of cancer-associated antigens or cancer-associated ‘danger signaling’ remained controversial. However, over last several years this dogmatic view has been considerably modified. The existence of cancer-associated antigens and ‘danger signaling’ has been proven to be incontrovertible. These developments have together paved way for the establishment of the attractive concept of “immunogenic cell death” (ICD). It has been established that a restricted class of chemotherapeutics/targeted therapeutics, radiotherapy, photodynamic therapy and certain oncolytic viruses can induce a form of cancer cell death called ICD which is accompanied by spatiotemporally defined emission of danger signals. These danger signals along with other help factors can cancer cells undergoing ICD to activate host innate immune cells, which in turn activate T cell-based immunity that helps eradicate live (or residual) surviving cancer cells. The emergence of ICD has been marred by some controversies. ICD has been criticized to be either experimental model or setting-specific or mostly a concept based on rodent studies that may have very limited implications for clinical application. However, in recent times it has emerged (through mainly retrospective or prognostic studies) that ICD can work in various human clinical settings hinting towards clinical applicability of ICD. However a widespread consensus on this issue is still transitional. In the current Research Topic we aimed to organize and intensify a discussion that strives to bring together the academic and clinical research community in order to provide a background to the current state-of-the-art in ICD associated bench-side research and to initiate fruitful discussions on present and future prospects of ICD translating towards the clinical, bedside reality.

**Apoptosis**
2001-05-30 Apoptosis provides a current and comprehensive collection of methods for the study of cell death. Using a diverse range of technical approaches and model systems, the chapters in this volume cover topics from the cellular and organismal to the molecular and anatomical. The methods are illustrated with user-friendly recipes and over 100 tables, halftones, and diagrams. Current methodologies for studying cell death. Wide range of model systems Molecular, biochemical, cellular, and genetic approaches. Complements the original Cell Death volume. Up-to-date methodology for a fast moving field Designed with the needs of both basic scientists and clinicians in mind. Authors are leaders in their respective fields.

**Macrophage Activation**
Khadij Hussein Bhat 2020-03-25 Macrophages are the sentinels of the immune system whose role has evolved beyond providing aseptic conditions to homeostasis, immune regulation, development, and behaviour. These cells have varied ontogenetic origins which reflects in their phenotypic and functional heterogeneity. Macrophage functions are fine-tuned by exogenous and endogenous signals and once tweaked, the information is included in their genetic makeup, albeit not indefinitely. Subversion of the macrophage functions is the hallmark of many pathogenic organisms and modulation of macrophage activity is pivotal to many therapeutic strategies. Fascinating and rapid developments in this field have necessitated the maintenance of currency of knowledge. This book provides a current account of information on varied topics in macrophage biology. Literature surveys have been presented in a captivating and lucid language. The contributing authors have also provided brief accounts of their own research. Every chapter provides a future perspective of what more could be achieved in the context of the current knowledge. The book will be of interest to students and researchers in microbiology, immunobiology, translational research, pathology, and related fields.

**Apoptosis and Its Relevance to Autoimmunity**
Keith B. Elkon 2006-01 This volume highlights the recent advances in the basic mechanisms of apoptosis and the application of that knowledge to understanding the impact of defective apoptosis or defective clearance of apoptotic cells on the immune function and the expression of the hallmark of many pathogenic organisms and modulation of macrophage activity is pivotal to many therapeutic strategies. Fascinating and rapid developments in this field have necessitated the maintenance of currency of knowledge. This book provides a current account of information on varied topics in macrophage biology. Literature surveys have been presented in a captivating and lucid language. The contributing authors have also provided brief accounts of their own research. Every chapter provides a future perspective of what more could be achieved in the context of the current knowledge. The book will be of interest to students and researchers in microbiology, immunobiology, translational research, pathology, and related fields.

**Phagocytosis: Molecular Mechanisms and Physiological Implications**
Esther M. Lafuente 2020-12-03
Cytokine Storm Syndrome—Randi Q. Cron 2019-09-09 Cytokine Storm Syndromes, including HLH and MAS, are frequently fatal disorders, particularly if not recognized early and treated during presentation. The genetics of Cytokine Storm Syndromes are being defined with many of the risk alleles giving rise to mutations in the perforin-mediated cytolytic pathway used by CD8 cytotoxic T cells and natural killer cells. These are being studied using murine models. Up to 10% of the general population may carry risk alleles for developing Cytokine Storm Syndromes, and Cytokine Storm Syndromes are being increasingly recognized around the world in pediatric and adult hospitals. A variety of infectious, rheumatic, and oncologic triggers are commonly associated with Cytokine Storm Syndromes, but understanding this disorder is critical for all researchers and physicians to ensure timely and appropriate therapy. This textbook, the first of its kind, addresses all aspects of the disorder—from genetics, pathophysiology, and ongoing research, to clinical presentations, risk factors, and treatment.

Recent Advances in Zebrafish Researches—Yusuf Bokzurt 2018-05-30 Model organisms have been used in various disciplines in order to understand different mechanisms underlying the problems. From this point of view, the zebrafish has become a favorite model organism in different scientific research fields in recent years because of its rapid embryonic development, transparency of its embryos, and its large number of offspring along with several other advantages. Recent Advances in Zebrafish Researches demonstrates the role and the function of zebrafish in different research fields and totally includes 11 chapters, which have been written by the expert researchers in their fields. With this book, every researcher will better understand different mechanisms underlying the problems at different disciplines using zebrafish as model organism.

Tumor Immunology and Immunotherapy - Cellular Methods Part B- 2020-02-11 Tumor Immunology and Immunotherapy - Cellular Methods Part B, Volume 632, the latest release in the Methods in Enzymology series, continues the legacy of this premier serial with quality chapters authored by leaders in the field. Topics covered include Quantitation of calreticulin exposure associated with immunogenic cell death, Side-by-side comparisons of flow cytometry and immunohistochemistry for detection of calreticulin exposure in the course of immunogenic cell death, Quantitative determination of phagocytosis by bone marrow-derived dendritic cells via imaging flow cytometry, Cytotoxic fluorescent assessment of dendritic cell-mediated uptake of cancer cell apoptotic bodies, Methods to assess DC-dependent priming of T cell responses by dying cells, and more. Contains content written by authorities in the field Provides a comprehensive view on the topics covered Includes a high level of detail

Autophagy—Gizem Ayna 2013-07-29 One of the natural functions of the immune system is to find and eradicate neoplastic and dysplastic cells in tissues. This immune surveillance can be impaired due to the unpredictable immune escape strategies of cancer cells. Induction of apoptotic cell death by chemotherapy is applied to kill malignant cells in patients with cancer even though it has many weak points, such as the fact that apoptotic cells are usually ignored by the immune system since they are immunologically silent and even suppress inflammation. Inducing immunogenic cell death can promote efficient clearance of cancerous cells before they become aggressive and lethal. Unlike the generally anti-inflammatory apoptotic cells, clearance of immunogenic apoptotic, necrotic, and autophagic dying cells often triggers an innate immune response through inflammasome activation with subsequent release of IL-1β and IL-18 from immune-competent cells. These immunogenic dying cells can expose or release danger-associated molecular pattern molecules (DAMPs), which are the inducers of inflammasome components' expression and/or assembly of the inflammasome to activate caspase-1 for the formation of active cytokines. In this chapter, we discuss which inflammasome-stimulant DAMPs have been recognized so far, and how immunogenic apoptotic, necrotic, and particularly autophagic dying cells may provoke inflammasome induction and/or activation.

Apoptosis and Autoimmunity—Joachim R. Kalden 2006-03-06 This is the first comprehensive book about the relationship between apoptosis and autoimmune diseases. It offers a unique up-to-date overview on research results on the defective execution of apoptosis and the incomplete clearance of apoptotic cells. The molecular and cellular mechanisms involved are described in detail. As a possible consequence of apoptotic dysfunction, the development of severe autoimmune diseases (e.g., rheumatoid arthritis, systemic lupus erythematosus) is discussed. An outlook on future research topics includes the evaluation of novel therapeutic strategies.

Carbon Nanotubes in Drug and Gene Delivery—Mahdi Karimi 2017-10-31 Recent important discoveries and developments in nanotechnology have had a remarkable and ever-increasing impact on many industries, especially materials science, pharmaceuticals, and biotechnology. Nanocarriers have been investigated for a wide variety of different medical applications. Some examples of these nanocarriers include polymersomes, liposomes, micelles and carbon-based nanomaterials. Within this book, the authors describe different features of carbon nanotubes (CNTs), survey the properties of both the multi-walled and single-walled varieties, and cover their applications in drug and gene delivery. In addition, the book explains the structure and properties of CNTs prepared by different method, and discussed their isolation and purification. The future of CNTs in the field of biomedical science will depend on minimizing their adverse effects by careful study of their structure and properties.

Exocytosis and Endocytosis—Andrei I. Ivanov 2008 Due to their vital involvement in a wide variety of housekeeping and specialized cellular functions, exocytosis and endocytosis remain among the most popular subjects in biology and biomedical sciences. Tremendous progress in understanding these complex intracellular processes has been achieved by employing a wide array of research tools ranging from classical biochemical methods to modern imaging techniques. In Exocytosis and Endocytosis, skilled experts provide the most up-to-date, step-by-step laboratory protocols for examining molecular machinery and biological functions of exocytosis and endocytosis in vitro and in vivo. Following the highly successful Methods in Molecular BiologyTM series format, the chapters present an introduction outlining the principle behind each technique, a list of the necessary materials, an easy to follow, readily reproducible protocol, and a Notes section offering tips on troubleshooting and avoiding known pitfalls. Insightful to both newcomers and seasoned professionals, Exocytosis and Endocytosis offers a unique and highly practical guide to versatile laboratory tools developed to study various aspects of intracellular vesicle trafficking in simple model systems and living organisms.

Mechanisms of Cell Death—Cell Death Society 1999 As the body of research on apoptosis grows, it paradoxically becomes simpler as the principles that define the field become more flexible and inclusive. Discussions of the role of cell death in AIDS, inflammatory disease, lung and cardiac disease, and lupus each emphasize the importance of understanding and regulating inflammation and the production of apoptotic bodies. Included in these proceedings is an in-depth review of the role of death cell genes, including intriguing studies of the existence of inhibitors of apoptosis in embryos. Many of these researchers now feel it is a combination, rather than any single gene, that activates apoptosis.

Biology of Myelomonocytic Cells—Anirban Ghosh 2017-05-10 Myelomonocytic cells are the multipotent cells in the stage of blood cell differentiation, which mainly comprise blood monocytes, tissue macrophages and subset of dendritic cells. Actually, their position and ability of judgement of the health of tissue or organ environment are the key initiators of tissue-specific immune response in a local and global fashion. Interestingly, the morpho-functional aspects of this group of cells vary to a wide range with their positional diversity. Their ability to communicate or represent the tissue microenvironment to the peripheral immune system and efficiency to engage the system to effector activation hold the key for a successful immune endeavour. The present volume shows some glimpses of such an extensive area of current immunology research.

Cytotoxicity—Erman Sahli Isthil 2019-10-02 Compensating for cytotoxicity for cytotoxicity in the multicellular organism by a certain level of cellular proliferation is the primary aim of homeostasis. In addition, the loss of cellular proliferation control (tumorigenesis) is at least as important as cytotoxicity, however, it is a contrasting trauma.
Phagocytosis of Dying Cells - From Molecular Mechanisms to Human Diseases is a comprehensive resource designed for students and researchers studying cytotoxicity and cellular proliferation as they relate to cancer. It is written in a concise and precise style, making it an ideal reference for those engaged in medical science.

**Enzyme Inhibitors and Activators**

Murat Şentürk 2017-03-29 Over the recent years, medicinal chemistry has become responsible for explaining interactions of chemical molecule processes such that many scientists in the life sciences from agronomy to medicine are engaged in medicinal research. This book contains an overview focusing on the research area of enzyme inhibitor and activator, enzyme-catalyzed biotransformation, usage of microbial enzymes, enzymes associated with programmed cell death, natural products as potential enzyme inhibitors, protease inhibitors from plants in insect pest management, peptidases, and renin-angiotensin system. The book provides an overview on basic issues and some of the recent developments in medicinal science and technology. Especially, emphasis is devoted to both experimental and theoretical aspect of modern medicine. The primary target audience for the book includes students, researchers, chemists, molecular biologists, medical doctors, pharmacologists, and professionals who are interested in associated areas. The textbook is written by international scientists with expertise in biochemistry, enzymology, molecular biology, and genetics, many of which are active in biochemical and pharmacological research. I would like to acknowledge the authors for their contribution to the book. We hope that the textbook will enhance the knowledge of scientists in the complexities of some medical approaches; it will stimulate both professionals and students to dedicate part of their future research in understanding relevant mechanisms and applications of pharmacology.

**Extracellular Release of High Mobility Group Box1 Protein from Necrotic Beta-cells in the Pathogenesis of Type 1 Diabetes Mellitus**

Mitsuhito Komba 2007 Nonobese diabetic (NOD) mice, an animal model of human type 1 diabetes mellitus (T1DM), exhibit impaired phagocytosis of apoptotic cells. In addition to phagocytosis, degradation of apoptotic cells determines the level of dead cells in tissues. Therefore, the work examined the kinetics of apoptotic cell degradation. The work revealed that macrophages from NOD mice digested internalised apoptotic thymocytes at a reduced rate compared to macrophages from control mice. How defective clearance leads to the development of T1DM is unclear. Necrosis is associated with inflammation, and high mobility group box 1 protein (HMGB1) released from necrotic cells induces inflammation. The relationship between cell death and HMGB1 release was investigated. The results showed that HMGB1 was released from necrotic -cells in a dose-dependent manner. If impaired, clearance of apoptotic -cells results in an increased population of necrotic -cells. HMGB1 release could initiate or exacerbate an inflammatory response in NOD mice.

**Basic Knowledge of Pharmacology**

Roland Seifert 2019-07-19 This is the perfect pharmacology textbook for medical and pharmacy students. The book was developed on the +30-year experience of the author as pharmacology professor in the United States and Germany. The book discusses the most important drugs (400) in the context of relevant diseases. Summary tables and schemes, MCQ exam questions, case studies and a list of drugs aid memorization of the material before an exam. All chapters are written in the same concise style and use a modern and precise pharmacological nomenclature. After reading of the book, the student will be able to critically assess the proper use of the most important drugs and advise patients properly. The didactic concept of the book has been developed on the author’s own pharmacology courses for which he has received numerous teaching awards. The book takes advantage of the learning spiral, in which material is presented repeatedly from various angles. This book is an adaptation for an international audience of the German textbook “Basiswissen Pharmakologie” (2018); ISBN: 978-3-662-56303-8.

**The Role of KIM-1 Mediated Efferocytosis by Cancer Cells in Blocking the Immunogenicity of Tumor Cell Death**

Sahra Nathoo 2014 The phagocytic clearance of apoptotic cells -efferocytosis- is essential for maintaining immune tissue homeostasis. Un cleared apoptotic cells can undergo secondary necrosis releasing endogenous danger signals such as high mobility group box protein 1 (HMGB1) into the extracellular milieu, triggering the innate immune system. Kidney Injury Molecule -1 (KIM-1) is a phosphatidylserine (PS) receptor that has been shown to confer on proximal tubular epithelial cells (PTECs) the ability to clear apoptotic cells during acute kidney injury. KIM-1 is overexpressed by various human tumours including renal cell carcinoma (RCC), though the impact of this on tumour progression is not known. Importantly, RCC tumours are highly resistant to chemotherapies and radiotherapies that are known to concurrently induce tumour cell apoptosis and trigger an immune response to the dying cancer cells. In this thesis I show, for the first time, that endogenous KIM-1 expressed by human RCC cell lines enables them to become semi-professional phagocytes and efficiently engulf apoptotic and necrotic cells. Using siRNA-mediated knockdown of KIM-1 expression in RCC cells, we show that KIM-1-dependent phagocytosis by RCC cells significantly reduced the leakage of HMGB1 from apoptotic cells undergoing secondary necrosis or necrotic cells. In addition, we demonstrate that the failure to clear dying cells by RCC cells was associated with enhanced activation of primary dendritic cells when they were exposed to the conditioned medium from RCC cells fed apoptotic or necrotic cells. Therefore, we propose that the upregulation of KIM-1 expression by cancers may allow them to evade the immune system and immunogenic cell death by chemotherapy and thereby makes KIM-1 a potential therapeutic target.

**Dying and Death in Oncology**

Lawrence Berk 2016-10-11 This book brings together in one volume many important topics about death and dying, including the pathophysiology of death, the causes of death among cancer patients, the ethics of death, the legal aspects of death for the physician and for the patient and caregivers, the economics of death, the medical management of the dying patient, including pain and dyspnea, the prediction of death, and the spiritual management of the dying patient. It also discusses other medical and humanistic aspects of death and dying, such as the historical definition of death and various cultures’ and religions’ viewpoints on death and the afterlife. Everybody, including every patient with cancer, will die, and every physician will have to assist dying patients. Oncologists face this prospect more often than many physicians. And yet to date there has been no comprehensive textbook on Thanatology, the academic discipline studying death and dying, to assist oncologists in this difficult task. This book will help the physician to understand his or her own relationship with death and to communicate about death and dying with the patient and the patient’s caregivers.