

# Recent advances in cell adhesion molecules and extracellular matrix proteins: potential clinical implications

Shaker A. Mousa and David A. Cheresh

The roles of cell adhesion molecules (CAMs) and extracellular matrix proteins (ECMs) in various pathological processes leading to both acute and chronic disease states have recently been documented. The authors report on the development of various therapeutic and diagnostic candidates based on the key role of CAMs in a range of diseases, and discuss the structure-function aspects of cell adhesion and signaling of the different CAMs/ECMs.

Several physiological processes, including cell activation, migration, proliferation and differentiation, require direct contact between cells or extracellular matrix proteins. Cell-cell and cell-matrix interactions are mediated through several different families of cell adhesion molecules (CAMs), including the selectins, the integrins, the cadherins and the immunoglobulins. Newly discovered CAMs, together with the discovery of new roles for integrins, selectins and immunoglobulins in certain disease states, provide great opportunities for the development of therapeutic, and perhaps diagnostic, modalities<sup>1</sup>.

Intensified R&D efforts, directed at manipulating CAM activity through the use of monoclonal antibodies, peptides, peptidomimetics and nonpeptide small molecules, continue

to broaden the scope of key clinical applications (Table 1). This article focuses on current advances in the discovery and development of novel anti-CAM agents for potential therapeutic and diagnostic applications.

## Roles of CAMs in disease states

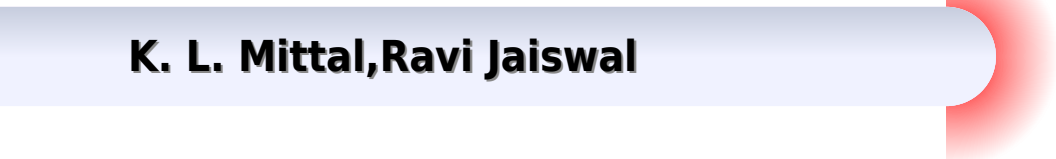
Cell adhesion molecules play highly significant roles both in normal and in various pathophysiological disease states. For this reason, the selection of a specific and relevant CAM to target a certain disease condition without interfering with other normal cellular functions is a very important prerequisite for ultimate success in developing truly active and safe therapeutic strategies<sup>2-7</sup>. Recent breakthroughs with animal models, the latest advances in the understanding of the signaling pathways, transcriptional regulation and the structure-function aspects of CAMs, as well as the role of CAMs and extracellular matrix proteins (ECMs) in cellular migration, spreading, proliferation and survival, have highlighted the potential for novel strategies based on CAM function.

There have been exciting advances in understanding several CAMs; most notably, the  $\alpha_5\beta_1$ ,  $\alpha_6\beta_1$ ,  $\alpha_4\beta_1$  and  $\alpha_9\beta_1$  integrin receptors and their direct relationships to different disease states represent tremendous therapeutic and diagnostic opportunities<sup>1-8</sup>. Potential roles for specific CAMs in different disease states, including cardiovascular, cancer, inflammatory, ocular, pulmonary, bone, central nervous system, kidney and gastrointestinal system disorders, have been suggested, including the following examples:

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# Recent Advances In Adhesion

**K. L. Mittal, Ravi Jaiswal**



## **Recent Advances In Adhesion:**

### **Recent Advances in Adhesion Science and Technology in Honor of Dr. Kash Mittal** Wojciech (Voytek)

Gutowski, Hanna Dodiuk, 2013-12-31 The surface of an object is the first thing we see or touch Nearly every article or object we encounter at home in industry land transportation aerospace or the medical field in some way uses an adhesive a sealant or a decorative coating Adhesion science provides the technology and the know how behind these applications Recent Advances in Recent Advances in Prolactin Research Maria Diakonova, PhD, 2014-12-03 Recent Advances in Prolactin Research summarizes the current knowledge of prolactin PRL PRL receptor PRL dependent signaling pathways the role of PRL in oncogenesis and PRL crosstalk with other oncogenic factors The chapters are written by experts in these fields and focus on identifying and reviewing timely experimental findings that provide new insights into the expanding role of PRL in the pathophysiology associated with a variety of human conditions Prolactin is a peptide hormone that is best known for its role in lactation Prolactin also has an influence on hematopoiesis and angiogenesis and is involved in the regulation of blood clotting through several pathways Although PRL was discovered more than 80 years ago the understanding of PRL signaling and its relationship to various pathologies is still very incomplete PRL is not only a pituitary hormone with an important role in reproduction but PRL also acts as a cytokine modulating a wide variety of physiological processes For example data gathered during the last decade have demonstrated that locally produced PRL acts as the autocrine paracrine factor and plays a contributory role during breast oncogenesis In fact the scientific and clinical communities have suggested that the manipulation of the PRL axis may lead to the successful treatment of breast cancer However recent work has demonstrated that the role of the PRL axis is much more complex than first envisaged **Recent Advances in Epilepsy Research** Devin K. Binder, Helen E. Scharfman, 2013-03-14 Epilepsy research has entered an exciting phase as advances in molecular analysis have supplemented in vitro and in vivo electrophysiologic and phenotypic characterization Recent Advances in Epilepsy Research sets forth a series of chapter reviews by researchers involved in these advances This volume is a composite profile of some exciting recent investigations in select areas of enquiry Key features neurogenetics of seizure disorders new developments in cellular and molecular neurobiology of seizure disorders the role of growth factors in seizures new advances in the roles of metabotropic glutamate receptors and GABA receptors and transporters gap junctions neuroimmunology of epilepsy malformations of cortical development neurogenesis new animal models of epilepsy and the use of brain stimulation to treat epilepsy This book should be of interest to a wide variety of audiences including graduate students in neurobiology and related disciplines neuroscientists medical students neurologists neurosurgeons and industry including pharmaceutical companies and medical device companies There are many ideas in this book that will lead ingenious innovators in academia and industry to develop new and better therapies **Recent Advances in Structural Integrity Analysis - Proceedings of the International Congress (APCF/SIF-2014)** Lin Ye, 2015-02-10 The proceedings of the International Congress c

include about 120 papers selected out of 160 papers submitted for presentations at APCF SIF 2014 to be held in Sydney Australia December 9-12, 2014 and uniting the Asian Pacific Conference on Fracture and Strength 2014 (APCFS 2014) with the International Conference on Structural Integrity and Failure SIF 2014. The congress will be hosted by The University of Sydney and co-organized by Australia Fracture Group (AFG), the Chinese Mechanical Engineering Society Materials Institution (CMES), MI, the Korean Society of Mechanical Engineers Materials and Fracture Division (KSME MFD) and The Japanese Society of Mechanical Engineers Materials and Mechanics Division (JSME MMD). The congress follows the series of the previous very successful APCF and SIF international forums in particular APCFS 2012 Busan and the 8th SIF Melbourne 2013.

Characterisations of complex mechanisms of damage accumulation and failure  
Application of new multi-scale modelling approaches in problems associated with structural integrity  
Development of more accurate technologies for structural damage assessment

**Recent advances in voltage-gated sodium channels, their pharmacology and related diseases**  
Mohamed Chahine, Jean-François Desaphy, It is our pleasure to co-edit a Research Topic on voltage-gated sodium channels pharmacology and related diseases. We are in a process of inviting submissions of novel research articles, state-of-the-art review papers and viewpoints on this topic. All the papers will follow a peer review process according to the guidelines of Frontiers in Pharmacology. Voltage-gated sodium channels play a critical role in electrical signalling in many excitable cells such as neurons, skeletal muscle cells and cardiac myocytes. They are responsible for the initiation and the propagation of action potential allowing integration of higher processes. They are formed by one  $\alpha$  subunit that forms the pore of the channel and one or several regulatory subunits. Sodium channels are the target for local anaesthetics, antiarrhythmic drugs and anticonvulsants. This class of ion channels is a prime target to several toxins. Recently, a number of mutations in sodium channels that often results in alterations of rapid channel gating have been identified and linked to human diseases. Such channelopathies cause periodic paralysis, myotonia, long QT syndrome and other cardiac conductance disturbances, pain, hemiplegic migraine and epilepsy. Sodium channels play also a negative role in malignant cellular proliferation, chronic pain and other diseases. Considering these crucial physiological and pathological implications, it is not surprising that sodium channels have been and still are key targets for drug development. This Research Topic of Frontiers in Pharmacology of Ion Channels and Channelopathies will focus on this important class of ion channels, how they operate, their pharmacology and their implication in diseases.

**Recent advances in crop protection**  
P. Parvatha Reddy, 2012-09-14 In the recent years, the need to increase food production to meet the demands of a rapidly increasing population from a limited land resource necessitated the use of intensive farming systems with the inputs like narrow genetic base, high dose of fertilizers, pesticides, irrigation, monocropping, etc., which led to the development of diseases and pests. The effect of changing global climate, particularly the sharp increase in CO<sub>2</sub> concentration, has increased the susceptibility of plants to pathogens and pests. Because of the chemicalization of agriculture, the age-old eco-friendly pest management practices like sanitation, crop

rotation mixed cropping adjustment of date of planting fallowing summer ploughing green manuring composting etc are not being practiced affecting the crops adversely This has encouraged researchers to look for eco friendly and novel approaches for pest management The information on recent advances in crop protection involving bacteria fungi nematodes insects mites and weeds is scattered The book delves upon the most latest developments in crop protection such as avermectins bacteriophages biofumigation biotechnological approaches bio priming of seeds disguising the leaf surface use of non pathogenic strains plant defense activators plant growth promoting rhizobacteria pathogenesis related proteins strobilurin fungicides RNA interference and variety of mixtures cultivar mixtures multilines soil solarization biointensive integrated pest management among several others fusion protein based biopesticides seed mat technology and environmental methods This book is a ready reference for students policy makers scientists researchers and extension workers **Recent Advances in**

**Adhesion** Lieng-Huang Lee,1973 **Recent Advances in Contact Mechanics** Georgios E. Stavroulakis,2012-10-19 Contact mechanics is an active research area with deep theoretical and numerical roots The links between nonsmooth analysis and optimization with mechanics have been investigated intensively during the last decades especially in Europe The study of complementarity problems variational quasivariational and hemivariational inequalities arising in contact mechanics and beyond is a hot topic for interdisciplinary research and cooperation The needs of industry for robust solution algorithms suitable for large scale applications and the regular updates of the respective elements in major commercial computational mechanics codes demonstrate that this interaction is not restricted to the academic environment The contributions of this book have been selected from the participants of the CMIS 2009 international conference which took place in Crete and continued a successful series of specialized contact mechanics conferences *Fundamentals of Adhesion and Interfaces* D. S. Rimai,L. P. DeMejo,K. L. Mittal,2020-05-18 No detailed description available for Fundamentals of Adhesion and Interfaces

Recent Advances in Fracture Mechanics W.G. Knauss,R.A. Schapery,2013-06-29 The papers in this volume represent a considerable cross section of the field of fracture mechanics a testimony to the breadth of interest that Mel and Max Williams friends share with them Several are expanded versions of papers that were given in special sessions honoring them at the 1997 Ninth International Conference on Fracture Mechanics in Sydney Australia The subjects treated in this volume can be classified as follows dynamic fracture problems as viewed primarily from a classical continuum point of view analysis of relatively general crack geometrics fracture problems of polymers and other relatively ductile materials scaling rules that allow extension of results obtained at one size to be translated into behavior at different size scales problems dealing with interactions that produce complex stress fields fracture problems directly appropriate to composite materials analysis of stress concentrations in anisotropic elastic solids and the problem of cracks in thin plates bending This volume will be of interest to engineers and scientists working on all aspects of the physics and mechanics of fracture Recent Advances in Pharmacotherapeutics Mr. Rohit Manglik,2024-03-24 Explores newly approved drugs novel treatment approaches drug

repurposing and cutting edge research in therapeutic drug development      *Recent Advances in Arthroplasty* Samo Fokter, 2012-01-27 The purpose of this book was to offer an overview of recent insights into the current state of arthroplasty. The tremendous long term success of Sir Charnley's total hip arthroplasty has encouraged many researchers to treat pain, improve function and create solutions for higher quality of life. Indeed and as described in a special chapter of this book, arthroplasty is an emerging field in the joints of upper extremity and spine. However, there are inborn complications in any foreign design brought to the human body. First in the chapter on infections we endeavor to provide a comprehensive up to date analysis and description of the management of this difficult problem. Second, the immune system is faced with a strange material coming in huge amounts of micro particles from the tribology code. Therefore, great attention to the problem of aseptic loosening has been addressed in special chapters on loosening and on materials currently available for arthroplasty.

**New Trends in Physics and Physical Chemistry of Polymers** Lieng-Huang Lee, 2012-12-06 Between June 6-10, 1988, the Third Chemical Congress of North America was held at the Toronto Convention Center. At this rare gathering, fifteen thousand scientists attended various symposia. In one of the symposia, Professor Pierre Gilles de Gennes of Collège de France was honored as the 1988 recipient of the American Chemical Society Polymer Chemistry Award sponsored by Mobil Chemical Corporation. For Professor de Gennes, this international setting could not be more fitting. For years, he has been a friend and a lecturer to the world scientific community. Thus, for this special occasion, his friends came to recount many of his achievements or report new research findings mostly derived from his theories or stimulated by his thoughts. In this volume of Proceedings titled *New Trends in Physics and Physical Chemistry of Polymers*, we are glad to present the revised papers for the Symposium and some contributed after the Symposium. In addition, we intend to include most of the lively discussions that took place during the conference. This volume contains a total of thirty-six papers divided into six parts, primarily according to the nature of the subject matter: Adsorption of Colloids and Polymers, Adhesion, Fractal and Wetting of Polymers, Dynamics and Characterization of Polymer Solutions, Diffusion and Interdiffusion of Polymers, Entanglement and Reptation of Polymer Melts and Networks, Phase Transitions, and Gel Electrophoresis.

**Recent Advances in Laser Processing of Materials** Jacques Perrière, Eric Millon, Eric Fogarassy, 2006-03-29 Laser materials interaction and processing is an established and growing field within the materials science community. By taking a detailed look at the fundamentals of laser-matter interaction, *Recent Advances in Laser Processing of Materials* charts the recent progress of laser materials interaction and processing in various emerging materials science domains. With special emphasis placed on nanostructures and future developments, this book provides an interdisciplinary support for basic and applied photo-assisted processing research. Coverage includes laser-assisted synthesis of new materials, nanoparticles, nanotubes, active molecules, new phases, laser-assisted surface transformation, nanostructuring, lithography, etching, laser-assisted bulk material transformation, doping, marking, crystallisation. Laser-assisted synthesis of new materials, nanoparticles, nanotubes, active molecules, new phases. Laser

assisted surface transformation nanostructuring lithography etching Laser assisted bulk material transformation doping marking crystallisation      **Recent Advances in Oral Immunity** Avi-Hai Hovav,Asaf Wilensky,Jean-Pierre Allam,2021-08-03

The oral mucosa is a challenging environment from an immunological perspective containing discrete niches with a unique architecture and function that requires precise adjustment of the immune system Being the port of entry to the gastrointestinal and respiratory tracts the oral cavity is also constantly challenged by antigens derived from air and food Moreover the oral cavity is the sole tissue of the body harboring a hard surface i e the tooth that is exposed to the hostile external environment resulting in the formation of a complex biofilm that has local and systemic effects To deal with such challenges the oral immune system aims to prevent the invasion of pathogens harmful antigens and to tolerate non pathogenic counterparts in order to maintain homeostasis In recent years numerous studies have addressed these fundamental issues revealing sophisticated mechanisms engaged by the immune system to maintain oral mucosal homeostasis and to combat various immunological insults Some of these studies have identified novel immunological mechanisms emphasizing the uniqueness of the oral immune system and the necessity to further investigate its functions

*Recent Advances in Gastroenterology 14* Her Hsin Tsai,2021-01-19 *Recent Advances in Gastroenterology 14* is the ideal resource for keeping abreast of new developments within this fast moving field Written by expert authors and featuring topics such as new therapies for IBD eosinophilic gastroenteritis gut mucus polyp detection and neurological complications of liver diseases each chapter introduces important principles that can be implemented into day to day treatment of GI disorders *Recent Advances in Gastroenterology 14* is an invaluable revision tool for trainees and a useful companion for practising gastroenterologists wishing to stay current in all aspects of this field Key points 14 chapters summarising important recent advances in the field of gastroenterology All topics written in a practical and clinically relevant manner further enhanced by key clinical points for practice sections at the end of each chapter Provides an effective exam revision tool for the gastroenterology portion of the MRCP UK and the SCE in Gastroenterology All chapters written by expert authors ensuring authoritative and accurate content Full colour photographs throughout      **Molecular Oncology Principles and**

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Ribatti,2014 The book presents recent advances in the field of angiogenesis and antiangiogenesis Starting with the hypothesis of Judah Folkman that tumor growth is angiogenesis dependent this area of research now has a solid scientific foundation Tumor growth meta      **Recent Advances in Stem Cells** Essam M. Abdelalim,2016-09-14 This volume explores recent advances in the use of pluripotent stem cells PSCs and adult stem cells ASCs in basic and clinical applications The chapters discuss use of PSCs for drug screening genome editing modeling of kidney motor neuron diseases and diabetes as

well as their application in cancer ASCs are discussed in the contexts of banking of umbilical cord stem cells use of multipotential stromal cells MSCs for bone repair cellular interactions during fracture repair stages and therapeutic applications of neural crest stem cells and lung stem cells The text is organized by sections dealing with PSCs and ASCs specifically presenting the reader with a comprehensive examination of both these forms of stem cells Expertly authored and drawing from a wealth of international perspectives Recent Advances in Stem Cells From Basic Research to Clinical Applications presents a succinct yet detailed review of cutting edge research in this rapidly expanding field This installment of Springer s Stem Cell Biology and Regenerative Medicine series is essential reading for academics researchers and clinicians in the fields of cell biology genetics nephrology osteology oncology and pulmonology

**Particle Adhesion and Removal** K. L. Mittal, Ravi Jaiswal, 2015-01-06 The book provides a comprehensive and easily accessible reference source covering all important aspects of particle adhesion and removal The core objective is to cover both fundamental and applied aspects of particle adhesion and removal with emphasis on recent developments Among the topics to be covered include

- 1 Fundamentals of surface forces in particle adhesion and removal
- 2 Mechanisms of particle adhesion and removal
- 3 Experimental methods e g AFM SFA SFM IFM etc to understand particle particle and particle substrate interactions
- 4 Mechanics of adhesion of micro and nanoscale particles
- 5 Various factors affecting particle adhesion to a variety of substrates
- 6 Surface modification techniques to modulate particle adhesion
- 7 Various cleaning methods both wet dry for particle removal
- 8 Relevance of particle adhesion in a host of technologies ranging from simple to ultra sophisticated



## Unveiling the Magic of Words: A Review of "**Recent Advances In Adhesion**"

In a world defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their capability to kindle emotions, provoke contemplation, and ignite transformative change is truly awe-inspiring. Enter the realm of "**Recent Advances In Adhesion**," a mesmerizing literary masterpiece penned by way of a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve into the book's central themes, examine its distinctive writing style, and assess its profound impact on the souls of its readers.

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