

José Marín-García

# Mitochondria and Their Role in Cardiovascular Disease

# Mitochondria And Their Role In Cardiovascular Disease

**Shamim I. Ahmad**



## **Mitochondria And Their Role In Cardiovascular Disease:**

**Mitochondria and Their Role in Cardiovascular Disease** José Marín-García, 2012-11-19 Over the past two decades due to dramatic advances in molecular and cell biology biochemistry and genetics our view on mitochondria as a relatively static cellular powerhouse has changed radically We now know that these organelles play a critical role in the normal and in the damaged heart Written by Dr Jos Mar n Garc a Director of the Molecular Cardiology and Neuromuscular Institute Mitochondria and Their Role in Cardiovascular Disease brings readers up to date on the many significant advances in the field of mitochondrial cardiovascular medicine The book begins with a general introduction to mitochondria followed by laboratory methods to study the structure and function of the organelle regulation of replication and biogenesis and the mechanisms and functional consequences of mitophagia and mitochondrial dynamics Subsequent chapters deal with mitochondrial oxidative stress and the role that the organelle plays in cell signaling and cell death Discussions will be undertaken on the biochemistry of mitochondrial cell signaling including the nature of the proteins engaged in these processes many of them only recently discovered Later chapters examine the role of mitochondria and mitochondrial abnormalities in cardiovascular diseases including their diagnosis therapeutic options currently available animal models of mitochondrial disease and new frontiers in mitochondria cardiovascular medicine including areas of research that are relatively new or developing such as proteomics next generation sequencing and systems biology

**Targeting Cardiac Proteotoxicity** Xuejun Wang, Hui-Hua Li, Md. Shenuarin Bhuiyan, Mark J. Ranek, 2021-05-25

**Metabolic Syndrome and Cardiovascular Disease** T. Barry Levine, Arlene Bradley Levine, 2012-07-05 Trends indicate that the metabolic syndrome will become the leading risk factor for heart disease Now more than ever you need an all in one reference that provides the tools and practical advice you need to Identify at risk patients Explain individual contributing factors Aid in patient education and motivation Direct comprehensive care and Choose the most appropriate interventions Comprehensively revised to reflect leading edge research and now organized to facilitate easy access to essential information and clinically relevant guidance Metabolic Syndrome and Cardiovascular Disease 2e offers this and more Not only will you receive a solid understanding of the pathophysiology underlying the metabolic syndrome and cardiovascular disease but also the rationale for today s most effective treatments What s new Filled with timely new content this updated edition covers New discoveries that have changed our understanding of the pathogenesis and interrelationship of metabolic syndrome cardiovascular disease CHD and type 2 diabetes mellitus DM The relevance of mitochondria and telomeres Sleep and its impact on cardiometabolic health The pivotal interplay between insulin and forkhead transcription factors Calorie restriction research Bariatric surgery experiences and outcomes In addition each chapter includes essential information on comorbidities interventions and pharmacotherapeutic options an exclusive feature found only in the second edition

Extracellular vesicles in cardiovascular diseases Junjie Yang, Zhen-Ao Zhao, Zhongjian Cheng, Phuong-Uyen Dinh, Ke Huang, Zhenhua Li, 2023-05-26

*Mitochondria and the Heart* José Marín-García, 2005-12-17 Mitochondria have been pivotal in the development of some of the most important ideas in modern biology Since the discovery that the organelle has its own DNA and specific mutations were found in association with neuromuscular and cardiovascular diseases and with aging an extraordinary number of publications have followed and the term mitochondrial medicine was coined Furthermore our understanding of the multiple roles that mitochondria play in cardiac cell homeostasis opened the door for intensive experimentation to understand the pathogenesis and to find new treatments for cardiovascular diseases Besides its role in adenosine triphosphate generation mitochondria regulate a complex network of cellular interactions involving 1 generation and detoxification of reactive oxygen species including superoxide anion hydrogen peroxide and hydroxyl radical 2 maintenance of the antioxidant glutathione in a reduced state and adequate level of mitochondrial matrix superoxide dismutase 3 cytoplasmic calcium homeostasis particularly under conditions of cellular calcium loading 4 transport of metabolites between cytoplasm and matrix 5 both programmed apoptosis and necrotic cell death and 6 cell growth and development It is therefore not surprising that this organelle has come to be the center stage in many current investigations of cardiovascular diseases aging and age-related disease Concomitant with these advances an impressive effort is under way for the development of new tools and methodologies to study mitochondrial structure and function including powerful ways to visualize monitor and alter the organelle function to assess the genetic consequences of these perturbations

**The Renin Angiotensin System in Cardiovascular Disease** Naranjan S. Dhalla, Sukhwinder K. Bhullar, Anureet K. Shah, 2023-01-01 This book on Renin Angiotensin System in Cardiovascular Disease includes 25 chapters which are organized in three sections namely i modulatory aspects ii pathophysiological aspects and iii pharmacotherapeutic aspects It includes an updated as well as comprehensive knowledge about molecular and cellular aspects for the role of the renin angiotensin system RAS in the pathophysiology and therapy of cardiovascular diseases such as hypertension atherosclerosis ischemic heart disease and heart failure This book emphasizes the molecular and cellular mechanisms signaling transduction pathways involved in the development of different cardiovascular diseases due to the prolonged activation of RAS Furthermore biochemical mechanisms are outlined for the inhibition of this system by the blockade of angiotensin converting enzyme as well as angiotensin II type 1 receptors in patients suffering from cardiovascular abnormalities Since cardiovascular disease is the number one cause of death worldwide leading to approximately 17.9 million deaths each year there is a keen interest in understanding the pathogenesis and improving its therapy In this regard we can attest that this book provides ample information about essential components of RAS and their role in the development of cardiovascular disease From the selection of recognized global experts in their area of investigation this book can be seen to cover diverse cardiovascular aspects and molecular and cellular mechanisms of angiotensin II action for the development of different cardiovascular abnormalities It is our contention that this book will be most suitable for promoting knowledge in the field of RAS biology and

will be of great interest to health professionals involved in both experimental and clinical cardiology as well as academic investigators and cardiovascular scientists graduate students and fellows worldwide

*Heart Failure in the Child and Young Adult* Joseph Rossano, John Lynn Jefferies, Anthony C. Chang, Jeffrey A. Towbin, Robert E. Shaddy, Shelley Miyamoto, 2025-08-01

*Heart Failure in the Child and Young Adult* From Bench to Bedside Second Edition highlights unique aspects of heart failure in the young This comprehensive resource combines research from multiple contributors with current guidelines to bridge the knowledge gap for the recognition and management of heart failure in children Coverage begins with the basic science of heart failure and then progresses through diagnosis management treatment and surgery finally concluding with advanced special topics including genetics self management and nanomedicine This new edition covers advancements in the field including additional chapters and discussion on biomarkers neuromuscular disease quality of life palliative care and the impact of COVID 19 in myocarditis and multisystem inflammatory syndrome in children It will serve as an indispensable reference to basic science researchers in cardiology pediatrics cardiologists and pediatric cardiologists Combines cutting edge research with current guidelines from the field Provides coverage of the basic science of heart failure its epidemiology and economic aspects outpatient and inpatient management and advanced therapies including mechanical circulatory support and heart transplantation Includes expanded chapters on the immune system and inflammation in the development and progression of heart failure Reviews new randomized controlled trials in pediatric heart failure

**Mitochondria and the Heart** José Marín-García, 2005-12-17 Mitochondria have been pivotal in the development of some of the most important ideas in modern biology Since the discovery that the organelle has its own DNA and specific mutations were found in association with neuromuscular and cardiovascular diseases and with aging an extraordinary number of publications have followed and the term mitochondrial medicine was coined Furthermore our understanding of the multiple roles that mitochondria play in cardiac cell homeostasis opened the door for intensive experimentation to understand the pathogenesis and to find new treatments for cardiovascular diseases Besides its role in adenosine triphosphate generation mitochondria regulate a complex network of cellular interactions involving 1 generation and detoxification of reactive oxygen species including superoxide anion hydrogen peroxide and hydroxyl radical 2 maintenance of the antioxidant glutathione in a reduced state and adequate level of mitochondrial matrix superoxide dismutase 3 cytoplasmic calcium homeostasis particularly under conditions of cellular calcium loading 4 transport of metabolites between cytoplasm and matrix 5 both programmed apoptosis and necrotic cell death and 6 cell growth and development It is therefore not surprising that this organelle has come to be the center stage in many current investigations of cardiovascular diseases aging and age related disease Concomitant with these advances an impressive effort is under way for the development of new tools and methodologies to study mitochondrial structure and function including powerful ways to visualize monitor and alter the organelle function to assess the genetic consequences of these perturbations

**Biochemical Aspects of Metabolic**

**Disorders** Muhammad Sajid Hamid Akash, Kanwal Rehman, 2025-05-17 Biochemical Aspects of Metabolic Disorders offers a comprehensive exploration of the intricate biochemical mechanisms and or pathways underlying a wide array of metabolic disorders From the genetic basis of inherited metabolic conditions to the environmental factors impacting metabolic dysregulation each chapter investigates the molecular insights essential for understanding and managing these complex diseases Covering topics such as carbohydrate and lipid metabolism disorders amino acid catabolism hepatic and renal metabolism mitochondrial dysfunction pediatric obesity and diagnostic approaches this book will serve as a requisite resource for researchers clinicians and students alike looking for unravel the biochemical intricacies of metabolic disorders Provides comprehensive coverage of various aspects of metabolic disorders including carbohydrate and lipid metabolism disorders and amino acid metabolism disorders Offers detailed molecular insight into the biochemical mechanisms and or pathways involved in metabolic disorders helping readers understand the underlying mechanisms driving disease pathogenesis Includes diagnostic algorithms and therapeutic approaches enabling readers to apply biochemical knowledge to real world clinical scenarios *INTRODUCTION FOR HEART 3D BIOPRINTING - LIVRO 1* Edenilson Brandl, 2024-05-18

The advent of 3D bioprinting technology has opened new frontiers in biomedical science offering unprecedented possibilities for tissue engineering and regenerative medicine As we embark on a journey to explore the intricate world of heart 3D bioprinting a comprehensive understanding of cell biology forms the foundation of our exploration This book Introduction for Heart 3D Bioprinting Introduction to Cell Biology aims to bridge the gap between fundamental cellular mechanisms and their applications in advanced bioprinting technologies The content of this book is meticulously structured to provide readers with a robust framework of cell biology encompassing a wide range of topics that are crucial for understanding the complexities of cellular functions and their implications in heart tissue engineering From the basic principles of cell division and DNA repair to the sophisticated mechanisms of signal transduction and metabolic regulation each chapter is crafted to elucidate the cellular processes that are pivotal for the success of 3D bioprinting in cardiovascular applications The chapters are organized in a logical sequence beginning with an introduction to essential cell biology concepts and progressing towards more specialized topics such as cellular senescence apoptosis and stem cell therapy By integrating these concepts the book not only highlights the biological underpinnings of heart 3D bioprinting but also underscores the therapeutic potential of this technology in addressing cardiovascular diseases One of the unique aspects of this book is its interdisciplinary approach While it delves deep into cell biology it also connects these biological principles with practical applications in bioprinting This dual focus ensures that readers gain both theoretical knowledge and practical insights making this book a valuable resource for students researchers and professionals in the fields of biomedicine bioengineering and tissue engineering As the field of 3D bioprinting continues to evolve it is imperative to stay abreast of the latest advancements and understand the fundamental science that drives these innovations This book endeavors to serve as a foundational text that not only educates

but also inspires further research and development in the realm of heart 3D bioprinting I would like to extend my gratitude to all the researchers educators and practitioners whose work has contributed to the knowledge encapsulated in this book It is my hope that this text will foster a deeper understanding of cell biology and its critical role in the exciting field of heart 3D bioprinting ultimately contributing to the advancement of medical science and improving patient outcomes Mitochondrial Metabolism in Ischemic Heart Disease Shijun Wang,Jian Wu,Lei-Lei Ma,Yang Li,Haiyang Tang,2022-07-27 Cardiac Hypertrophy: From Compensation to Decompensation and Pharmacological Interventions Hai-Gang Zhang,Ya Liu,Xiongwen Chen,2021-06-28 **Insights in atherosclerosis and vascular medicine: 2021** Masanori Aikawa,2023-02-28

Mitochondrial Dysfunction and Cardiovascular Diseases Sebastiano Sciarretta,Richard N. Kitsis,Junichi Sadoshima,2021-03-04 **Handbook of Mitochondrial Dysfunction** Shamim I. Ahmad,2019-05-15 Mitochondria produce the chemical energy necessary for eukaryotic cell functions hence mitochondria are an essential component of health playing roles in both disease and aging More than 80 human diseases and syndromes are associated with mitochondrial dysfunction this book focuses upon diseases linked to these ubiquitous organelles Accumulation of mitochondrial DNA damage results in mitochondrial dysfunction through two main pathways Mutation in mitochondrial DNA causes diseases such as Kearns Sayre syndrome and Pearson syndrome Mutation in chromosomal DNA causes diseases such as Parkinson s disease and schizophrenia These and many other diseases are reviewed in this book Key Features Presents the detailed structure of mitochondria mitochondrial function roles of oxidants and antioxidants in mitochondrial dysfunction Includes summary of both causes and effects of these diseases Discusses current and potential future therapies for mitochondrial dysfunction diseases Explores a wide variety of diseases caused by dysfunctional mitochondria **Molecular mechanism of vascular remodelling and target organ damage** Jia Qi,Qingxun Hu,Jintao Wang,Haineng Xu,Yanggang Yuan,2023-06-05

Modulation of Oxidative Stress in Heart Disease Sajal Chakraborti,Naranjan S. Dhalla,Madhu Dikshit,Nirmal K. Ganguly,2019-11-10 This book highlights the multifaceted roles of Reactive Oxygen Species ROS in modulating normal cellular and molecular mechanisms during the development of different types of heart disease Each chapter in the book deals with the role that altered redox homeostasis plays in the pathophysiology of heart disease In addition the book explains how reactive oxidant species interact with their targets and provides novel strategies for attenuating oxidative stress induced types of heart disease The book not only covers ROS induced response in heart disease at the cellular level but also demonstrates that an imbalance of redox states has its roots in our genes and explains the ways gene expression is regulated In turn it reviews potential sources of ROS their pathological effects on the heart and potential sites for therapeutic interventions **Translational Mitochondrial Medicine** Anna Gvozdiáková,Guillermo López Lluch,2024-12-18 Translational mitochondrial medicine applies the knowledge of experimental medicine in clinical practice it is a prospective direction of the development of mitochondrial medicine The monograph Translational Mitochondrial Medicine was created on

the basis of rapidly developing new information about mitochondrial diseases and their disorders is a revised and supplemented edition of the monographs Mitochondrial Medicine ed A Gvozdkov Springer 2008 and Recent Advances in Mitochondrial Medicine and Coenzyme Q10 eds A Gvozdkov G Cornlissen RB Singh NOVA Science USA 2018 The monograph was created as part of the book series Advances in biochemistry in health and disease edited by prof Naranjan Dhalla of Winnipeg for which we are grateful The book Translational Mitochondrial Medicine contributes to the elucidation of the pathobiochemical mechanisms of various diseases provides current information on the prospective application of the latest diagnostic approaches and targeted therapy of mitochondrial diseases Perspective mtDNA diagnostic methods include new technologies based on NGS Next Generation Sequencing to identify new genes associated with mitochondrial diseases With the help of the high resolution respirometry method HRR it is possible to record even the most subtle deviations of the bioenergetics of mitochondria in blood cells it contributes to the monitoring of the used daily doses of drugs in patients with various diseases Determination of the endogenous level of coenzyme Q10 CoQ10 in platelets is a key method to improve the diagnosis and targeted therapy of damaged mitochondrial bioenergetics Perspective therapeutic strategies for damaged mitochondria include mitochondrial transplantation plasma therapy mitochondrial nanotherapy weight reduction in obesity spa rehabilitation the influence of molecular hydrogen and oxygen therapy Targeted therapeutic methods for dysfunctional mitochondria and CoQ10 deficiency include supplementation with CoQ10 antioxidants and vitamins This volume is intended for researchers and physicians looking for new prospective diagnostic approaches and targeted therapies for dysfunctional mitochondria in their patients

*Celebrating 40 Years of the Chilean Society of Pharmacology* Gonzalo E. Yevenes, Jorge Fuentealba, Javier A. Bravo, Guillermo Diaz-Araya, Ramón Sotomayor-Zárate, Jenny Lucy Fiedler, Miguel Reyes-Parada, 2021-01-19

*Extracellular Mitochondria in Health and Disease* Carla Lopes, Paulo César da Silva Pinheiro, 2025-11-01

Extracellular Mitochondria in Health and Disease covers this new and significant area of research shedding light on their roles in intercellular communication and disease pathology These tiny powerhouses traditionally known for their intracellular functions are now recognized for their extracellular activities that impact various physiological and pathological processes The book delves into a range of topics including cellular mechanisms of mitochondrial transfer metabolic signaling and the crosstalk between extracellular vesicles and mitochondria It serves as a comprehensive guide for scientists researchers and students eager to explore these novel findings and their potential implications Other sections examine the roles of extracellular mitochondria in immune regulation and inflammation neurodegeneration and neuroprotection and their therapeutic potential By bridging gaps in existing literature this resource offers up to date research and discoveries providing valuable insights into how extracellular mitochondria could revolutionize medical advancements and improve patient outcomes Describes cellular mechanisms of mitochondrial transfer and metabolic signaling Discusses extracellular mitochondria in health and disease Explains extracellular mitochondria in immune

regulation and inflammation Explores therapeutic potential of extracellular mitochondria

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## Mitochondria And Their Role In Cardiovascular Disease Introduction

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