

# Principles of Cardiovascular Neural Regulation in Health and Disease

BY  
ALBERTO MALLIANI

SPRINGER SCIENCE+BUSINESS MEDIA, LLC

# Principles Of Cardiovascular Neural Regulation In Health And Disease

**Joanne S. Ingwall**



## **Principles Of Cardiovascular Neural Regulation In Health And Disease:**

**Principles of Cardiovascular Neural Regulation in Health and Disease** Alberto Malliani, 2000 This book is an attempt to indicate to researchers and clinicians a simple way to approach the complexity of cardiovascular neural regulation. A conceptual pillar like homeostasis is contrasted with instability and a continuous interaction of opposing mechanisms that have negative and positive feedback characteristics and is considered to subserve the multitude of patterns pertaining to physiology. However, in pathophysiological conditions the final design is most often replaced by largely purposeless neural mechanisms. The complexity of cardiovascular neural regulation reflected by the state of sympathovagal balance is also assessed in the frequency domain. Power spectrum analysis of heart rate and arterial pressure variability, a sophisticated but simply explained approach, provides an unprecedented tool to evaluate this interaction in both physiological and pathophysiological conditions. The elementary characteristics of nonlinear dynamics are also outlined. Finally, the need for an ethical structure for science and medicine is analyzed.

**Primer on the Autonomic Nervous System** David Robertson, 2004-05-05 Presents in a readable and accessible format key information about how the autonomic nervous system controls the body, particularly in response to stress. Especially suitable for students, scientists, and physicians seeking key information about all aspects of autonomic physiology and pathology in one convenient source, this book provides up-to-date knowledge about basic and clinical autonomic neuroscience in a format designed to make learning easy.

**Handbook of the Autonomic Nervous System in Health and Disease** Liana Bolis, Julio Licinio, Stefano Govoni, 2002-10-29 Examines the role of the ANS in the maintenance and control of bodily homeostasis as well as in the pathogenesis, pathophysiology, and treatment of disorders such as cardiovascular disease, hypertension, asthma, arrhythmia, diabetes, ischemia, myocardial infarction, urinary retention, and depression.

**Adrenomedullin in Cardiovascular Disease** Toshio Nishikimi, 2005-04-28 Adrenomedullin was discovered in 1993 in an extract of human pheochromocytoma while monitoring cAMP levels in rat platelets. Adrenomedullin has attracted considerable interest among cardiologists due to its impact on the cardiovascular system, which includes a decrease in blood pressure in vivo and an impact on vascular smooth muscle cells that increases cAMP levels, indirectly reducing blood pressure and having a role in the pathogenesis of arteriosclerosis. **Adrenomedullin in Cardiovascular Disease** is an up-to-date review of the most relevant aspects of adrenomedullin. It encompasses a broad range of fields, including biochemistry, molecular biology, physiology, pharmacology, pathophysiology of cardiovascular disease, and clinical applications of adrenomedullin to cardiovascular disease. Toshio Nishikimi MD PhD is an Associate Professor in the Department of Hypertension and Cardioresenal Medicine, Dokkyo University School of Medicine, Tochigi, Japan.

**The Biology of Senescence** Bernard Swynghedauw, 2019-06-06 This book describes the fundamental process of senescence and reviews a new concept developed by a number of research groups that is based on cellular senescence and its secretome. This concept provides a basic explanation of the main physiological and pathological features of senescence and delineates

possibilities for treating it Following an introduction to the emerging medical landscape the increasing incidence of a new epidemiological group age related chronic non transmissible diseases and the multiple origins of aging the book explores and characterizes the senescent cell which is linked to benign and pathological age related manifestations In turn the closing chapters discuss how to treat or prevent the aging process underscoring the central role of physical exercise and caloric reduction as compared to new senolytic approaches Appendices are also provided and address circadian rhythms telomere shortening diabetic cardiomyopathy and senescence in plants and bacteria Given its scope the book will primarily be of interest to geriatricians but will also appeal to a wider range of clinicians

### **Renin Angiotensin System and the Heart**

Walmor C. De Mello, 2005-10-31 Recent studies have shown that the heart possesses an intrinsic renin angiotensin system that is controlled by tissue specific parameters that are activated by biomechanical stress This book reviews the latest information on the way in which both the plasma and cardiac renin angiotensin systems affect heart function It covers the cell and molecular biology of these systems with contributions on renin synthesis uptake and the intracellular signalling pathways Particular insight comes from transgenic mouse models in which either mouse or human genes for various components of the renin angiotensin system are expressed Other topics covered include wound healing as well as the trophic effects of aldosterone Contains the most recent findings on the renin angiotensin system and the heart Written by an international team of distinguished scientists Covers both the cellular and molecular basis of the renin angiotensin system and the clinical relevance of this research

### *The Local Cardiac Renin-Angiotensin Aldosterone System* Edward D.

Frohlich, Richard Noel Re, 2006 Until recently the renin angiotensin aldosterone system has been considered a systemic endocrine hormonal system exclusively It is now known that each component of the renin angiotensin system is produced synthesized and indeed present in many organisms including the heart and vessels This volume presents the most recent clinical and laboratory experiences of the leading physicians and investigators in the field of the local cardiac renin angiotensin aldosterone system Cardiovascular renal and hypertension oriented physicians investigators and scientists would find this book of interest Edward D Frohlich M D M A C P F A C C is the Alton Ochsner Distinguished Scientist at the Ochsner Clinic Foundation in New Orleans Louisiana He is also Professor of Medicine and of Physiology at Louisiana State University School of Medicine New Orleans and Clinical Professor of Medicine and Adjunct Professor of Pharmacology at Tulane University School of Medicine New Orleans He is past Editor in Chief of the American Heart Association journal HYPERTENSION Richard N Re M D is the Section Head Hypertension at the Ochsner Clinic Foundation in New Orleans Louisiana He is also Ochsner's Scientific Director of Research

### Cardiac Cellular Electrophysiology Edward Carmeliet, J. Vereecke, 2001-11-30

Cardiac Cellular Electrophysiology is intended for the clinical cardiologist who wishes to refresh or deepen his understanding of the cellular basis of cardiac electrophysiology for researchers interested in the basis of the electrical activity of the heart such as clinical investigators physiologists or pharmacologists for teachers in physiology

pharmacology and other biomedical studies and for medical students from graduate to postgraduate level Cardiac Cellular Electrophysiology starts with a primer of basic electrophysiology the cardiac action potential and the physiological basis of the electrocardiogram Our second aim after having introduced the basic concepts was to continue with giving an overview of the properties of the most important ionic currents in the heart and to treat their modulation in order to deal with the mechanisms underlying cardiac ischaemia arrhythmias and remodelling Edward Carmeliet and Johan Vereecke Katholieke University Leuven Belgium have collaborated for over 30 years in cardiac electrophysiology research Their studies include the genesis of the normal action potential its changes in ischaemia the effect of drugs and the mechanism of arrhythmias using techniques from the classic potential registration with intracellular microelectrodes to whole cell clamp and single channel measurements

*Myocardial Ischemia* Dennis V. P. Cokkinos, C. Pantos, Gerd Heusch, H. Taegtmeyer, 2006-03-08 Effective new treatments of heart disease are based on a refined understanding of cellular function and the heart's response to environmental stresses Not surprisingly therefore the field of experimental cardiology has experienced a phase of rapid exponential growth during the last decade The acquisition of new knowledge has been so fast that textbooks of cardiology or textbooks of cardiovascular physiology are often hard pressed to keep up with the most important conceptual advances Witness the explosive increase in knowledge about signaling pathways of cardiac growth transcriptional regulation of cardiac metabolism hormonal signaling and the complex responses of the heart to ischemia reperfusion or ischemic preconditioning This book is meant to bridge the gap between original literature and textbook reviews It brings together investigators of various backgrounds who share their expertise in the biology of myocardial ischemia Each chapter is a self contained mini review but it will soon become apparent to the reader that there is also a common thread Molecular and cellular cardiology has never been more exciting than now but ever more exciting times are yet to come The Editors

**ACKNOWLEDGEMENTS** Publication of this book was generously supported by Sanofi Aventis Hellas Eikon creative team provided the technical assistance in preparing the manuscripts We thank Dr Bernard Swynghedauw for all his scientific support

**Complexity and Nonlinearity in Cardiovascular Signals** Riccardo Barbieri, Enzo Pasquale Scilingo, Gaetano Valenza, 2017-08-09 This book reports on the latest advances in complex and nonlinear cardiovascular physiology aimed at obtaining reliable effective markers for the assessment of heartbeat respiratory and blood pressure dynamics The chapters describe in detail methods that have been previously defined in theoretical physics such as entropy multifractal spectra and Lyapunov exponents contextualized within physiological dynamics of cardiovascular control including autonomic nervous system activity Additionally the book discusses several application scenarios of these methods The text critically reviews the current state of the art research in the field that has led to the description of dedicated experimental protocols and ad hoc models of complex physiology This text is ideal for biomedical engineers physiologists and neuroscientists This book also Expertly reviews cutting edge research such as recent advances in measuring complexity nonlinearity and information

theoretic concepts applied to coupled dynamical systems Comprehensively describes applications of analytic technique to clinical scenarios such as heart failure depression and mental disorders atrial fibrillation acute brain lesions and more Broadens readers understanding of cardiovascular signals heart rate complexity heart rate variability and nonlinear analysis

*Role of Potassium in Preventive Cardiovascular Medicine* David B. Young, 2012-12-06 Role of Potassium in Preventive Cardiovascular Medicine Information related to this question has accumulated for nearly a hundred years from work in cellular physiology experimental studies in animals clinical trials and from population and epidemiological investigations Because of the importance of integration of this diverse body of information the most significant findings are brought together in this book This body of information provides emphatic support for the importance of high dietary potassium intake as a means of reducing the risk of cardiovascular diseases as it provides abundant evidence that potassium depletion has significant deleterious influences that increase the risk of hypertension atherosclerosis heart failure and stroke At this time we have the results and data required to strongly recommend dietary modification to increase potassium intake But making the recommendation will only be the first step convincing the population to undertake the change in eating patterns will be challenging and will require concerted actions by government the medical community and the food and beverage industries The outcome promises to be well worth the investment This book is an excellent source of current information on the many roles of potassium in cardiovascular disease It succinctly mixes basic physiology and clinical aspects in a manner that will make it of great value to both researchers and clinicians Norman M Kaplan M D Professor of Internal Medicine University of Texas Southwestern Medical Center Dallas TX

**Snapshots of Hemodynamics** Nico Westerhof, Nikos Stergiopoulos, Mark I.M. Noble, 2006-01-12 Hemodynamics makes it possible to characterize in a quantitative way the function of the heart and arterial system thereby producing information about what genetic and molecular processes are of importance for cardiovascular function Snapshots of Hemodynamics An Aid for Clinical Research and Graduate Education by Nico Westerhof Nikos Stergiopoulos and Mark I M Noble is a quick reference guide designed to help basic and clinical researchers as well as graduate students to understand hemodynamics The layout of the book provides short and independent chapters that provide teaching diagrams as well as clear descriptions of the essentials of basic and applied principles of hemodynamics References are provided at the end of each chapter for further reading and reference Nico Westerhof PhD is affiliated with the Laboratory for Physiology at VU University Medical Center in Amsterdam The Netherlands Nikos Stergiopoulos PhD is affiliated with the Laboratory of Hemodynamics and Cardiovascular Technology at the Swiss Federal Institute of Technology in Lausanne Switzerland Mark IM Noble DSc MD PhD is affiliated with Cardiovascular Medicine at Aberdeen University Aberdeen Royal Infirmary in Aberdeen Scotland

*Stress Challenges and Immunity in Space* Alexander Chouker, 2011-12-20 Stress of either psychological or physical nature can activate and or paralyse humans innate and adaptive immunity However adequate immunity is crucial to the maintenance of health on earth and in space During space flight human physiology and

health are challenged by complex environmental stressors which might be at their most pronounced during lunar or interplanetary missions While previous publications have addressed the physiological changes that occur during space flight this book goes further by adopting an interdisciplinary approach to analyze the complex interaction of living conditions in space the immune system and astronauts health It is explained how such analysis of the consequences of stress for the immune system may help in preventing diagnosing and counteracting immune related alterations in health on earth as well as in space

Genetics and Genomics for the Cardiologist Gian Antonio Danieli,2002-11-30 Genetics and Genomics for the Cardiologist is a concise but comprehensive volume for the clinical cardiologist or medical student interested in learning how molecular genetics is now being applied to prevention and treatment of heart diseases from DNA tests to pharmacogenomics and gene based therapeutics The volume written in a plain language contains detailed figures A rich glossary three appendices many references and several URLs provide additional sources of information

**Primer on the Autonomic Nervous System** Phillip A. Low,2011-11-03 The Primer on the Autonomic Nervous System presents in a readable and accessible format key information about how the autonomic nervous system controls the body particularly in response to stress It represents the largest collection of world wide autonomic nervous system authorities ever assembled in one book It is especially suitable for students scientists and physicians seeking key information about all aspects of autonomic physiology and pathology in one convenient source Providing up to date knowledge about basic and clinical autonomic neuroscience in a format designed to make learning easy and fun this book is a must have for any neuroscientist s bookshelf Greatly amplified and updated from previous edition including the latest developments in the field of autonomic cardiovascular regulation and neuroscience Provides key information about all aspects of autonomic physiology and pathology Discusses stress and how its effects on the body are mediated Compiles contributions by over 140 experts on the autonomic nervous system

*Genetics of Dyslipidemia* Pascale Benlian,2012-12-06 Profound mortality rates due to cardiovascular disease are a worldwide problem Cardiovascular disease results from complications of a silent and chronic arterial disease atherosclerosis The challenge for the practitioner is adapting diagnostic and therapeutic responses to prevent this common and complex disease Dyslipidemia are disorders of the metabolism of soluble transporters of lipids in extracellular spaces of the human body including blood called lipoproteins They are major cardiovascular risk factors causally related with atherosclerosis and are themselves multifactorial diseases resulting from interactions between genetic and environmental factors The study of genetic factors has recently taken a new path with the study of DNA as an experimental object More than fifty genes of lipoprotein metabolism have been identified in both their physiological actions and their contribution to the pathogenesis of human dyslipidemia The diversity of observations has refined our current knowledge of the control of lipid metabolism and energy homeostasis in living organisms beyond the limits of the cardiovascular system e g brain immune system and development These studies have given way to a shake up of former phenotypic classifications distinguishing new entities defining targeted

therapeutic strategies providing a basis for different patterns of disease distribution in human populations **Mechanics and Energetics of the Myocardium** Christian J.F. Holubarsch, 2012-12-06 During several decades of this century the classical physiological studies on the cardiovascular system have greatly improved our knowledge on the function of this system under normal and pathological conditions This knowledge was the basis of the breakthrough for diagnostic techniques like the Swan Ganz catheter coronary arteriography left and right heart biopsies and invasive measurements of contractility as well as therapeutic tools including aortocoronary bypass surgery percutaneous transluminal coronary angioplasty and a broad field of pharmacological interventions for the whole spectrum of cardiovascular diseases especially chronic heart failure It was during the last decade that the scientific world focused on the evolution of molecular biology of the cardiovascular system so that cardiovascular physiology seemed to become less important Regarding the myocardium molecular alterations of important functional proteins phenotype changes as well as signal transduction pathways of contractility and cardiac growth have been elucidated The functional importance of a number of genes has undoubtedly been proven with the help of transgenic animals Mechanics and Energetics of the Myocardium provides an overview for those researchers and practitioners interested in the broad field of molecular biology and physiology of the cardiovascular system

Coronary flow reserve - measurement and application: Focus on transthoracic Doppler echocardiography Pawel Petkow-Dimitrow, 2002-09-30 Coronary flow reserve is an important functional parameter to understand the pathophysiology of coronary circulation Coronary flow reserve measurement is used to assess epicardial coronary stenoses or to examine the integrity of microvascular circulation An appreciation of coronary physiology is an integral part of clinical decision making for cardiologists treating patients with coronary artery disease The pioneering research efforts of Dr Lance Gould who explored the relationship between the anatomic severity of a stenosis and its flow resistance 59 60 have been transferred to clinical practice 94 194 In the absence of stenosis in epicardial coronary artery the coronary flow reserve may be decreased when coronary microvascular circulation is compromised by arterial hypertension with or without left ventricular hypertrophy diabetes mellitus hypercholesterolemia or other diseases Several techniques have been established for measuring coronary flow reserve However these techniques are either invasive intracoronary Doppler flow wire highly expensive and scarcely available Positron Emission Tomography PET or semi invasive and causing patient discomfort transesophageal Doppler echocardiography thus their clinical use is limited Because of the clinical importance of coronary flow reserve there is a need for a simple noninvasive repeatable and inexpensive tool capable of this functional evaluation This monograph focuses on the assessment of coronary flow reserve using transthoracic Doppler echocardiography the technique fulfilling the above mentioned criteria Transthoracic Doppler echocardiography has become a popular tool evolving from a research to diagnostic technique applied in everyday practice Stress Challenges and Immunity in Space Alexander Choukèr, 2019-11-27 This book explains how stress either psychological or physical can activate and or paralyze



human innate or adaptive immunity Adequate immunity is crucial for maintaining health both on Earth and in space During space flight human physiology is specifically challenged by complex environmental stressors which are most pronounced during lunar or interplanetary missions Adopting an interdisciplinary approach the book identifies the impact of these stressors the space exposome on immunity as a result of dys functions of specific cells organs and organ networks These conditions e g gravitation changes radiation isolation confinement affect immunity but at the same time provide insights that may help to prevent diagnose and address immune related health alterations Written by experts from academia space agencies and industry the book is a valuable resource for professionals researchers and students in the field of medicine biology and technology The chapters The Impact of Everyday Stressors on the Immune System and Health Stress and Radiation Responsiveness and Assessment of Radiosensitivity and Biomonitoring of Exposure to Space adiation are available open access under a Creative Commons Attribution 4 0 International License via link [springer.com](https://www.springer.com) **ATP and the Heart**

Joanne S. Ingwall, 2002-06-30 ATP plays a central role in the two leading causes of cardiac morbidity and mortality in the western world ischemia and heart failure We are in our infancy applying what is known about biology and chemistry of ATP toward developing effective therapies for these diseases In this volume the current understanding of the chemistry and biology of ATP specifically in the cardiomyocyte is presented New insights into ATP have been gleaned using biophysical techniques allowing dynamic measurement of chemical events in the intact beating heart and using new animal models in which cardiac proteins are either over expressed deleted or harbor specific mutations This book provides a summary of the basic understanding and includes illustrations of why ATP and the Heart is important to both the clinician and scientist

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