Blood Pressure Regulation By Aortic Baroreceptors In Birds

This book summarizes the papers presented at the symposium "Dynamics and Regulation of the Arterial System" held at Erlangen on 28-30 October 1977 in honor of Professor Erik Wetterer. The aim of the symposium was an inten sive exchange of ideas within a mUltidisciplinary group of scientists who are specialists in their fields of research. It is obvious that a two-day symposium covering such a wide range of topics could only highlight certain aspects of the latest research on the cardiovascular system. The book is divided into three sections. The first part deals with arterial hemo dynamics. Emphasized are the mechanical properties of the arterial wall, in particular the smooth muscle, fundamental parameters for the description of pulse wave propagation, such as attenuation, phase velocity, and reflection of pulse waves. Furthermore, new methods for recording arterial diameters and the latest results in determining pulsatile pressure and pulsatile diameter of arteries in vivo as well as from calculations based on models of the arterial system are presented. The second part deals with applications of the control theory and the principles of optimality of the cardiovascular system in toto and of single regions of this system. Contributions to research in the field of regulation of blood volume and of regional hemodynamics are also presented. The third part covers problems of interaction of the heart and the arterial system, including fluid mechanics of the aortic valves and the coronary blood flow under normal and pathologic conditions.

Research centering on blood flow in the heart continues to hold an important position, especially since a better understanding of the subject may help reduce the incidence of coronary arterial disease and heart attacks. This book summarizes recent advances in the field; it is the product of fruitful cooperation among international scientists who met in Japan in May, 1990 to discuss the regulation of coronary blood flow.

Recent studies show that more people than ever before are reaching old age in better health and enjoying that health for a longer time. This Handbook outlines the latest discoveries in the study of aging from bio-medicine, psychology, and socio-demography. It treats the study of aging as a multidisciplinary scientific subject, since it requires the interplay of broad disciplines, while offering high motivation, positive attitudes, and behaviors for aging well, and lifestyle changes that will help people to stay healthier across life span and in old age. Written by leading scholars from various academic disciplines, the chapters delve into the most topical aspects of aging today - including biological mechanisms of aging, aging with health, active and productive aging, aging with satisfaction, aging with respect, and aging with dignity. Aimed at health professionals as well as general readers, this Cambridge Handbook offers a new, positive approach to later life.

Hypertension is defined by an increase in systemic blood pressure above limits considered normal, currently set at 140 mmHg for systolic and 90 mmHg for diastolic pressure. Assuming central venous pressure to be near zero, mean arterial pressure is determined by the product of total peripheral resistance and cardiac output. In most cases of essential hypertension, as well as in animal models of hypertension, cardiac output and its main determinants, stroke volume and heart rate, are normal, whereas total

peripheral resistance is increased. Total peripheral resistance is influenced by a number of factors described by the Poiseuille's law, the most significant of which by far is the diameter of blood vessels of the arterial tree. Since blood vessel diameter is a reflection of both vascular structure and active regulation of vascular tone through mechanisms of vasoconstriction and vasodilatation, it is generally considered that alterations in total peripheral resistance are directly determined by alterations in vascular smooth muscle structure and/or function. Thus, complex blood pressure regulation systems, including renal, nervous, endocrine, immune, and others, in their turn influenced by genetic or environmental factors, converge upon the same molecular mechanisms that control the structure and function of vascular smooth muscle. In this work, rather than providing the exhaustive list of modifications in the blood pressure regulating systems that ultimately affect the vasculature in hypertension, we will focus on the structural and functional alterations of vascular smooth muscle per se during hypertension.

This new analysis of reflex and hormonal control of the human cardiovascular system developed from questions raised in Human Circulation: During Physical Stress (Rowell, 1986) and from recent findings. The goal is to help students, physiologists and clinicians understand the control of pressure, vascular volume, and blood flow by examining the cardiovascular system during orthostasis and exercise, two stresses that most affect these variables. A discussion of the passive physical properties of the vascular system provides a basis for explaining how vascular control is modified by mechanical, neural, and humoral factors. Interactive effects of the vasculature on cardiac performance are emphasized; they reveal the importance of autonomic control, supplemented by muscle pumping, in maintaining adequate ventricular filling pressure. The author's detailed analysis of how total oxygen consumption is restricted focuses on limitations in cardiac pumping ability, oxygen diffusion from lungs to blood and from blood to active muscle, oxidative metabolism and neural control of organ blood flow. An unsolved mystery is the nature of the signals that govern the cardiovascular responses to exercise. This is discussed in a new and critical synthesis of ideas and evidence concerning the "error signals" that are sensed and then corrected by activation of the autonomic nervous system during exercise.

Although cardiac output is measured as the flow of blood from the left ventricle into the aorta, the system that controls cardiac output includes many other components besides the heart itself. The heart's rate of output cannot exceed the rate of venous return to it, and therefore, the factors governing venous return are primarily responsible for control of output from the heart. Venous return is affected by its pressure gradient and resistance to flow throughout the vascular system. The pressure gradient for venous return is a function of several factors including the blood volume flowing through the system, the unstressed vascular volume of the circulatory system, its capacitance, mean systemic pressure, and right atrial pressure. Resistance to venous return is the sum of total vascular resistance from the aortic valve to the right atrium. The sympathetic nervous system and vasoactive circulating hormones affect short-term resistance, whereas local tissue blood flow autoregulatory mechanisms are the dominant determinants of long-term resistance to venous return. The strength of contraction of the heart responds to changes in atrial pressure driven by changes in venous return, with small changes in atrial pressure eliciting large changes in strength of contraction, as described by

the Frank-Starling mechanism. In addition, the autonomic nervous system input to the heart alters myocardial pumping ability in response to cardiovascular challenges. The function of the cardiovascular system is strongly affected by the operation of the renal sodium excretion-body fluid volume-arterial pressure negative feedback system that maintains arterial blood pressure at a controlled value over long periods. The intent of this volume is to integrate the basic knowledge of these cardiovascular system components into an understanding of cardiac output regulation. Table of Contents: Introduction / Venous Return / Cardiac Function / Integrated Analysis of Cardiac Output Control / Analysis of Cardiac Output Regulation by Computer Simulation / Analysis of Cardiac Output Control in Response to Challenges / Conclusion / References / Author Biography

Since the discovery of blood pressure by Stephen Hales in 1733, scientific interest in blood pressure regulation, particularly in hypertensive population, has not lost its popularity. The importance of the interactive effects of blood pressure shifts in different clinical conditions is well understood. We know many contributing factors regulate the pressure of the blood within the arteries. However, crucial blood pressure control and the exact mechanisms involved are still under debate. The present book aims to cover blood pressure from its measurement to various factors of its control with valuable contributions from different authors, in the light of contemporary data, from bench to bed.

Blood pressure was measured at a peripheral and central site in the rat. Pressure at the peripheral site was determined by a tail occlusion cuff method, while central pressure was measured by aortic intubation. There was a marked decrease in blood pressure measured at the peripheral sit 8 hours after the animals were exposed to 485 rads of x-rays, with a return to control values by 3 days after exposure. Aortic blood pressure, however, was not altered at this dose level. There was a mild decrease in aortic pressure 24 and 48 hours after 970 rads and a marked hypotension 8 and 24 hours following 1940 rads. The aortic blood pressure response to various stimuli was also altered after 970 rads, but not after 485 rads of x-rays. These data demonstrate that blood pressure at a peripheral site can be decreased at a dose level which does not affect central pressure. It is suggested that this differential effect in blood pressure is a result of a radiation response in peripheral circulation. (Author).

A basic understanding of cardiovascular physiology is essential for optimal patient care. This practical book provides a concise tutorial of all the essential aspects of cardiovascular hemodynamics and the techniques used to assess cardiovascular performance. A high-yield reference, this book is replete with figures, tracings, tables, and clinical pearls that reinforce the basic tenets of hemodynamics. From identifying key findings of the patient history and physical exam to correlating hemodynamic tracings with acute clinical presentations, this book arms the reader with the tools necessary to handle any hemodynamic-related situation.

This uniquely readable, compact, and concise monograph lays a foundation of knowledge of the underlying concepts of normal cardiovascular function. Students welcome the book's broad overview as a practical partner or alternative to a more mechanistically oriented approach or an encyclopedic physiology text. Especially clear explanations, ample illustrations, a helpful glossary of terms, tutorials, and chapter-opening learning objectives provide superb guidance for self-directed learning and help fill the gap in many of today's abbreviated physiology blocks. A focus on well-established cardiovascular principles reflects recent, widely accepted cardiovascular research. The supplemental CD-ROM is an interactive, dynamically linked version of the book, which is organized by normal cardiovascular function and cardiac disease. Students may begin a path of questioning with, for example, a disease condition and then pursue background information through a series of links. Students can also link to the author's regularly updated Web site for additional clinical information.

Hypertension is a condition which affects millions of peopleworldwide and its treatment greatly reduces the risk of strokes andheart attacks. This fully revised and updated edition of the ABCof Hypertension is an established guide providing all thenon-specialist needs to know about the measurement of bloodpressure and the investigation and management of hypertensivepatients. This new edition provides comprehensively updated andrevised information on how and whom to treat. The ABC of Hypertension will prove invaluable to generalpractitioners who may be screening large numbers of patients forhypertension, as well as nurse practitioners, midwives and otherhealthcare professionals.

Low Blood Pressure: Its Causes and Significance focuses on the important and interesting aspects of low arterial pressure. This book discusses the vasomotor control of arterial pressure; significance of low arterial pressure; autonomic-endocrine influences; and symptomatology of acquired hypopiesis. The parasympathetic or extended vagus system; arteriosclerosis of large vessels; psychical low arterial pressure; and agents causing vascular dilatation are also deliberated. This text likewise covers the exanthematous infections of doubtful etiology; atrophic cirrhosis of the liver; occasional difficulties in diagnosis; and control of low arterial pressure. This publication is intended for medical practitioners and clinicians aiming to acquire knowledge of low arterial pressure and its associations.

It is a great honor and pleasure for me to introduce this book; an honor, because of the scientific renown and authority of the investigators who have edited the volume and contributed the chapters; a pleasure, because my own long-lasting interest in the baroreflexes has always gone in the same directions as those along which the authors of this book have conceived and organized their work. It is particularly meaningful, in my opinion, that the very title of this volume underlines the integrative functions and the clinical aspects of baroreceptor reflexes. Under the aspect of integration, it is more and more apparent that baroreceptor reflexes, though preponderantly influencing cardiovascular functions, are not limited to cardiovascular control. Their influence on respiration has been well known since the earliest studies on baroreflexes, and wider influences have more recently been shown, e. g. , on hormone release, on sleep and vigilance, and on emotional behavior. Even within the scope of cardiovascular regulation, the integrated action of baroreflexes is not only directly exerted on the heart and blood vessels, but is also exerted through more devious but no less important routes, such as renin release from juxtaglomerular cells and sodium and water reabsorption by the renal tubules.

Mean arterial pressure (MAP) is a critical hemodynamic factor. The absence of proper regulation of MAP can have important pathophysiological consequences. Low MAP can cause inadequate blood flow to organs, syncope, and shock. On the other hand, elevated MAP contributes to increased oxygen demand by the heart, ventricular remodeling, vascular injury, end organ damage, and stroke. The arterial baroreflex system is a key controller of MAP and is a complex system. It can be considered in its entirety as an integrative physiological system or in terms of its regulated component parts. Those component parts include MAP, mechanosensory transduction, afferent pathways, central neural circuits, efferent pathways, receptor pharmacology, integration with other key homeostatic inputs, molecular biology, and/or other elements. This chapter provides an overview of each of these individual components but stresses the importance of the integrative nature of this reflex. In addition, this chapter explores common measurement techniques for the baroreflex and explores the baroreflex in diseases.

Early Vascular Aging (EVA): New Directions in Cardiovascular Protection brings together the last decade of research related to the characterization of EVA, as well as the predictive power of pulse wave velocity (PWV). The book presents a novel approach to the problem of cardiovascular disease, showing it in relation to great vessels disease and revealing a comprehensive approach to the problem of increased rigidity of the great vessels, its causes, and further consequences. Information provided is accompanied by online access to a supplemental website with video clips of anatomic specimens, cardiac imaging, and surgical procedures. Introduces the latest information on early vascular aging (EVA), complete with summaries of recent evidence and guidelines for relevant risk factor control Ideal reference for the study of vascular aging, pulse wave velocity, arteriosclerosis, EVA, arterial stiffness, vascular, PWV biomarkers, and cardiovascular disease Contains all the relevant information available from different fields of knowledge (from basic biology to epidemiology) in regard to EVA Provides evidence that leads to a new target for interventions, early vascular aging (EVA) in subjects with early onset increased arterial stiffness Includes online access to a supplemental website with video clips of anatomic specimens, cardiac imaging, and surgical procedures

Neural Control of Circulation presents an in-depth view of specialized areas in the neural regulation of the circulatory system that have been the subject of intensive research, the historical basis and theory from which those investigations evolved, and directions for future studies. Special emphasis is placed on critical evaluation of the experimental data in each field of research. This volume is comprised of seven chapters and begins with a synthesis of a large number of studies undertaken using conscious animals, particularly those that focuses on the behavioral and cerebral control of cardiovascular function. The second chapter explores the role of the brain stem and cerebellum in cardiovascular control. Next, specific research areas concerning bulbospinal control of sympathetic nerve discharge are discussed. This is followed by a chapter devoted to the nucleus tractus solitarii and experimental neurogenic hypertension. A concept in potential hypertensive mechanisms involving long-term transsynaptic regulation of adrenal medullary function is also described, and the neural control of the circulation during hypoxia is considered. Finally, aspects of central nervous system pharmacology and regulation of circulation are examined. This book is designed for individuals who are interested in the cardiovascular system and its function, and should also prove useful to students and researchers in physiology and individuals in other ancillary areas of bioscience.

The most prominent function of the central nervous system is the control of motor functions by rapidly transmitted impulses through efferent cranial and spinal peripheral nerves. Besides electrically transmitted neural impulses, humoral mechanisms with more sustained actions are exercised by the brain and spinal cord to regulate body homeostasis. Thus, the brain may be regarded as an "endocrine gland" discharging neurohormones (peptides) either into the general circulation (neurohypophyseal hormones) or into the hypothalamo-adenohypophyseal portal circulation (releasing and inhibiting hormones). The brain, therefore, which is protected by the blood-brain barrier from disturbing and potentially noxious exogenous and endogenous agents circulating in the blood, has to have certain neurohemal regions beyond this barrier, such as the neural lobe and the median eminence (infundibulum), where neurohor mones have free access to the blood stream. To regulate somatic and autonomic functions in the

best possible way, the central nervous system is highly dependent on feedback signals conveyed through somatic and visceral afferent nerves as well as on peripheral humoral signals such as peripheral hormones and other circulating substances that are under homeostatic regulation, e. g. , peptides, arnines, electrolytes, and other biologically active agents. In this chapter, the role of the blood-brain barrier in the regulation of these sub stances will be discussed with special emphasis on the access through the blood-brain barrier to cardiovascular centers. 2 The Blood-Brain Barrier 2.

This book is an up-to-date summary of all aspects of aortic disease, written by international experts in their fields, covering diagnostic concepts of all aortic diseases, the most modern therapeutic approaches in various aortic syndromes, the pathogenic origin and the most recent molecular and cellular findings that have revolutionized our present knowledge of aortic diseases. The reader will come to understand the aorta as a functional organ with a complex regulatory system rather than just a major arterial vessel, and will have a better understanding of the prognostic impact of various aortic syndromes, and of the most recent therapeutic concepts for chronic as well as acute aortic pathology. As a unique feature of this book, the aorta is placed in the center of systemic illnesses, such as atherosclerosis, diabetes, hypertension, infectious diseases and connective tissue disorders, storage diseases, trauma and toxic factors; this concept aims to attract the attention of both clinical specialties such as cardiology, radiology and cardiovascular surgery and adjacent areas like pathology and clinical genetics. The book portrays the aorta as an integral part of the cardiovascular system and the entire organism and features the complexity and clinical impact of all major aortic diseases.

Wearable technologies are equipped with microchips and sensors capable of tracking and wirelessly communicating information in real time. With innovations on the horizon, the future of wearable devices will go beyond answering calls or counting our steps to providing us with sophisticated wearable gadgets capable of addressing fundamental and technological challenges. This book investigates the development of wearable technologies across a range of applications from educational assessment to health, biomedical sensing, and energy harvesting. Furthermore, it discusses some key innovations in micro/nano fabrication of these technologies, their basic working mechanisms, and the challenges facing their progress.

MICHEL E. SAFAR and MICHAEL F. O'ROURKE One of the principal problems of hypertension is the precise definition of blood pressure as a cardiovascular risk factor. Clinicians indicate peak systolic pressure and end diastolic pressure in the brachial artery as the principal criteria for blood pressure measurement. Consequently, these values are as indicators for clinical management and therapeutic adjustment. This used methodology, based on indirect blood pressure measurements at the site of the brachial artery relates only to the highest and lowest pressure in that vessel, and does not give any information of the blood pressure curve itself; this carries more information than peak systolic pressure and end diastolic pressure. As a first step in better analysis of the blood pressure curve, research workers in experimental

hypertension defined in addition to peak systolic pressure and end diastolic, another blood pressure value, mean arterial pressure, i. e. the average pressure throughout the cardiac cycle, and about which pressure fluctuates. This is the pressure recorded by Hales [1] and by Poiseuille [2] in their pioneering studies. By application of Poiseuille's Law, this definition of mean arterial pressure led to the concept that increased mean arterial pressure (and therefore hypertension) was related, at any given value of cardiac output, to an increase in vascular resistance, i. e. to a reduc tion in the caliber of the small arteries.

Reflex Control of the Circulation presents an interdisciplinary discussion of concepts in the reflex control of circulation. This volume describes aspects of autonomic receptor physiology, central pathways of reflex control, the electrophysiology of cardiovascular afferents, the interaction between reflexes, the autonomic control of regional blood flows, the autonomic control of fluid and electrolyte balance, and neurohumoral control of the circulation through normal and pathological states (e.g., hypertension, congestive heart failure). In addition, the regulation of regional blood flow during exercise and developmental aspects of reflex control are examined. Any researcher interested in the autonomic system and its role in circulation will find this book fascinating reading.

The cardiovascular system is regulated through numerous control systems, which operate on various time scales. The baroreflex operates on the scale of seconds to minutes, responding to acute changes in pressure by altering heart rate, heart contractility, and blood vessel diameter. Blood volume control operates on a time scale of minutes to hours, in which the kidneys regulate blood pressure by means of blood plasma osmolarity and volume in the circulatory system. When pressure is altered on a longer time scale of days to years, growth and remodeling occur in the heart and blood vessel walls. In this thesis, a multi-scale model was created to improve the capacity for study of the summed or individual effects of different time scales. This time scale consideration resulted in a more physiological approach to modeling the cardiovascular system than previous models. The time scales modeled were an acute seconds-to-minutes scale, during which the baroreflex acts, and a minutes-to-hours scale during which blood volume control occurs. The model was then optimized to allow for future coupling to computationally expensive growth and remodeling models. Arterial pressure regulation was demonstrated in both normal conditions and the pathophysiological condition of aortic valve disease. The work of this thesis successfully reproduced the local effects of the disease, and demonstrated the physiologic response on multiple time scales to the reduction in arterial pressure at an aortic stenosis.

Sir Dominic Corrigan's classic monograph "On Permanent Patency of the Mouth of the Aorta, or Inadequacy of the Aortic Valves" was published in 1832. Descriptions of aortic regurgitation had previously been published by others, but Corrigan's contribution was so comprehensive that his name is still closely associated with this disorder. He described

the physical findings and the underlying gross pathologic anatomy of aortic regurgitation. He recognized that sudden death was not characteristic of aortic regurgitation, as it was in aortic stenosis, and his therapeutic approach was based on firm physiologic principles. In the past 150 years we have expanded Corrigan's work, and we have developed a detailed appreciation of the natural history, pathophysiology, diagnostic methods, and treatment of chronic aortic regurgitation. Fifteen years ago, cardiac catheterization and angiography had already achieved widespread application in the evaluation of aortic regurgitation, but cardiac ultrasound, especially Doppler echocardiography, was in its infancy, and the utility of radionuclide ventriculography was not widely appreciated.

Disorders of Blood Pressure RegulationPhenotypes, Mechanisms, Therapeutic OptionsSpringer

Hypertension remains a leading cause of disability and death worldwide. Self-monitoring of blood pressure by patients at home is currently recommended as a valuable tool for the diagnosis and management of hypertension. Unfortunately, in clinical practice, home blood pressure monitoring is often inadequately implemented, mostly due to the use of inaccurate devices and inappropriate methodologies. Thus, the potential of the method to improve the management of hypertension and cardiovascular disease prevention has not yet been exhausted. This volume presents the available evidence on home blood pressure monitoring, discusses its strengths and limitations, and presents strategies for its optimal implementation in clinical practice. Written by distinguished international experts, it offers a complete source of information and guide for practitioners and researchers dealing with the management of hypertension.

This book aims to present a comprehensive classification of hypertensive phenotypes based on underlying target organ involvement. Particular emphasis is placed on review and assessment of clinical presentation, pathophysiologic mechanisms, and possible specific therapeutic options for each hypertension phenotype. Several of these phenotypes are well known and well described in the literature, such as prehypertension, white coat and masked hypertension, isolated systolic hypertension, renovascular hypertension, endocrine hypertension, pediatric hypertension, and gestational hypertension. Other hypertension phenotypes, however, are not widely recognized, being reported only in special reviews; examples include hypertension associated with renal calculus disease and other rarer causes such as Turner syndrome, herbal and medicinal compounds, and pharmacologic agents. A detailed account of the various causes of monogenic hypertension is also included. Finally, a section is devoted to general aspects of hypertension, including the significance of blood pressure indices, the natural course of untreated and treated hypertension, hypertension mechanisms, genetics, and guidelines for blood pressure control.

Hypertension is the major cause of left ventricular hypertrophy. While the electrocardiogram is an extremely insensitive measure of anatomic left ven tricular hypertrophy, it provides a time-tested important marker of an adverse

cardiovascular outcome. There has been a recent temporal decrease in the incidence of electrocardiographic evidence of L VH even within the hyperten sive population; no doubt this is the result of large antihypertensive treatment experts. Anatomical evidence of left ventricular hypertrophy is best docu mented pre-morbidly using echocardiographic techniques. It therefore ap pears that between 20 and 50 percent of the hypertensive population has left ventricular hypertrophy by echo cardiographic techniques. The prognostic significance of the echocardiographically determined increase in left ventric ular mass is just beginning to be evaluated. Early information suggests that there is an increased rate of cardi~)Vascular morbidity in patients with echo car diographic evidence of increased left ventricular mass. However, this in formation is only preliminary, and as yet only a limited number of events have been reported. Far more supporting information will be required before the full impact of echocardiographically-detected left ventricular hypertrophy can be determined. Nevertheless, it must be stated that the electrocardiogram still has the greatest predictive value of cardiovascular morbid and mortal events when the pattern of left ventricular hypertrophy plus repolarization abnormal ities are present.

The technique of electromyography, used to study the electrical currents generated by muscle action, has become invaluable to researchers in the biological, medical, and behavioral sciences. With it, the scientist can study the role of muscles in producing and controlling limb movement, eating, breathing, posture, vocalizations, and the manipulation of objects. However, many electromyographic techniques were developed in the clinical study of humans and are inappropriate for use in research on other organisms--tadpoles, for example. This book, a complete and very practical hands-on guide to the theoretical and experimental requirements of electromyography, takes into account the needs of researchers across the sciences.