Pulmonary Vascular Physiology And Pathophysiology Lung Biology In Health And Disease

The Second Edition of Pulmonary Physiology and Pathophysiology presents normal and abnormal pulmonary function in the same case-based format that has made the first edition a favorite among students. Each chapter begins with a clinical case study of diseases typically seen by practitioners. The cases are followed by a discussion and breakdown of the physiology, pathophysiology, anatomy, pharmacology, and pathology for each disease, and a question-and-answer section. This edition has an infectious diseases chapter, updates on asthma pathogenesis and bronchodilators, and user-friendly features such as chapter openers, chapter outlines, "key points" summary boxes, and board-formatted questions and answers.

Reabsorption (Renal Glucosuria).- H+ Ion Excretion.- Nephrotic Syndrome.- Edema in Renal Disease.- The Kidneys and Hypertension.- Renovascular Hypertension.- Hypertension in Chronic Renal Insufficiency.- Hypertension in Acute Glomerulonephritis.- 6 Water and Electrolyte Balance.- Physiology.- Water Balance.- Electrolyte Balance.- Capillaries-Interstitial Fluid Transfer.- Regulation of Water and Electrolyte Balance.- Pathophysiology.- Overhydration and Dehydration.- Isotonic Overhydration: Excess of Extracellular Water and Sodium.- Isotonic Dehydration: Lack of Extracellular Water and Sodium.- Hypertonic Overhydration: Sodium Excess.- Hypertonic Dehydration: Water Deficiency.- Hypotonic Overhydration: Water Excess.- Hypotonic Dehydration: Sodium and Water Deficiency.- Disturbances of Electrolyte Balance.- Sodium, Potassium, Membrane Receptors, Channels and Transporters in Pulmonary Circulation is a proceeding of the 2008 Grover Conference (Lost Valley Ranch and Conference Center, Sedalia, Colorado; September 3-7, 2008), which provided a forum for experts in the fields of those receptors, channels and transporters that have been identified as playing key roles in the physiology and pathophysiology of the pulmonary circulation. The book rigorously addresses: i) recent advances in our knowledge of receptors, channels and transporters and their role in regulation of pulmonary vascular function; ii) how modulation of expression and function of receptors, channels and transporters and their interrelationships contribute to the pathogenesis of pulmonary vascular disease; and iii) the therapeutic opportunities that may be revealed by enhancing our understanding of this area. The overall goal was to explore the mechanisms by which specific receptors, channels and transporters contribute to pulmonary vascular function in both health and disease, and how this knowledge may lead to novel interventions in lung dysplasia, pulmonary edema, lung injury, and pulmonary and systemic hypertension to reduce and prevent death from lung disease. Membrane Receptors, Channels and Transporters in Pulmonary Circulation is divided into six parts. Part I (Ion Channels in the Pulmonary Vasculature: Basics and New Findings) is designated for basic knowledge and recent findings in the research field of ion channels in pulmonary circulation. There are five chapters in Part I discussing the function, expression, distribution and regulation of various ion channels present in pulmonary vascular smooth muscle cells and how these channels are integrated to regulate intracellular Ca2+ and cell functions. Part II (TRP Channels in the Pulmonary Vasculature: Basics and New Findings) is composed of five chapters that are exclusively designed to discuss the role of a recently identified family of cation channels, transient receptor potential (TRP) channels, in the regulation of pulmonary vascular tone and arterial structure. Part III (Pathogenic Role of Ion Channels in Pulmonary Vascular Disease) includes four chapters that discuss how abnormal function and expression of various ion channels contribute to changes in cell functions and the development of pulmonary hypertension. Part IV (Receptors and Signaling Cascades in Pulmonary Arterial Hypertension) consists of five chapters devoted to the role of bone morphogenetic protein receptors, Notch receptors, serotonin receptors, Rho kinase and vascular endothelial growth factor receptors in the development of pulmonary arterial hypertension. Part V (Receptors and Transporters: Role in Cell Function and Hypoxic Pulmonary Vasoconstriction) includes four chapters designed to illustrate the potential mechanisms involved in oxygen sensing and hypoxia-induced pulmonary vasoconstriction and hypertension. Part VI (Targeting Ion Channels and Membrane Receptors in Developing Novel Therapeutic Approaches for Pulmonary Vascular Disease) consists five chapters which discuss the translational research involving on membrane receptors, channels and transporters, including their potential as novel drug targets. We hope that Membrane Receptors, Channels and Transporters in Pulmonary Circulation will allow readers to foster new concepts and new collaborations and cooperations among investigators so as to further understand the role of receptors, channels and transporters in lung pathophysiology. The ultimate goal is to identify new mechanisms of disease, as well as new therapeutic targets for
pulmonary vascular diseases. An additional outcome should be enhanced understanding of the role of these entities in systemic vascular pathophysiology, since the conference will include researchers and clinicians with interests in both pulmonary and systemic circulations. Textbook of Pulmonary Vascular Diseases combines basic scientific knowledge on the pulmonary circulatory system at levels of the molecule, cell, tissue, and organ with clinical diagnosis and treatment of pulmonary vascular diseases. State-of-the-art techniques and their potential applications in research, diagnosis, and treatment of pulmonary vascular diseases are also covered.

Proceedings of the International Symposium on Physiology and Pathophysiology of the Fetal and Neonatal Lung, held in Brussels, June 6-8, 1985

Cardiovascular Hemodynamics
Applied Cardiovascular Physiology
Respiratory Care Anatomy and Physiology - E-Book
Pathologic Physiology and Therapy of Diseases

Gives students a solid grasp of those aspects of pulmonary physiology that are essential for an understanding of clinical medicine. The Sixth Edition presents a new section of case presentations, improved illustrations, problem-based examples, and new study questions & answers after each chapter to help students prepare for the USMLE Step 1.

Reflecting the trusted expertise of Dr. John B. West and Dr. Andrew M. Luk's, West's Pulmonary Pathophysiology: The Essentials, Tenth Edition offers accessible explanations of disease processes that affect the respiratory system. This best-selling companion to West's Respiratory Physiology: The Essentials, 11th Edition, has served generations of students and practitioners who work with respiratory patients, presenting vital knowledge in a concise, straightforward manner that's easy to understand. Building on this legacy of success, the tenth edition is updated throughout with the latest clinical perspectives, new images, clinical vignettes, and enhanced USMLE-style review questions to help students excel in today's changing healthcare practice.

Prepare to think critically, take a more clinical perspective, and connect theory with practice! Written specifically for respiratory care students in an easy-to-understand format, Respiratory Care Anatomy and Physiology: Foundations for Clinical Practice, 4th Edition details applied respiratory and cardiovascular physiology and how anatomy relates to physiological functions. Content spans the areas of detailed anatomy and physiology of the pulmonary, cardiovascular, and renal systems, and covers the physiological principles underlying common therapeutic, diagnostic, and monitoring therapies and procedures. Thoroughly updated to reflect changes in the NBRC exam, this comprehensive, clinically relevant text features open-ended concept questions that help you learn how to think like the expert you aim to become. Chapter outlines, chapter objectives, key terms, and a bulleted points to remember feature highlight important concepts and make content more accessible. Open-ended concept questions require reasoned responses based on thorough comprehension.
of the text, fostering critical thinking and discussion. Clinical Focus boxes throughout the text place key subject matter in a clinical context to help you connect theory with practice by understanding how physiology guides clinical decision-making in the real world. Appendixes contain helpful tables, formulas and definitions of terms and symbols. Evolve resources include a 600-question test bank in NBRC-style, PowerPoint presentations with ARS questions, an image collection, and an answer key to concept questions. UPDATED! Thoroughly updated content reflects changes in the NBRC exam. NEW and UPDATED! New images enhance understanding of key concepts.

Packed with easily understood, up-to-date and clinically relevant material, this is the only physiology book junior anaesthetists will need.

Cardiovascular Physiology
Pulmonary Vascular Disease
Basic Physiology for Anaesthetists
Respiratory Physiology
Nitric Oxide in Pulmonary Processes

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.

Hypertension is a condition which affects millions of people worldwide and its treatment greatly reduces the risk of strokes and heart attacks. This fully revised and updated edition of the ABC of Hypertension is an established guide providing all non-specialist needs to know about the measurement of blood pressure and the investigation and management of hypertensive patients. This new edition provides comprehensively updated and revised information on how and whom to treat. The ABC of Hypertension will prove invaluable to general practitioners who may be screening large numbers of patients for hypertension, as well as nurse practitioners, midwives and other healthcare professionals.

Membranes in Pulmonary Vascular Disease, Volume 82, the latest release in the Current Topics in Membranes series, highlights new advances in the field, with this new volume presenting interesting chapters from recognized experts on topics such as Sphingolipids in Vascular Lung Disease, Endothelial Glycocalyx, Cholesterol Regulation of Endothelial Cell Calcium Homeostasis in Pulmonary Hypertension, Mechanosensitive Channels and Gap Junction Channels in EC, Endothelial Protrusions in Junctional Integrity and Barrier Function, Cortical Actin Dynamics in Endothelial Permeability, Endothelial Microparticles and Exosomes, Store Operated TRP Channels and Endothelial Responses, and Caveolin and Endothelial NO signaling. Provides the authority and expertise of leading contributors from an international board of authors. Presents the latest release in the Current Topics in Membranes series. Includes the latest information on Membranes in Pulmonary Vascular Disease.
Research and practices in pulmonary vascular biology and medicine are reviewed here for clinical and non-clinical students who want a broad-based introduction, postgraduates involved in research on pulmonary circulation, and specialists in chest medicine, cardiology, and intensive and critical care whose clinical work concerns diseases affecting the pulmonary blood vessels. Early chapters survey the physiological knowledge and principles gained in the era 1950-1980 and the advances in the basic sciences from 1980 to the present. Later chapters describe the investigation, pathogenesis, and management of pulmonary hypertension, edema, and intrapulmonary shunting, with emphasis on disease mechanisms. Hughes is emeritus professor of thoracic medicine and radiology at Imperial College School of Medicine, UK. Morrell is lecturer in respiratory medicine at the University of Cambridge School of Clinical Medicine, UK. Distributed by World Scientific. Annotation copyrighted by Book News, Inc., Portland, OR.

Physiology and Pharmacology
Use of Pressure-flow Relationships to Link Pulmonary Vascular Function to Pulmonary Vascular Mechanics and Structure
Role in Physiology and Pathophysiology of Lung Disease
An Introduction to Cardiovascular Physiology
From Theory to Practice

Nitric oxide is an endogenously produced gas with a wide range of biological effects and has been implicated in many physiological and pathophysiological processes. It is released by many cell types in various organs but is particularly important in the maintenance of normal lung function. Nitric oxide in exhaled breath has been identified as a marker for lung disease in some patients. Thus, it is appropriate to consider the lung separately for the role and functioning of nitric oxide. The authors identify key areas in the history, biochemistry, physiology, pathophysiology, immunology and clinical applications of nitric oxide in the lung. The contents of this book will be of particular importance to scientists and clinicians with an interest in lung disease. Moreover, the authors encompass state of the art opinions of and rational for the therapeutic potential of nitric oxide and its inhibitors.

Widely considered the "gold standard" for the teaching and learning of respiratory physiology, this fully updated Ninth Edition includes key points for each chapter and multiple-choice review questions and answers with full explanations. Available online via thePoint, animations help to clarify particularly difficult concepts and provide a visual component for use during instruction or review. --NEW Presents rationales for all questions, as well as explanations for each answer choice --Provides 82 essential-to-know, multiple-choice review questions which appear at the end of each chapter --Features an Appendix of important equations --Supports learning through chapter-opening learning objectives and introductory material, as well as Key Concepts summaries at the end of each chapter --Includes online resources such as question bank, animations, and full text for students --Includes animations online--8 in total--via thePoint to illustrate particularly challenging concepts

A concise yet complete overview of the treatment of cardiovascular instability in the
critically ill patient. The authors consider all aspects, ranging from basic physiology and pathophysiology to diagnostic tools and established and novel forms of therapy. The whole is rounded off with an integration of these principles into a series of clinically relevant scenarios.

The Pulmonary Endothelium is a uniquely comprehensive compendium of our current knowledge of the pulmonary endothelium and is the first book dedicated specifically to the subject, offering insights into current and future approaches to management. The text provides the clinician with the most up-to-date information on one of the core physiological processes in airway disease and is an ideal point of reference for both postgraduates and professionals — specialist physicians in pulmonology and allergy and workers in biomedical and pharmaceutical research.

From Basic Mechanisms to Clinical Practice
Oxford Textbook of Cardiothoracic Anaesthesia
The Essentials

**This unique book provides clinicians and administrators with a comprehensive understanding of perioperative hemodynamic monitoring and goal directed therapy, emphasizing practical guidance for implementation at the bedside. Successful hemodynamic monitoring and goal directed therapy require a wide range of skills. This book will enable readers to:**

- Detail the rationale for using perioperative hemodynamic monitoring systems and for applying goal directed therapy protocols at the bedside
- Understand the physiological concepts underlying perioperative goal directed therapy for hemodynamic management
- Evaluate hemodynamic monitoring systems in clinical practice
- Learn about new techniques for achieving goal directed therapy
- Apply goal directed therapy protocols in the perioperative environment (including emergency departments, operating rooms and intensive care units)
- Demonstrate clinical utility of GDT and hemodynamic optimization using case presentations. Illustrated with diagrams and case examples, this is an important resource for anesthesiologists, emergency physicians, intensivists and pneumonologists as well as nurses and administrative officers.

Detailing state-of-the-art developments in the various aspects of primary pulmonary hypertension (PPH), this practical reference explores the history, most current scientific concepts, and treatments of this disease. Includes new advances not yet formally published!

Written by nearly 30 of the top international experts in the field, Primary Pulmonary Hypertension addresses the general histological features of the normal and hypertensive pulmonary vasculature and the pathology of PPH discusses etiological possibilities of
pathogenesis, common morphological features, and findings in experimental models examines risks factors for PPH and looks separately at familial PPH and PPH in children presents an approach to the differential diagnosis of pulmonary hypertension, emphasizing the recognition of PPH elucidates the invasive and noninvasive modalities available for obtaining qualitative and quantitative hemodynamic data for the diagnosis of PPH covers a variety of therapeutic options and much more!

The Lung Circulation, Volume 2: Pathologic Physiology and Therapy of Diseases considers the reactions of various cardiovascular and bronchopulmonary drugs for certain lung-related diseases. This book is organized into three sections encompassing 15 chapters that also cover the etiology of acute cardiopulmonary diseases and chronic pulmonary hypertension. The first section reviews the benefits of five pulmonary treatment options, including musculotropic vasodilators and vasoconstrictors; general anesthetics and adjuvants; antitussives, expectorants, and antiallergens; Digitalis, glycosides, and quinidine; and medical and surgical procedures. The second section describes the pathologic physiology and pathogenesis of some acute cardiopulmonary diseases, such as acute injuries, systemic shock, acute pulmonary edema, pulmonary embolism, and other localized pulmonary diseases. The third section surveys numerous studies on the chronic pulmonary hypertension. This book is directed toward pulmonologists.

Part of the Oxford Textbooks in Anaesthesia series, this title covers the anatomy and physiology, pharmacology, post-operative complications, critical care, and all clinical aspects of cardiac and thoracic anaesthesia. Practical aspects, such as team working, and designing and equipping cardiothoracic theatre and critical care, are also included. The expert and international author team use their experience to ensure this title reflects current world-wide practice across the globe.

Pulmonary Physiology and Pathophysiology in Isolated Mouse Lungs

Pulmonary Physiology

Nunn's Applied Respiratory Physiology E-Book

Primary Pulmonary Hypertension

Pulmonary Circulation

Pulmonary hypertension is a life-threatening disease with no known cure. Here we provide a concise yet comprehensive review of the current knowledge about the pathophysiology of pulmonary hypertension (PH). The underlying signaling mechanisms involved in pulmonary vascular remodeling and the exaggerated vascular contractility, two characteristic features of pulmonary hypertension, are discussed in depth. The roles of inflammation, immunity, and right ventricular function in the
Pathobiology of pulmonary hypertension are discussed. The epidemiology of the five groups of pulmonary hypertension (World Health Organization classification; Nice, 2013) is also briefly described. A clear understanding of our current knowledge about the pathogenesis of PH is essential for further exploration of the underlying mechanisms involved in this disease and for the development of new therapeutic modalities. This book should be of interest to researchers and graduate students, both in basic research and in clinical settings, in the fields of pulmonary vascular biology and pulmonary hypertension.

Nunn's Applied Respiratory Physiology, Seventh Edition covers all aspects of respiratory physiology in health, disease, and altered conditions and environments, from basic science to clinical applications. Includes functional anatomy, mechanics, control of breathing, ventilation, circulation, ventilation-perfusion matching, diffusion, carbon dioxide and oxygen, and non-respiratory functions of the lung. Discusses the effects of pregnancy, exercise, sleep, altitude, pressure, drowning, smoking, anaesthesia, hypocapnia, hypercarbia, hypoxia, hyperoxia, and anaemia on respiratory physiology. Explores specific clinical disorders such as ventilatory failure, airways disease, pulmonary vascular disease, parenchymal lung disease, and acute lung injury, as well as the physiological basis of current therapies, including artificial ventilation, extrapulmonary gas exchange, and lung transplantation. Chapter on Parenchymal Lung Disease has been specifically expanded to include the physiology and pathology of the pleural space and lung cancer. Contains a new chapter on Pulmonary Surgery, covering a wide range of surgical interventions from bronchoscopy to lung resection. Includes almost 500 new references to the literature. The result is an invaluable source for those preparing for examinations in anaesthesia and intensive care, as well as an essential purchase for practitioners who want quick reference to current knowledge. Describes respiration in health and disease and in normal and abnormal situations, to help readers manage all conditions they see in their practices. Examines the respiratory effects of exercise, sleep, smoking, anaesthesia, drowning, anaemia, pregnancy, and other events as well as environmental factors such as altitude, flying, high pressure, closed environments, and air pollution on respiration. Maintains the clarity of style and single-author approach of previous editions through the close collaboration of Andrew Lumb and John Nunn. Makes difficult concepts easy to understand and apply with nearly 300 illustrations. A new chapter on the History of Respiratory Physiology. More coverage of pathophysiology and even more applications of respiratory physiology to clinical practice. A more consistent organization, a revised page design that aids readability, and an art program featuring new and newly redrawn illustrations.

An Introduction to Cardiovascular Physiology is designed primarily for students of medicine and physiology. This introductory text is mostly didactic in teaching style and it attempts to show that knowledge of the circulatory system is derived from experimental observations. This book is organized into 15 chapters. The chapters provide a fuller account of microvascular physiology to reflect the explosion of microvascular research and include a discussion of the fundamental function of the cardiovascular system involving the transfer of nutrients from plasma to the tissue. They also cover major advances in cardiovascular physiology including biochemical events underlying Starling's law of the heart, nonadrenergic, non-cholinergic neurotransmission, the discovery of new vasoactive substances produced by endothelium and the novel
This book provides a concise yet comprehensive review of the morphological, biochemical, electrical, mechanical, and metabolic properties of vascular smooth muscle, the regulation of vascular activities and the intracellular signaling involved. It particularly focuses on recently identified vasoactive agents, enzymes and transduction mechanisms. It also discusses the latest findings in the regulation of cerebral, coronary and pulmonary circulation as well as vascular activity under hypoxia and ageing. The contraction and dilatation activities of vasculature are of fundamental importance for maintaining circulation homeostasis and adapting physiological changes. Over the last four decades, there have been significant advances in our understanding of the biochemical, structural, genetic, physiological, and pharmacological aspects of vascular activity regulation, and these insights into the responsiveness of blood vessels under normal and pathophysiological conditions help to provide valuable weapons in the fight vascular diseases. The book is of interest to researchers and graduate students, both in basic research and in clinic settings, in the field of vascular biology.

An Introductory Guide

Textbook of Pulmonary Vascular Disease

Biology of Vascular Smooth Muscle: Vasoconstriction and Dilatation

Oxford Textbook of Critical Care

The Lung Circulation

This new book provides an accessible review of the field of lung biology and disease aimed at the graduate or medical student and biomedical researcher. The book starts by considering the anatomy and ultrastructure of the lung and the tracheal and bronchial system, the control of respiration as well as the fundamentals of pulmonary physiology, gas exchange and circulation. This is followed by discussion of the regulation of acid-base balance, high altitude physiology and pathophysiology as well as exercise and the pulmonary system. Chapters follow on the immunology of the lung, lung injury, asthma and emphysema, granulomatous lung disease, inhalation of toxic substances as well as diseases of the small airways. The final chapter considers current research into lung transplantation.

L. B. STRANG The past 25 years have seen a remarkable growth in our knowledge of lung development in its structural, physiological and biochemical dimensions. Much of the impetus for research leading to new knowledge has derived from the perception that many respiratory disorders in the newborn infant are due to defective development or maladaption of some component or components of the respiratory system. Thus, to cite one example, surfactant deficiency is clearly seen to be the cause of atelectasis in hyaline membrane disease; and to cite another, it is widely accepted that the mechanisms controlling patency of the ductus arteriosus and pulmonary vascular resistance also determine the right-to-left or left-to-right shunting frequently.
observed in the course of neonatal respiratory disorders. There are, however, areas of physiological knowledge - such as those relating to respiratory control and to liquid formation and absorption - which are clearly of great relevance to lung adaptation at birth but where it has not yet proved possible to link a specific clinical state to the malfunction of a particular mechanism. In planning this symposium an attempt was made to organize the material in an orderly manner, starting with the embryonic and fetal stages of growth and development, continuing with respiratory control and the role of surfactant in lung aeration at birth, and ending with the treatment of neonatal respiratory disorders.

A quick reference to basic science for anaesthetists, containing all the key information needed for FRCA exams.

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.

Membranes in Pulmonary Vascular Disease
Pulmonary Biology in Health and Disease
West's Pulmonary Pathophysiology
Pathophysiology of Pulmonary Hypertension
Foundations for Clinical Practice

Now in paperback, the second edition of the Oxford Textbook of Critical Care is a comprehensive multi-disciplinary text covering all aspects of adult intensive care management. Uniquely this text takes a problem-orientated approach providing a key resource for daily clinical issues in the intensive care unit. The text is organized into short topics allowing readers to rapidly access authoritative information on specific clinical problems. Each topic refers to basic physiological principles and provides up-to-date treatment advice supported by references to the most vital literature. Where international differences exist in clinical practice, authors cover alternative views. Key messages summarise each topic in order to aid quick review and decision making. Edited and written by an international group of recognized experts from many disciplines, the second edition of the Oxford Textbook of Critical Care provides an up-to-date reference that is relevant for intensive care units and emergency departments globally. This volume is the definitive text for all health care providers, including physicians, nurses, respiratory
therapists, and other allied health professionals who take care of critically ill patients. The Lung Circulation deals with important aspects of the lung circulation, with emphasis on the physiology of the pulmonary and bronchial circulation and autonomic pharmacology. Topics covered range from the role of anoxia in pulmonary circulation to reflexes arising from the pulmonary circulation and neighboring structures. The release of chemical substances from the pulmonary and bronchial circulation is also discussed. This volume is comprised of 10 chapters and begins with a review of the influence of anoxia on pulmonary circulation as well as four pertinent effects of anoxemia, namely, respiratory stimulation; cardiac stimulation; systemic vasoconstriction and vasodilation; and pulmonary vasoconstriction and vasodilation. The following chapters focus on the regulation of bronchial circulation; autonomic nervous control of pulmonary circulation involving acetylcholine, anticholinesterases, and atropine; and the pharmacology of sympathomimetic drugs, sympathetic blocking drugs, ganglion stimulants, and blocking drugs. The final chapter is devoted to the pharmacology of the autonomic nervous system and considers drugs that stimulate chemoreflexes arising from the lung circulation, including veratrum alkaloids. This book will appeal to physiologists and pharmacologists.

This easy yet comprehensive reference guide covers the mechanisms of respiratory diseases, explaining the main respiratory conditions for clinicians and postgraduate trainees. It discusses their aetiology as well as the basic concepts required to effectively evaluate and treat them. Applied Respiratory Pathophysiology is the first book to bring together detailed, clinicallyrelevant explanation of respiratory physiological processes and pathophysiological processes in one text. It is essential reading for anyone diagnosing and treating specific clinical conditions of the lungs.

Acute pulmonary embolism (APE) has a high mortality and many cases of APE go undiagnosed, as the pulmonary circulation is relatively hidden from clinical examination. The pathophysiology of APE is not completely understood, as there is a complex interplay of mechanisms that contribute to the disorder’s response. A difficulty in treating APE is that the mechanisms contributing to response are not well defined, and therefore it is difficult to predict which patients will respond most sensitively to a given clot load based on clinical evidence. Insight into the mechanisms of APE progression and severity has relied on controlled animal studies. Pigs are a widely-used experimental animal for representing human physiology and pathophysiology, because their comparative anatomy, as well as physiological and pathophysiological responses, are said to closely resemble that of humans. However, differences between pig and human in size and lung anatomy leads to translational limitations that are sometimes overlooked. Computational models with appropriate validation could bridge the gap in translating data from animal studies to human clinical practice. In the area of APE this translation is currently limited by a lack of a validated structure-function model for
perfusion of the porcine lung. The branching geometry of the pulmonary arterial and venous trees in pig is different in structure to the human pulmonary vasculature, and studies have previously suggested that species-specific branching asymmetry of the pulmonary blood vessels contributes to differences observed in pulmonary blood flow distribution between species. A realistic model that accurately reflects the geometry and mechanical properties of the in vivo porcine lung is therefore critical for translating detailed investigation of structurefunction relationships in the pulmonary circulation of the pig to human. The overall aim of this research was to develop a novel, validated computational model for the porcine pulmonary circulation, that can be used to understand the interplay between the fundamental mechanisms of pulmonary vascular disease. A structure-based theoretical model that integrates new imaging and experimental data, plus previous experimental and clinical observations, is presented here. This thesis presents a quantitative analysis of the pulmonary arteries in five pig lungs, characterising their branching pattern, inter-subject similarity, and self-similarity in branching geometry. A summary model for the self-similar pulmonary arterial tree is described. A method for generating anatomically-based finite element models of the porcine pulmonary vascular tree was developed, based on previous volume-filling branching methods and the new knowledge of the porcine pulmonary arterial tree morphometry. Subject-specific spatially distributed models were generated for each animal using this new method (in the prone posture, at close to full lung expansion), and the full pulmonary arterial tree geometry statistics were compared with experimental data from the five animals. The generated models were consistent with the data with respect to key morphometric parameters of branching angles, rates of reduction of branch diameter and length with branch order, rate of increase of number of branches in an order with reduction in order, ratios of minor or major child diameters to parent diameter, and length to diameter ratios. A multi-scale model was implemented to simulate the distribution of perfusion in the porcine lung. The model includes an approximation for the deformation of the lung tissue due to change in lung size and posture. Model predictions for the lung supine, at close to functional residual capacity, compared well with the haemodynamic data from each animal at baseline. The performance of the model was assessed for predicting haemodynamics and gas exchange following arterial occlusion in APE. The model predicted the general trends of the experimental data, but was not completely consistent with regional functional imaging. The model also suggested that recruitment of small vessels (arterio-venous shunts, or supernumerary vessels) could be important for mitigating increase in pulmonary vascular resistance when the proportion of occluded lung increases. An important question was whether a subject-specific model is necessary for all studies, or whether a single (generic) geometry with appropriate boundary conditions is sufficient to reproduce the important behaviours of the pulmonary circulation. A generic species-specific model was therefore developed and validated, by demonstrating that any subject-specific porcine model can be
parameterised to reflect individual pulmonary vascular function that has been measured for any other subject. The model was extended further by including a model for hypoxic pulmonary vasoconstriction. Simulation of normoxic and hypoxic ventilation was compared against experimental data from an independent study. The model prediction of arterial constriction during hypoxia (indicated by elevation of pulmonary artery pressure) and change in blood gases from normoxia were consistent with experiment. This research has established a new validated model to complement animal experimental studies, such that the interaction of mechanisms that contribute to APE can be investigated and presented in a quantitative way.

Membrane Receptors, Channels and Transporters in Pulmonary Circulation
Pulmonary Physiology and Pathophysiology

This open access book focuses on the molecular mechanism of congenital heart disease and pulmonary hypertension, offering new insights into the development of pulmonary circulation and the ductus arteriosus. It describes in detail the molecular mechanisms involved in the development and morphogenesis of the heart, lungs and ductus arteriosus, covering a range of topics such as gene functions, growth factors, transcription factors and cellular interactions, as well as stem cell engineering technologies. The book also presents recent advances in our understanding of the molecular mechanism of lung development, pulmonary hypertension and molecular regulation of the ductus arteriosus. As such, it is an ideal resource for physicians, scientists and investigators interested in the latest findings on the origins of congenital heart disease and potential future therapies involving pulmonary circulation/hypertension and the ductus arteriosus.

Offers a current and comprehensive review of the pathophysiology, diagnosis, and treatment of pulmonary hypertension and venous thromboembolism. Discusses in depth the pharmacologic and non-pharmacologic therapies used in the treatment of pulmonary vascular disease -- including the benefits and risks of each -- allowing for more informed care decisions.

A Computational Model to Predict Function in Experimental Pulmonary Embolism
Function in Health and Disease
Regulation of Coronary Blood Flow