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#### EDUCATIONAL CORNER OF THE ISSUE

# Basic concepts of medical genetics

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#### 1. Gene function

The genome of each organism, composed of all genes specific to the organism, is responsible for determining, configuring, and regulating all structural and functional aspects of that organism. These activities are actually mediated by the unique proteome of each organism, i.e. the sum of proteins produced in that particular organism by its own genome. The genomes of different organisms are composed of variable numbers of senes, up to tens of thousands as is the case in human, and can produce variable numbers, up to tens of thousands or even millions, of different proteins required for development and maintenance of all life aspects of the organism. So, the proteome of each organism is determined by its genome. Each of the genes of the genome is responsible for controlling a particular biological function through its product, may be a particular protein or a non-mRNA molecule responsible for mediating that particular biological function. Accordingly, the main function of the gene is the production of a unique product responsible for a specific biological function. Each gene carries in its unique base sequence the genetic information necessary for production of its gene product or its unique protein synthesized in the cell cytoplasm or cytosol [1].

The central dogma of molecular biology, or the frame of mediation of life processes at the zene protein level, as illustrated in (Fig. 1), entails that genes regulates ynthesis of proteins which mediate all life activities of living organisms. Actually, this is the major function of most genes. Genes which directly regulate protein synthesis are called structural genes. The functions of these structural genes are conducted under strict supervision of regulatory genes which regulate switching on, or activation, and switching off, or suppression, of structural genes so that the proper amount of proteins necessary for mediating physiological processes is synthesized at proper times. Proper control of these temporal aspects of gene function is of utmost importance for fine control, regulation and cooperation of the very large number of metabolic networks of the cell. Still, a third group of genes, master genes or housekeeping genes, function in a continuous manner to emure maintenance and persistence of life-dependant processes. Examples of these processes include cell growth, cell division. ATP production and apoptosis. Continuous monitoring of these life-dependant activities is mandatory to keep life activities in living organisms [1].

Structural genes regulate protein synthesis via the genetic information, or the genetic code, which is the information contained within the specific arrangement of the nucleotides, or bases, of the gene that determine the gene function(s). It is designed to function in a specific way so that each three nucleotides in sequence along the gene, known as the codon, which is the functional unit of the gene, define a single specific amino acid in the protein synthesized under regulation of the gene. There are 64 known codoms: 61 functional codoms which define specific amino acids in the proteins, and three termination or stop codoms that do not define any amino acids in the protein (Fig. 2). Rather, they determine the end point of the synthesized protein.

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# **Basic Concepts In Medical Genetics**

Lynn B. Jorde, PhD, John C. Carey, MD, MPH, Michael J. Bamshad, MD

#### **Basic Concepts In Medical Genetics:**

Basic Concepts in Medical Genetics Marshall Horwitz, Mary Beth Dinulos, Kris Carroll, 2000 Medical Genetics E-Book Lynn B. Jorde, John C. Carey, Michael J. Bamshad, 2019-09-27 Up to date and extensively revised to reflect recent advances in the genetics of common diseases as well as current progress in gene therapy Medical Genetics 6th Edition delivers easy to read highly visual coverage of this rapidly changing field This accessible practical text integrates key concepts with clinical practice highlighted by numerous illustrations tables concept summaries and more all designed to enhance effective learning and retention of complex material Discusses current topics including polygenic risk scores and their potential applications for diabetes cancer and heart disease and the latest sequencing technologies and their clinical application in genetic testing and diagnosis Offers a completely updated discussion of genetic testing modalities and applications Includes convenient concept summaries more than 230 photographs illustrations and tables as well as patient family vignettes that present valuable perspectives on disease and treatment Features Clinical Commentary boxes that demonstrate how the hard science of genetics has real applications to everyday patient problems preparing you for problem based integrated courses Illustrates key concepts with disease examples to demonstrate relevance to medicine Provides study questions for self assessment as well as 200 additional USMLE style questions online Enhanced eBook version included with purchase Your enhanced eBook allows you to access all of the text figures and references from the book on a variety of devices Introduction To Basic Concepts Of Medical Genetics Mohammad Salem, 2012 Medical genetics a branch of human genetics spans a wide spectrum of sub branches including basic clinical diagnostic therapeutic prophylactic and applied genetics. This booklet I hope it be the first in a series is confined to two disciplines of basic genetics viz molecular genetics and pathogenetics that are concerned with studying the structure and function of the genetic material in health and disease states It aims at offering the basic concepts of these two subjects to clinicians and research workers in the field For clinicians beginning their specialization as medical geneticists I tried my best to offer as simplified as possible definitions and illustrations of the main points of both subjects concerning the structure and function of genes mutagens and disease causing mutations as well as the anti mutation mechanisms of the human genome For research workers I pointed out some of the most enigmatic aspects of the field that still await more research to disclose in order to go a step further in our way to understand what we think we know about the Medical Genetics Lynn B. Jorde, PhD, John C. Carey, MD, MPH, Michael role of our genetic constitution in shaping our life J. Bamshad, MD,2015-09-04 Popular for its highly visual clinical approach Medical Genetics delivers an accessible yet thorough understanding of this active and fast changing field Key updates in this new edition cover the latest developments which are integrated with clinical practice to emphasize the central principles and how they apply to practice Photographs illustrations and tables along with boxes containing patient family vignettes demonstrate clinical relevance and enhance visual impact of the material for easier and more effective learning and retention Includes access to the complete text and

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understanding of this active and fast changing field Key updates in this new edition cover the latest developments which are integrated with clinical practice to emphasize the central principles and how they apply to practice Photographs illustrations and tables along with boxes containing patient family vignettes demonstrate clinical relevance and enhance visual impact of the material for easier and more effective learning and retention Mini summaries study questions suggested reading and a detailed glossary supplement and reinforce what you learn from the text More than 230 photographs illustrations and tables along with patient family vignettes clarify difficult concepts and demonstrate clinical significance Clinical Commentary Boxes help demonstrate how the hard science of genetics has real applications to everyday patient problems and prepare you for problem based integrated courses Human Genetics ,1980 The Era of Precision Medicine: Genetics, Pharmacy, and Personalized Health Edenilson Brandl, This book explores the fascinating field of precision medicine and its role in understanding and treating genetic diseases in various systems and organs of the human body Throughout the chapters topics such as precision medicine in the context of developmental diseases nutrigenomics and its relationship to diet personalization pulmonary diseases musculoskeletal diseases genetic diseases of the cardiovascular system and genetic diseases of the hepatic system are explored In addition subjects such as the application of genetic tests in precision medicine analysis of genetic variants precision medicine in women s health rare genetic diseases dermatological diseases nervous system diseases renal system diseases and metabolism diseases are addressed. The book also explores the role of epigenetics in precision medicine highlighting how modifications to the genetic environment can influence disease development and progression In addition topics such as allergic diseases genetic diseases of the respiratory system and genetic diseases of the musculoskeletal system are discussed As a comprehensive guide this book provides valuable insights into precision medicine and its impact on clinical practice in the quest for more accurate diagnoses and personalized treatments It is essential reading for healthcare professionals researchers and students interested in the field of medical genetics and its applications in the era of precision medicine Human Genetics, Informational and Educational Materials National Clearinghouse for Human Genetic Diseases (U.S.), **Histology and Cell Biology: An Introduction to Pathology - E-Book** Abraham L. Kierszenbaum, Laura Tres, 2025-03-25 The first text to integrate microscopic anatomy with cell biology general pathology and physiology Histology and Cell Biology An Introduction to Pathology Sixth Edition continues to set the standard for studying today s rapidly evolving molecular oriented medicine Drs Abraham L Kierszenbaum and Laura L Tres present essential concepts in an accessible easy to understand manner with full color illustrations diagrams photomicrographs and pathology photos fully integrated on every page Linking pathological conditions to basic sciences throughout this award winning text helps you build a substantial clinical knowledge base while learning the structure and function of normal organs Provides cover to cover updates throughout reflecting current terminology basic science and clinical concepts Includes new material at the beginning of each chapter that assists you with the microscope as you first encounter the architectural complexity of

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an approach to solving clinical problems and provides a conceptual framework within which to sort it all out Davidson approaches the subject of medical genetics as students wil l encounter it clinically The book is problem based and each chapt er begins with a case scenario requiring a knowledge of genetics with which the practicing physician will have to come to grips fairly frequently with the emphasis on having the student recognize the applications of basic science data and solving the problem presented It Emery and Rimoin's Essential Medical Genetics David L. Rimoin, Reed E. Pyeritz, Bruce Korf, 2013-05-15 For decades Emery and Rimoin's Principles and Practice of Medical Genetics has provided the ultimate source for practicing clinicians to learn how the study of genetics can be integrated into practice Developed in parallel to the sixth edition and featuring 174 original contributions from the many authors of the full set this one volume work expertly condenses and synthesizes the most clinically relevant content for convenient desk reference Helping to bridge the gap between high level molecular genetics and individual application it follows the multi volume set in encompassing scientific fundamentals full spectrum discussion of major inherited disorders and actionable therapies Clinically oriented information is supported by concise descriptions of the principles of genetics research approaches and analytics to embrace the evolving population of students researchers and practitioners who are integrating their work to provide advanced diagnosis prevention and treatment of human disease This print volume is complemented and enhanced with online access to the complete text online only references and high quality illustrations on www expertconsult com Features 174 summarized contributions concisely discussing advances in cancer genetics genomic technologies and molecular genetics Contains hundreds of full colour illustrations supporting users with identification concept illustration and method processing Enhanced with full text online access high quality illustrations and online only references at www expertconsult com The Importance of Genetic Literacy and Education in Medicine Nina Pereza, Borut Peterlin, Saša Ostojić, 2022-05-24 Genetics Ruth M. DeBusk, 2003 Discover how the Human Genome Project will soon affect dietetic practice in this fascinating new reference Medical nutrition therapy nutrition and food service drug therapy gene therapy gene diagnostics and social and public nutrition policies will all feel the impact of this on going research Each chapter in the Genetic Connection begins to answer the question of how these advances will affect dietetics Prepare for the future with this exciting new title

Handbook of Clinical Adult Genetics and Genomics Shweta Dhar, Sandesh Sreenath Chakravarthy Nagamani, Tanya Eble, 2020-04-10 Handbook of Clinical Adult Genetics and Genomics A Practice Based Approach provides a thorough overview of genetic disorders that are commonly encountered in adult populations and supports the full translation of adult genetic and genomic modalities into clinical practice Expert chapter authors supplement foundational knowledge with case based strategies for the evaluation and management of genetic disorders in each organ system and specialty area Topics discussed include employing genetic testing technologies reporting test results genetic counseling for adult patients medical genetics referrals issues of complex inheritance gene therapy and diagnostic and treatment criteria for developmental

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**Techniques of Medical Genetics** Dr. Ruchi Ratnesh, 2019-10-14 The knowledge of genetics and the bioinformatics has increased rapidly over the past few decades The application of this knowledge has become an integral part of patient care and the preventive thrust of modern medicine The aetiology of the majority of disorders has some genetic component The subject of genetics is gaining utmost importance in the medical science However most of the medical students find this subject difficult to understand and therefore neglect it The aim of this book is to present the text in such a way that it provides the clear and conceptual understanding of the subject A simple and concise account of different techniques of genetics will help students understand them better This book is not a comprehensive textbook of genetics Instead it takes a look at the basic concepts as well as interesting and clinically applicable aspects of genetics This book on techniques of genetics emphasize the central principles and how they apply to practice Photographs illustrations and tables containing patient family vignettes demonstrate clinical relevance and enhance visual impact of the material for easier and more effective learning and retention Includes access to the complete text and images online at student The latest knowledge and research on gene identification cancer genetics gene testing and gene therapy common disorders ethical and social issues and much more so you can keep up with current developments in genetics Bioinformatics NGS Data analysis Barcoding and Multiplexing Whole genome sequence analysis Gene bank Genomic browers and Genomic batabases are some of the interesting topics that has been provided for the students A knowledge of molecular genetics is essential to understand the latest developments in medicine An attempt has been made to outline the fundamentals of molecular genetics so that the reader gets familiar with the terminologies and techniques used in this field The students from various nonmedical background will also find this book useful in familiarizing them with the clinically applied aspects of genetics To make it easy text is supported with the flowchart Integrating Evolutionary Biology Into Medical Education Jay Schulkin, Michael L. Power, Michael Power, 2019-12-12 This book builds a compelling case for integrating evolutionary biology into undergraduate and postgraduate medical education as well as its intrinsic value to medicine It achieves this within the broader context of medicine but through the focused lens of maternal and child health The Encyclopaedia of Sports Medicine, Genetic and Molecular Aspects of Sports Performance Claude Bouchard, Eric P. Hoffman, 2011-08-02 This is the latest volume in the IOC Encyclopaedia of Sports Medicine series summarizing the evidence from all relevant sources on the genetic and molecular basis of sports and other human physical performance The initial chapters address the basic science of genomics and genetics and the regulation of gene expression Additional chapters provide authoritative information on the

genetics of complex performance phenotypes the contributions of small animal research family and twin studies and ethnic comparisons A final section addresses the issue of the contribution of specific genes and molecular markers as related to endurance strength and power and responsiveness to specific conditioning programs This latest volume in the Encyclopaedia of Sports Medicine Series from the Medical Commission of the International Olympic Committee is a must for sports and exercise scientists who require a thorough guide to the most cutting edge science in this expanding field

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