

Regulation of the Lactase Gene



About This Worksheet

This worksheet complements the Click and Learn "Regulation of the Lactase Gene" developed in conjunction with the 2011 HHMI Holiday Lectures on Science "Bones, Stones, and Genes: The Origin of Modern Humans."

Author: Ann Brokaw, Rocky River High School, OH.

Key Concepts

- Eukaryotic gene expression is regulated at the levels of transcription, RNA processing, translation, and post-translation.
- Proteins called transcription factors bind to DNA and control transcription. Different types of transcription factors can increase or decrease transcription.
- Mutations in DNA regions that control gene expression can alter the way genes are expressed.
- Infants have high lactase levels so that they can digest their mothers' milk, but lactase gene expression is turned off after weaning.
- Lactase persistence is the trait that allows adults to continue to digest milk. It results from a mutation in an enhancer region of the lactase gene.

Instructions

1. Go to BioInteractive.org.
2. In the menu bar under the masthead, mouse over Topics → Evolution → Interactive.
3. Scroll down the page and click on "Regulation of the Lactase Gene."
4. Proceed through the slides, watch the embedded video clips, and answer the following questions in the space provided.

Questions

1. What is the difference between lactose tolerance and lactose intolerance? Be specific.

The main difference between lactose tolerance and lactose intolerance is the ability to digest lactose, a carbohydrate commonly found on dairy products, to its simpler units – glucose and galactose through the enzyme lactase. Basically, a person is considered lactose intolerant if he/she does not have/ have reduced lactase in his/her small intestine.

2. Why is lactose tolerance also called lactase persistence?

Lactase is a normal enzyme found in the human body most especially during its infant to childhood stages. As we age, the ability to produce the enzyme reduces and in some cases it completely stops. This makes a person lactose intolerant. Lactose tolerance is also called lactase persistence because these people did not stop from producing lactase even post childhood stage. They have persistently produced this enzyme which allow the person to easily digest dairy products with ease.

3. In which cells or tissues is lactase produced and what is its role?

Lactase is primarily produced in the cells of the walls of the small intestine. The small intestine functions for the absorption of nutrients from digested food as well as further digestion of food. To be more specific, proteins, fats, and carbohydrates are digested here with the help of many gastric juices. Hence, lactase is one of the carbohydrates that is digested in the small intestine with the help of lactase.

4. What normally happens to the levels of lactase produced throughout a person's lifetime?

LCT gene, the gene responsible for the translation of lactase, is very active during infant to childhood stage. As a person ages, the LCT gene becomes inactive thus greatly affecting the production of lactase. In general, as a person gets older, the more the person becomes lactose intolerant.

Regulation Of The Lactase Gene Key

Lei Huang



Regulation Of The Lactase Gene Key:

Lactose Intolerance: Pathophysiology, Diagnosis, and Management Dr. Spineanu Eugenia, 2025-02-19 Lactose Intolerance Pathophysiology Diagnosis and Management offers a comprehensive exploration of lactose intolerance from a medical and biochemical perspective This treatise delves into the underlying pathophysiological mechanisms including enzyme deficiencies and genetic variations that contribute to lactose intolerance It provides an in depth analysis of diagnostic approaches including hydrogen breath tests lactose tolerance tests and stool acidity tests The text also examines various management strategies from dietary modifications and lactase supplements to alternative therapies and long term care plans Tailored for healthcare professionals researchers and individuals seeking a thorough understanding of lactose intolerance this resource integrates the latest research and clinical practices With a focus on optimizing diagnosis and treatment Lactose Intolerance Pathophysiology Diagnosis and Management serves as an essential guide to managing this common digestive disorder effectively

Physiology of the Gastrointestinal Tract Kim E. Barrett, Faye K. Ghishan, Juanita L. Merchant, Hamid M. Said, Jackie D. Wood, 2006-05-10 FROM THE PREFACE The original purpose of the First Edition of *Physiology of the Gastrointestinal Tract* to collect in one set of volumes the most current and comprehensive knowledge in our field was also the driving force for the Fourth Edition The explosion of information at the cellular level made possible in part by the continued emergence of powerful molecular and cellular techniques has resulted in a greater degree of revision than that of any other edition The first section now titled Basic Cell Physiology and Growth of the GI Tract contains numerous new chapters on topics such as transcriptional regulation signaling networks in development apoptosis and mechanisms in malignancies Most of the chapters in this section were edited by Juanita L Merchant Section II has been renamed Neural Gastroenterology and Motility and has been expanded from seven chapters with rather classic titles to more than twenty chapters encompassing not only the movement of the various parts of the digestive tract but also cell physiology neural regulation stress and the regulation of food intake Almost all of the chapters were recruited and edited by Jackie D Wood The third section is entirely new and contains chapters on Immunology and Inflammation which were edited by Kim E Barrett The fourth section on the Physiology of Secretion consists of chapters with familiar titles but with completely updated information to reflect the advances in our understanding of the cellular processes involved in secretion The last section on Digestion and Absorption contains new chapters on the intestinal barrier protein sorting and ion channels along with those focusing on the uptake of specific nutrients These chapters were recruited and edited by Hamid M Said and Faye K Ghishan Collected in one set the most current and comprehensive coverage of gastrointestinal physiology Information presented in a style that is both readable and understandable Valuable to the specialized researcher the clinical gastroenterologist the teacher and the student Features an entirely new section on Immunology and Inflammation Each section edited by the preeminent scientist in the field

Physiology of the Gastrointestinal Tract, Two Volume Set Hamid M. Said, 2012-07-04 Physiology of the

Gastrointestinal Tract Fifth Edition winner of a 2013 Highly Commended BMA Medical Book Award for Internal Medicine covers the study of the mechanical physical and biochemical functions of the GI Tract while linking the clinical disease or disorder bridging the gap between clinical and laboratory medicine The gastrointestinal system is responsible for the breakdown and absorption of various foods and liquids needed to sustain life Other diseases and disorders treated by clinicians in this area include food allergies constipation chronic liver disease and cirrhosis gallstones gastritis GERD hemorrhoids IBS lactose intolerance pancreatic appendicitis celiac disease Crohn s disease peptic ulcer stomach ulcer viral hepatitis colorectal cancer and liver transplants The new edition is a highly referenced and useful resource for gastroenterologists physiologists internists professional researchers and instructors teaching courses for clinical and research students 2013 Highly Commended BMA Medical Book Award for Internal Medicine Discusses the multiple processes governing gastrointestinal function Each section edited by preeminent scientist in the field Updated four color illustrations

Gene Regulation as a Driver of Adaptation and Speciation Ekaterina Shelest, Katja Nowick, Deborah A. Triant, 2022-01-06

Research Awards Index, 1987 *Development of the Gastrointestinal Tract* Ian R. Sanderson, W. Allan Walker, 2000 The authors chronicle the development of the gastrointestinal system beginning with the embryology of the gastrointestinal tract through development of cells to hormones and enzymes Each section provides detailed explanation of that stage of development so residents and clinicians can better understand the interrelationships of each structure Special attention is given to the latest cellular information and gene promoters in the regulation of intestinal development Coverage of defects due to trauma and infections is also included

Gene Environment Interactions Moyra Smith, 2020-01-14

Gene Environment Interactions Nature and Nurture in the Twenty first Century offers a rare synergistic view of ongoing revelations in gene environment interaction studies drawing together key themes from epigenetics microbiomics disease etiology and toxicology to illuminate pathways for clinical translation and the paradigm shift towards precision medicine Across eleven chapters Dr Smith discusses interactions with the environment human adaptations to environmental stimuli pathogen encounters across the centuries epigenetic modulation of gene expression transgenerational inheritance the microbiome s intrinsic effects on human health and the gene environment etiology of cardiovascular metabolic psychiatric behavioral and monogenic disorders Later chapters illuminate how our new understanding of gene environment interactions are driving advances in precision medicine and novel treatments In addition the book s author shares strategies to support clinical translation of these scientific findings to improve health literacy among the general population

Bioinformatics of Genome Regulation and Systems Biology Yuriy L. Orlov, Ancha Baranova, 2020-09-17

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microRNA Regulation in Health and Disease Clifford J. Steer, Subbaya Subramanian, 2020-02-21

MicroRNAs miRNAs are small regulatory RNAs that play a crucial role in posttranscriptional gene regulation Over two thousand miRNAs have been identified in humans and many of them are conserved in other species miRNAs are implicated in fundamental cellular functions including development and disease In the last decade there has been an overwhelming amount of data contributing to the understanding of miRNA biogenesis and their target genes Moreover a significant amount of work has been carried out in developing miRNA biomarkers and therapeutics for various disease conditions RNA based markers and therapeutics have been proven to have a clinical impact and many of these miRNA based therapies are at various stages of human clinical trials and clinical applications Notably miRNAs are also found in exosomes and are considered to impart intercellular communication and function via several different modalities including tunneling nanotubes In spite of our understanding of miRNA biology and function there are many challenges in effectively using miRNAs as biomarkers and therapeutic agents in clinical applications In this Special Issue we are inviting reviews perspectives and original research articles to address some of these challenges Topics will include but are not limited to miRNA biogenesis clinical applications extracellular function biomarkers miRNA immune regulation signaling pathways and preclinical models

Dairy in Human Health and Disease across the Lifespan Ronald Ross Watson, Robert J Collier, Victor R Preedy, 2017-06-19

Dairy in Human Health and Disease across the Lifespan addresses the contribution of milk to the human diet and health throughout the life span This comprehensive book is divided into three sections and presents a balanced overview of dairy s impact on nutrition from infancy to adulthood Summaries capture the most salient points of each chapter and the book provides coverage of dairy as a functional food in health and disease Presents various dairy products and their impact on health specific to various stages in the lifespan Provides information to identify which food and diet constituents should be used as dietary supplements based on modification of health and nutrition Incorporates contributions from an international team of authors with varying areas of expertise related to dairy and nutrition

Advanced Dairy Chemistry Paul L. H. McSweeney, Patrick F. Fox, 2009-04-20

The Advanced Dairy Chemistry series was first published in four volumes in the 1980s under the title Developments in Dairy Chemistry and revised in three volumes in the 1990s The series is the leading reference source on dairy chemistry providing in depth coverage of milk proteins lipids lactose water and minor constituents Advanced Dairy Chemistry Volume 3 Lactose Water Salts and Minor Constituents Third Edition reviews the extensive literature on lactose and its significance in milk products This volume also reviews the literature on milk salts vitamins milk flavors and off flavors and the behaviour of water in dairy products Most topics covered in the second edition are retained in the current edition which has been updated and expanded considerably New chapters cover chemically and

enzymatically prepared derivatives of lactose and oligosaccharides indigenous to milk P L H McSweeney Ph D is Associate Professor of Food Chemistry and P F Fox Ph D D Sc is Professor Emeritus of Food Chemistry at University College Cork Ireland

The Genome Factor Dalton Conley, Jason Fletcher, 2017-01-09 How genomics is revolutionizing the social sciences For a century social scientists have avoided genetics like the plague But the nature nurture wars are over In the past decade a small but intrepid group of economists political scientists and sociologists have harnessed the genomics revolution to paint a more complete picture of human social life than ever before The Genome Factor describes the latest astonishing discoveries being made at the scientific frontier where genomics and the social sciences intersect The Genome Factor reveals that there are real genetic differences by racial ancestry but ones that don t conform to what we call black white or Latino Genes explain a significant share of who gets ahead in society and who does not but instead of giving rise to a genotocracy genes often act as engines of mobility that counter social disadvantage An increasing number of us are marrying partners with similar education levels as ourselves but genetically speaking humans are mixing it up more than ever before with respect to mating and reproduction These are just a few of the many findings presented in this illuminating and entertaining book which also tackles controversial topics such as genetically personalized education and the future of reproduction in a world where more and more of us are taking advantage of cheap genotyping services like 23andMe to find out what our genes may hold in store for ourselves and our children The Genome Factor shows how genomics is transforming the social sciences and how social scientists are integrating both nature and nurture into a unified comprehensive understanding of human behavior at both the individual and society wide levels

Revise As/A2 Biology Senior Lecturer in African History John Parker, HarperCollins UK, 2008-10 Level A Level Subject Biology Revise for AS A2 Biology with confidence Providing complete study support throughout the two A Level years this Biology study guide matches the curriculum content and provides in depth course coverage plus invaluable advice on how to get the best results in the exams Providing plenty of exam practice and frequent progress checks and questions to consolidate learning this AS A2 Biology study guide contains invaluable advice and preparation for the exam Included in this book examiner s tips that reveal how to achieve higher marks information presented in a clear and easy to use format exam board labels that allow students to identify content relevant to their course highlighted key points and examiner s hints to offer guidance progress check questions to test recall and understanding sample questions and model answers that reveal what examiners are looking for exam style questions and answers that provide crucial exam practice eal what examiners are looking for exam style questions and answers that provide crucial exam practice eal what examiners are looking for exam style questions and answers that provide crucial exam practice

Fennema's Food Chemistry Srinivasan Damodaran, Kirk L. Parkin, 2017-05-25 This latest edition of the most internationally respected reference in food chemistry for more than 30 years Fennema s Food Chemistry 5th Edition once

again meets and surpasses the standards of quality and comprehensive information set by its predecessors All chapters reflect recent scientific advances and where appropriate have expanded and evolved their focus to provide readers with the current state of the science of chemistry for the food industry This edition introduces new editors and contributors who are recognized experts in their fields The fifth edition presents a completely rewritten chapter on Water and Ice written in an easy to understand manner suitable for professionals as well as undergraduates In addition ten former chapters have been completely revised and updated two of which receive extensive attention in the new edition including Carbohydrates Chapter 3 which has been expanded to include a section on Maillard reaction and Dispersed Systems Basic considerations Chapter 7 which includes thermodynamic incompatibility phase separation concepts Retaining the straightforward organization and accessibility of the original this edition begins with an examination of major food components such as water carbohydrates lipids proteins and enzymes The second section looks at minor food components including vitamins and minerals colorants flavors and additives The final section considers food systems by reviewing basic considerations as well as specific information on the characteristics of milk the postmortem physiology of edible muscle and postharvest physiology of plant tissues

Transcriptional/posttranscriptional regulations in agricultural species after stresses Suxu Tan,Rani Alex,Turgay Unver,2023-02-03

Robbins and Cotran Pathologic Basis of Disease, Professional Edition E-Book Vinay Kumar,Abul K. Abbas,Nelson Fausto,Jon C. Aster,2014-08-27 Dependable current and complete Robbins and Cotran Pathologic Basis of Disease 9th Edition is the perennially best selling text that you ll use long after your medical student days are behind you A world class author team headed by Drs Vinay Kumar Abul Abbas and Jon Aster delivers the latest most essential pathology knowledge in a readable interesting manner ensuring optimal understanding of the latest basic science and clinical content High quality photographs and full color illustrations highlight new information in molecular biology disease classifications new drugs and drug therapies and much more Rely on uniquely authoritative and readable coverage ideal for USMLE or specialty board preparation as well as for course work Simplify your study with an outstanding full color highly user friendly design Stay up to date with the latest information in molecular and genetic testing and mechanisms of disease Consult new Targeted Therapy boxes online that discuss drug therapy for specific diseases Gain a new perspective in key areas thanks to contributions from new authors at the top of their fields Consult this title on your favorite e reader conduct rapid searches and adjust font sizes for optimal readability

Nutrigenomics Carsten Carlberg,Ferdinand Molnár,2025-04-28 Now in its second edition this concise textbook provides an overview of the field of nutrigenomics a topic at the intersection of nutrition and genetics that explores how dietary molecules interact with our genome and epigenome to influence health and disease Substantially updated and expanded the book offers a fresh perspective on how diet has shaped human evolution and our susceptibility to conditions such as type 2 diabetes and cardiovascular disease The 11 chapters cover a wide range of topics beginning with an overview of the role of nutrients in health and disease basic mechanisms of

nutrient sensing and nuclear receptors and the impact of epigenetic regulation on health Readers will discover how chromatin modifying enzymes and energy status sensing kinases play critical roles in signaling pathways between diet and the genome The book also explores the influence of diet on cancer prevention the importance of the microbiome and low grade chronic inflammation and aging Written in an accessible style this textbook is intended for undergraduate and graduate students in nutrition biochemistry molecular biology and biology as well as for students and practitioners in medicine Numerous color illustrations aid in the transfer of knowledge by graphically summarizing complex processes Combined with a glossary that explains key terms this work is an indispensable resource for anyone interested in how our daily dietary choices interact with our genome

Genome-based Nutrition Strategies for Preventing Diet-related Chronic Diseases: Where Genes, Diet, and Food Culture Meet Arturo Panduro, Omar Ramos-Lopez, Claudia

Ojeda-Granados, 2024-07-02 Human populations that have recently undergone substantial changes in their traditional social cultural and dietary habits have shown an increased susceptibility to developing chronic diet related diseases concerning their genetic background One factor is that the population's adaptive genetic variants related to its evolutionary history are exposed to different physical and lifestyle environments that underlie and influence the current patterns of disease risk Under this perspective the current obesogenic environment has promoted the acculturation of a westernized diet disrupting the ancestral gene foods nutrients bioactive compounds interactions i.e. ancestral genetic ethnic profile vs modern lifestyle Modern lifestyles including unhealthy dietary patterns have further impaired the consumption of staple foods with essential nutrients and functional properties increasing the incidence of obesity and associated comorbidities However most conventional nutrition approaches targeting chronic diseases have limited impact on managing the leading non communicable diseases affecting modern societies

The Sacred Depths of Nature Ursula Goodenough, 2023 This eloquent volume reconciles our contemporary scientific understanding of reality with our timeless spiritual yearnings Addressing ideas like evolution emotions sexuality and death The Sacred Depths of Nature allows even non scientists to appreciate that the origins of life and the universe are no less meaningful in light of our scientific understanding of them This new edition offers a deepened consideration of emergent properties and emergent dynamics as well as an exploration of their role as the generators of life's complexity Goodenough also expands upon the ethic of ecomorality in a new chapter and incorporates new quotes figures and poems in her analysis

Cancer Biology and Medical Genetics Mr. Rohit Manglik, 2024-03-02 EduGorilla Publication is a trusted name in the education sector committed to empowering learners with high quality study materials and resources Specializing in competitive exams and academic support EduGorilla provides comprehensive and well structured content tailored to meet the needs of students across various streams and levels

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Table of Contents Regulation Of The Lactase Gene Key

1. Understanding the eBook Regulation Of The Lactase Gene Key
 - The Rise of Digital Reading Regulation Of The Lactase Gene Key
 - Advantages of eBooks Over Traditional Books
2. Identifying Regulation Of The Lactase Gene Key
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Regulation Of The Lactase Gene Key
 - User-Friendly Interface
4. Exploring eBook Recommendations from Regulation Of The Lactase Gene Key
 - Personalized Recommendations
 - Regulation Of The Lactase Gene Key User Reviews and Ratings
 - Regulation Of The Lactase Gene Key and Bestseller Lists
5. Accessing Regulation Of The Lactase Gene Key Free and Paid eBooks

- Regulation Of The Lactase Gene Key Public Domain eBooks
- Regulation Of The Lactase Gene Key eBook Subscription Services
- Regulation Of The Lactase Gene Key Budget-Friendly Options
- 6. Navigating Regulation Of The Lactase Gene Key eBook Formats
 - ePub, PDF, MOBI, and More
 - Regulation Of The Lactase Gene Key Compatibility with Devices
 - Regulation Of The Lactase Gene Key Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Regulation Of The Lactase Gene Key
 - Highlighting and Note-Taking Regulation Of The Lactase Gene Key
 - Interactive Elements Regulation Of The Lactase Gene Key
- 8. Staying Engaged with Regulation Of The Lactase Gene Key
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Regulation Of The Lactase Gene Key
- 9. Balancing eBooks and Physical Books Regulation Of The Lactase Gene Key
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Regulation Of The Lactase Gene Key
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Regulation Of The Lactase Gene Key
 - Setting Reading Goals Regulation Of The Lactase Gene Key
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Regulation Of The Lactase Gene Key
 - Fact-Checking eBook Content of Regulation Of The Lactase Gene Key
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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