

# 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."

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## 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](http://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

**Andrew S. Reynolds**



## **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, 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

*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 Fayez 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 *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 This eBook is a collection of articles from a Frontiers Research Topic Frontiers Research Topics are very popular trademarks of the Frontiers Journals Series they are collections of at least ten articles all centered on a particular subject With their unique mix of varied contributions from Original Research to Review Articles Frontiers Research Topics unify the most influential researchers the latest key findings

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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

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 genocracy 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

**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

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

**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 eal what examiners are looking for exam style questions and answers that provide crucial exam practice

**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

**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

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

*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

Nutrition and Metabolism Susan A. Lanham-New, Ian A. Macdonald, Helen M. Roche, 2011-07-08 Nutrition and Metabolism Nutrition and Metabolism In this second edition of the second title in the acclaimed Nutrition Society Textbook Series Nutrition and Metabolism has been revised and updated to meet the needs of the contemporary student Ground breaking in scope and approach this title Provide students with the required scientific basics of nutrition in the context of a systems and health approach Enable teachers and students to explore the core principles of nutrition to apply these throughout their training and to foster critical thinking at all times Is fully peer reviewed to ensure completeness and clarity of content as well as to ensure that each book takes a global perspective Nutrition and Metabolism is an essential purchase for students of nutrition and dietetics and also for those students who major in other subjects that have a nutrition component such as food science medicine pharmacy and nursing Professionals in nutrition dietetics food science medicine health sciences and many related areas will also find much of great value within its pages Other books in the Nutrition Society Textbook Series Introduction to Human Nutrition ISBN 9781405168076 Clinical Nutrition ISBN 9780632056262 Public Health Nutrition ISBN 9780632056279 For further information companion material for use with these textbooks and full details of how to purchase them visit [www.wiley.com](http://www.wiley.com) go



nutrition society      **Understanding Metaphors in the Life Sciences** Andrew S. Reynolds, 2022-04-28 Introduces the diverse roles metaphors play in the life sciences and highlights their significance for theory communication and education

## Reviewing **Regulation Of The Lactase Gene Key**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is really astonishing. Within the pages of "**Regulation Of The Lactase Gene Key**," an enthralling opus penned by a highly acclaimed wordsmith, readers set about an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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